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Patron : Dr. Fr. Davis George

Editor : Dr. Kallol Das

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Associate Editors : Fr. J.G. Valan Arasu Ms. J. V. Zahir

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MESSAGE

The launch of the research journal 'Ninad' of St. Aloysius' College marks the beginning of a new era of knowledge and awakening. The name "Ninad' is suggestive of creativity and uniqueness brought forward by interdisciplinary action. The awareness of high intellect portray a uniform blend of thoughts and ideas on pen and paper and here we have the final version in the form of a journal.

To bring out a journal requires meticulous planning, execution and disciplined attitude in the formative steps. If all the above are carried out satisfactorily, the result is a shimmering and shining product all set to draw attention and seek appreciation. Fortunately the same has been true for the journal It has been well thought of, in terms of individual contributions and the subject matter has been logically arranged. It is sure to present original thought content and a fresh approach to increase the frontiers of knowledge.

A journal is an academic pursuit to explore the frontiers of knowledge and continue the on-going and ever-going process of self-discovery and discovery of the universe. Human potential is infinite. In today's world knowledge alone prevails and 'Knowledge is Power'. A journal like this will motivate the scholars and mobilize their talents for the service of humankind.

My heartiest congratulations to Dr. K. Das and his team on this great achievement. May this journal illuminate the dark areas of ignorance and visualize a utopia of ultimate bliss where knowledge is imbibed thoroughly at all levels of learning. My earnest prayer for the institution is expressed by Alfred Tennyson:

"To follow knowledge like a sinking star Beyond the utmost bound of human understanding."

With best wishes,

Dr. Fr. Davis George

Principal, St. Aloysius College, Jabalpur

EDITORIAL

"Ninad" is the first issue of a multidisciplinary journal being published by St. Aloysius College, Jabalpur. This multidisciplinary journal is an endeavour to bring forth several research disciplines on a common platform. The serious researcher often suffers from a serious handicap as he or she may be stationed in a far flung area or in one of the many non descript cities which dot the educational map of the country. Also, they may have available at their disposal, paltry research facilities with which to further his or her research. Through this journal, research and popular articles in the areas of Physics , Mathematics, Chemistry, Zoology, Commerce, Economics, Botany and others would be published at a very affordable cost. This journal should also be useful for teaching and of informative use to the academia. To this end, the articles in this journal are on polymers, biotechnology, power sector and economic reforms, sports Jane Austen and others . These should certainly whet the appetite of those readers who will find that subsequent issues of Ninad will be having articles on solar devices, noise in polymers, fungal herbicides, mushroom technology, martyrdom in Bernard Shaw, GATT, VAT and other tantalizing topics. We welcome suggestions and healthy criticisms from our readers and wish our readers a fruitful reading.

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Dr. K. Das

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Motivation - Key to Quality Enhancement Dr. Fr. Davis George*

1. Introduction

There is a story of an eagle, which gently coaxed her offspring toward the edge of the nest. Her heart quivered with conflicting emotions as she felt their resistance to her persistent nudging. "Why does the thrill of soaring have to begin with the fear of failing?"

As in the tradition of the species, her nest was located high on the shelf of a sheer rock face. Despite her fears, the eagle knew it was time. Her parental mission was all but complete. There remained one final task- the push. The eagle drew courage from an innate wisdom. Until her children discovered their wings, there was no purpose for their lives. Until they learned how to soar, they would fail to understand the privilege it was to have been born an eagle. The push was the greatest gift she had to offer. And the decisive moment dawned and the eaglet was gently pushed from the cozy and comfortable nest into the unknown horizon. It was her supreme act of love. And so one by one she pushed them, and they flew. Even the eagles need a push.

The difference between achievers and non-achievers is that the first group is motivated and the second group is not. Most people are good and qualified. Most of them can do much better than what they are doing. But they desist and resist change as it would dislodge their comfort zone and they would prefer to remain where they are and as they are. Fewer expectations, less demands and less work. And it works, they think. They have to be shown that the same things can be done in a better way. The missing link is the spark of motivation. Achievers do not do different things but they do things differently.

*Principal, St. Aloysius' College, Jabalpur 482001

Without motivation there is no change. No learning. No actions. And, most important of all, without motivation, there are no results. Life can only be understood backwards; but it must be lived forwards. Pablo Casuals, the great cellist, was asked why, at eighty-five years of age, he continued to practice five hours a day. He replied, "Because I think I'm getting better." Life is about growing; it is about change. As it is said those who are not busy being born are busy dying. As said by Henri Bergson in, Creative Evolution, "To exist is to change; to change is to mature and to mature is to go on creating oneself endlessly.". How true it is that we cannot become what we need to be by remaining what we are. Motivation accelerates this process of becoming. The path we shall follow in this article is not one laden with positive platitudes, but rather it is a quest for insight, wholeness, integrity and better performance. We shell embark upon a journey of discovery, to reflect upon and clarify what is truly important and meaningful to you.

2. Motivation defined and explained

Motivation is that invisible force that ignites the mind, sets your heart with feelings of zeal and zest and propels you into action. It can persuade, convince, inspire, encourage and lead you into action, changing your vision and life. It is the driving force in our lives. It comes from a drive to succeed and have fulfillment in life. One has to cultivate the right attitude and positive self-talks. Knock off the 't' from can't and constantly indulge in auto-suggestion that I can." "Impossible" has to be turned into I'm possible. My students have taken "They can because they think they can", - to be a magic formula. It has done wonders in the lives of thousands of students both of St Aloysius Senior Secondary School where I was the Principal for ten years and the students of St. Aloysius College where I am the Principal for the last ten years. In many of the human and spiritual resource development programme I conducted in India and abroad for the last twenty years, I have witnessed the miracle of motivation. To be

inspired and motivated means to move forward with purpose and enthusiasm. Purpose denotes clarity of intension while enthusiasm is derived form the Greek entheos, a god or sprit within. The motivated and inspired person comes to life with the purpose and passion, with the daily desire to grow and contribute. Only managers who can deal with uncertainty, with ambiguity, and with battles that are never won but only fought well can hope to succeed. Motivation knows your purpose in life, Growing to reach your maximum potential, and sowing seeds that benefit others, enabling you make your life a success. Success is a journey rather than a destination. You will never exhaust your capacity to grow towards your potential or run out of opportunities to help others. You will never have the problem of trying to "arrive" at an elusive final destination. The very moment that you make the shift to finding your purpose, growing to your potential, and helping others, you are on the path of success. The only true measure of success is the ratio between what we might have been and what we have become. In other words, success comes as the result of growing to our potential. It's been said that our potential is God's gift to us, and what we do with it is our gift to him. Our potential is probably our greatest untapped resource. Henry Ford observed, "There is no man living who isn't capable of doing more than he thinks he can do." Find out what you are searching that will set your soul on fire and pursue it. And then as President Theodore Roosevelt said, "Do what you can, with what you have, where you are." Never wait for inspiration or permission or an invitation to get started. That is motivation.

In Man's Search for Meaning, Victor Frankel relates what he learned from his experience as a prisoner in Auschwitz. He writes, "Everything can be taken from a man but one thing: the last of the human freedomsto choose one's attitude in any given set of circumstances, to choose one's own way." Again he said, "Everyone has his own specific vocation or mission in life. Everyone must carry out a concrete assignment that demand fulfillment. Therein he cannot be replaced nor can his life be repeated. Thus everyone's task is as unique as his specific opportunity to implement it." Stop being a victim and be responsible. Crisis is often what author and psychologist Dick Leider refers to as one of life's "wake up" calls. Who we are, implies responsibility. There is no tougher challenge we face than to accept personal responsibility for not only what we are but also what we can be. As the Spanish proverb says, "He who does not look ahead remains behind." You need to identify and sail toward your destination. The past lives now only in your memory, but the future holds a myriad of possibilities. You can renew yourself mentally by replacing worn out, stagnant thinking with thoughts that simulate a sense of hope and positive anticipation about your future. Henry Ford asserted, "The whole secret of a successful life is to find out what is one's destiny, and then to do it.

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2.1 External motivation

External motivation comes from outside the person, such as promotion, money, social status, fame and name. It could be fear of being fired, demoted, ignored or isolated. Fear of getting spanked by parents and fear of getting suspended or terminated from work, could be examples of external motivation. Fear is a powerful source of motivation and deterrent. It gets the job done quickly, meeting your deadlines and improving the performance of the person concerned. But it is not lasting. As long as the motivator is there, the employee is motivated. In the long run, performance goes down and destroys creativity and gets limited to mere compliance of the minimum work.

Many corporate sectors motivate their employees with incentives, bonuses, commission, and recognition. It can work as long as the incentive is strong enough.

2.2 Internal motivation

"Internal motivation comes from within, such as pride, a sense of achievement, responsibility and belief." One would not focus on external elements of success, failure, incentives, fear and so on. It is for inner satisfaction and fulfillment that one works. Feeling of contentment and accomplishment as a result of doing ones own work and translating ones own dream into reality. Vision, mission, goals and objectives have to be kept in mind constantly and a person should be self-driven. Recognition and responsibility are the two most important motivating factors. Recognition gives the person concerned dignity and respect without which one would not work hard. Responsibility would instill in the person a sense of belonging and ownership. One would be responsible and accountable and would accomplish things on one's own. We should always be proactive when confronted with problems. It is good to keep in mind that it is better to light a candle than to curse darkness. Such persons are self-driven. They will have in depth knowledge, required skill and right attitude.

3. How to motivate?

A new employee is to be moulded to the culture and expectations of the organization. Training and orientation programme will be of immense help and in service training will do wonders. Often the new recruits are not properly introduced to the demands of the work and the expectations of the organizations and the students. As a result the other staff misguides them. Professional organizations take special care at the time of recruitment and induction. They explain to them the terms and conditions, conventions and traditions, expectations and demands, vision, mission, objectives and means. SWOT analysis of the teacher and college will be of immense help to take stock of the ground reality and make strategic planning. This will have direct bearing on the performance. Performance appraisal from the beginning itself will create competitive and healthy attitudes. How true, a motivated professional learns the trade and brings in the required changes and lasting result, but a de-motivated employee starts sabotaging the company. His performance is marginal. He makes fun of the good performers. He rejects new ideas and spreads the negativity all around. Performance is the parameter of motivation. A self-motivated persons performance appraisal will show qualitative results. De-motivated and ineffective staff should be identified and

set aside, ignored or taken to task. Self-driven and self-motivated people will not look for reason outside themselves. They have their own inner resource to translate their dream into reality. It is about driving people and friends towards higher levels of achievement. Staff members, teaching and non-teaching, are the institutions only sustainable resource centre. If they are well motivated they will do much better and faster. Motivation is the willingness of an individual to do something better than otherwise done.

3.1 Vision and Mission to translate your dream into reality

Before you can think about how to mobilize the staff to achieve results, you have to be clear about what results your college aims to achieve-it's vision and mission. You also have to be clear about how you plan to achieve that mission-your college's strategy. The mission states in broad terms the college's purpose. The strategy lays out a plan for fulfilling that purpose-a set of more specific goals to be achieved, an array of approaches to be used, a mechanism for evaluating progress and improving continuously.

The mission should capture the very reason the college exists; the strategy should be the blueprint by which the college leader acts to achieve that mission. Your mission and strategy are critical building blocks for all the activities that fall under the term "human resources." When you recruit and select new teachers, you look for individuals that have the qualities needed to implement the strategy and achieve the mission. When you help individual staff members or teams set goals, you align those goals with the college's broader aims. When you provide coaching or design professional development opportunities, you seek to build the specific capacities that allow the college to live up to its purposes.

A dream gives us direction and increases our potential. A person who has a dream knows what he is willing to give up in order to go up. If you move in any direction other than toward your dream, you'll miss out on the opportunities necessary to be successful. Without a dream, we may struggle to see potential in ourselves because we don't look beyond our current circumstances. But with a dream, we begin to see ourselves in a new light, as having greater potential and being capable of stretching and growing to reach it. Every opportunity we meet, every resource we discover, every talent we develop, becomes a part of our potential to grow toward that dream. The greater the dream, the greater the potential. E. Paul Hovey said, "A blind man's world is bounded by the limits of his touch; an ignorant man's world by the limits of his knowledge; a great man's world by the limits of his vision." If your vision - your dream - is great, then so is your potential for success.

A dream puts everything we do into perspective. Even the tasks that aren't exciting or immediately rewarding take on added value when we know they ultimately contribute to the fulfillment of a dream. Each activity becomes an important piece in that bigger picture. It reminds me of the story of a reporter who talked to three construction workers pouring concrete at a building site. "What are you doing?" He asked the first worker. "I'm earning a paycheck, "he grumbled. The reporter asked the same question of a second laborer, who looked over his shoulder and said, "What's it look like I'm doing? I'm pouring concrete." 'Then he noticed a third man who was smiling and whistling as he worked. "What are you doing?" He asked the third worker. He stopped what he was doing and said excitedly, "I'm building a Cathedral." He wiped his hands clean on a rag and then pointed, "Look, over there is where sanctuary will be. And that over there is the main altar ... " Each man was doing the same job. But only the third was motivated by a larger vision. The work he did was fulfilling a dream, and it added value to all his efforts.

3.2 Setting goals: prerequisite for motivation

According to a study of American employee attitudes, only about half of employees say they understand how their organizations will assess their job performance. Supporting performance needs to start with making expectations clear. Without clear expectations, it's difficult for the staff to know where to focus their energies, how to improve, or whether they're doing a good job.

When thinking about setting goals and expectations, keep in mind these points:

Align individual and team goals with college goals. To ensure that teachers and other staff are applying their energies in ways that help the college achieve its mission, work hard to align expectations for individuals and teams with the broad goals of the college. In part, doing so is a mechanical process of thinking through what each team or individual needs to accomplish for the college to meet its goals. We need to communicate the College's Mission, Goals, and Expectations to Staff

As familiar as you are with your college's mission and goals and with your expectations of staff, each staff person comes to your charter college with a lifetime of experiences that shape how he or she sees the world. To keep staff on the same path as your college, you must communicate your goals and expectations repeatedly. That means repeating the same things, in new and inspiring ways, and it means encouraging the staff to find new ways of making the mission and goals more real in daily college life. Write it, say it, draw it, talk about it, and improve it. Here are some concrete ideas:

- Focus on a particular college goal at each faculty meeting. You
 might do this by reviewing the benchmarks for the goal, outlining
 progress or highlighting particular efforts towards the goal, and/
 or asking teachers to speak about his/her ideas for and/or
 perceptions of the goal.
- Post the mission and college goals around the college and on college paraphernalia (t-shirts, mugs, letterhead, etc.).
- Provide professional development (e.g., training, coaching) around college goals and expectations. Base teacher evaluations (e.g., self, peer, and college head) in part on how the teacher is contributing to college mission and goals.

Celebrate the reaching of benchmarks.

Communicate mission and goals to parents so that they may also keep teachers focused on the college's vision. Model the behaviors you demand of your staff. Set goals at all relevant levels of the college. Every college is organized differently. Some have departments, others have teams, and so on. Whatever your college's organization, create a goal-setting framework that matches the college's structure. If your teachers are organized into different departments, for example, set goals for each Department, and then for each individual within the department. As you move "down" the structure, goals become more specific and tailored. For example, all teams in the college may share broad goals having to do with improving student achievement in the core subjects. But different grade levels may have different emphasis or additional goals, depending upon unique challenges faced by the team. And within teams, different teachers may have different goals based on the challenges they face and the particular developmental needs they bring to college. Consider multiple goals and measures. It would be unusual to find a college where the expectations for a teacher's performance could be boiled down into a single goal or indicator. Performance for professionals is likely to involve a range of attributes, and your systems of goals should reflect the complex nature of the professional's job.

3.3 Make Goals "SMART"

There are lots of catchy frameworks for thinking about what makes a goal or expectation a good one. Here's one such framework that may help you evaluate the expectations you currently have for staff, and set new ones. A goal is "SMART" if it is Specific, Measurable, Ambitious but Attainable, Relevant, and Time-based:

3.3.1 Specific. Goals like "the teacher will contribute effectively to the college's curriculum planning process" aren't very helpful in guiding a teacher's decisions and activities. To be effective, expectations need to contain very specific ideas about what kinds of behavior and performance are valued.

- 3.3.2 Measurable. Leaders and staff need ways of measuring whether a team or individual staff member is attaining each goal. "Measurable" does not necessarily mean "quantitative." But even qualitative attributes can be measured - not with simple scores on tests, but using rubrics that define different levels of performance. Creating such rubrics is hard work, but without them, it's impossible for everyone to understand what constitutes high performance.
- 3.3.3 Ambitious but Attainable. Setting goals requires striking a tough balance. On one hand, to spur improvement, goals must be ambitious, pressing staff toward higher performance. On the other, they must be attainable or staff will soon come to disregard them as "pie-in-the-sky."
- 3.3.4 Relevant. Think of relevance in two ways. One, noted above, is relevant to the college's broader goals. The other is relevance to each staff member's own professional development. Most people work harder to attain goals they find intrinsically valuable, and decades of research on educators makes clear that this generalization applies particularly to people working in colleges.
- 3.3.5 Time-based. Goals should have a timeframe attached to them - a statement about when the goal should be achieved. This month? This semester? This year? Over the term of the charter? There's a place for all kinds of timeframes, but each goal should have one that makes sense.

3.4 Performance appraisal

Evaluating, improving and rewarding your college and its staff are critical parts of creating a motivating, high-performance climate. Good performers in organizations of all kinds find it motivating both to hear what they are doing is well and to learn how they can improve staff members who are committed to their own and college success will be hungry for any information that helps them understand how they can keep doing better and better. A well-designed performance appraisal process and appropriate reward system can help you feed the natural desire of committed staff to succeed.

Your evaluation process should begin with your college mission and goals and individual staff role expectations. You then must seek ways of measuring how your college, teams and individual staff members have contributed to meeting goals and expectations. The best evaluation processes address both measures of achievement (to what extent have we met goals?) and underlying causes (why?).

3.5 Rewards, recognition

Rewards, recognition and non-cash awards reinforce and guide behavior whether you want them to or not. For example, not using rewards to discriminate between high and low performance (at a college, team or individual level) reinforces the message that performance does not matter. Not surprisingly, research has shown that high-performing organizations are more likely to use rewards that discriminate between high and low performance than are average performing organizations. Rewards must be designed carefully to reinforce the behaviors and results that reflect your college's mission, goals and work process. Monetary rewards are temporary and shortlived; they are not gratifying in the long run. In contrast, seeing an idea being implemented can be emotionally gratifying by itself. People feel that they are not being treated like objects. They feel part of a worthwhile team.

4. Motivating Actions

Reengineering Performance Management: Breakthroughs in Achieving Strategy Through People, offers a simple list of such motivating actions:

• Defining staff performance expectations

- Communicating expectations with staff
- Creating a "motivating environment" (using influence strategies and visionary leadership)
- Coaching employees (both before and after assessment; to improve both strong and weak performance)
- Assessing performance (both achievement of goals and behaviors used to get there)
- Confronting poor performance
- Reinforcing good performance
- Modeling the behavior you want your staff to emulate

4.1 Build a "college climate" that encourages performance

- 4.1.1 Write out and make inspirational speeches. Let the staff and the public knows whom you are and what you stand for, what the organization's purpose and mission are, what your expectations are and what others can do together to make the mission happen.
- 4.1.2 Articulate the mission statement often and passionately. When ever you speak to the staff, write memos, or issue bulletins, reiterate the mission statement.
- 4.1.3 Develop a yearly theme that is consistent and connected to the college's mission. This is necessary to break the mission into doable, understandable segments.
- 4.1.4 Be visible to the staff, students, to the parents, to all constituencies. Walk around. Be in the classrooms. Observe work in progress. Everyone needs to see the leader and know who he or she is and what his or her expectations are.
- 4.1.5 Publicize successes and the celebration progress of individuals, groups, or a class. Recognize small wins as well as large ones.

- 4.1.6 Departmental meetings, Academic council meetings, and staff council meetings will keep everyone informed and abrest. Programmes like art of living, Vipassana and yoga will infuse new life into the staff.
- 4.1.7 We have developed a new motivational programme for the staff called "onward inward journey", wherein each Head of the Department gives an input session on topics of academic interest and the discussion is concluded by the Principal with his comments, observations and concluding remarks. This has been found very interesting, enriching and participatory.

5. Motivational Factors

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In reflecting upon how to build college spirit, it is interesting to note that organizational factors that contribute to job satisfaction may be distinct from factors that contribute to job dissatisfaction. In an article in the Harvard Business Review, Frederick Herzberg outlines both types of factors based on a number of studies conducted in a crosssection of organizations and with a broad range of employees. These studies suggest that factors responsible for job satisfaction include: achievement, recognition for achievement, the work itself, responsibility, growth or advancement, Factors responsible for job dissatisfaction include: company policy and administration, supervision, interpersonal relationships, working conditions, salary, status and security.

This distinction between job satisfaction and job dissatisfaction factors suggests that measures you would adopt to keep staff happy are not necessarily the same ones you would adopt to keep staff from being unhappy. Thus, you must assess the status of the "spirit" at your college. If your main objective at this point is either to encourage people to join or to keep people from leaving, it might be wise first to concentrate on factors of job dissatisfaction such as salary and working conditions. If, on the other hand, turn-over is not high and morale not low, it might be better to focus on issues of job satisfactionfor example, by creating a sense of achievement and increasing the levels of responsibility, rather than focusing on salary, status, and other job dissatisfaction factors.

5.1 The key to motivation: respond to human needs.

As individuals we have four basic needs and these needs become a powerful motivator in our personal lives: need to love and loved; need to belong; need for autonomy and need for self worth. Often we are driven from within to meet these basic human needs common to all people all over the world. The need to love and love is the basic of all needs. Without love one cannot survive. So also we all have a need to belong to some one or the other, to some organization or the other. The next stage is intense need for autonomy. All need their own space and time. Without intruding into the mystery of the other person we need to let him or her work. Without a sense of self worth people will create problems for oneself and for the other. A positive self-image will play a vital role in making a person self motivated. Needs of a child will be different from a teenager. It will again change when one reaches adulthood. At a later age the needs would be different. In the same way the needs of a deprived person would be food, clothing and shelter. When he acquires all these, his needs will change. Both the employee and employer should be aware of the dynamics of human needs.

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Abraham Maslow was the father of the human potential movement. He spent years researching the healthy personality and learned that all of us have the same basic needs. These needs always come in the same order, for everyone on earth. The second level need won't even be considered until the first level need is met. The third level need will become an important priority when the first and second levels are taken care of. And so on. Maslow's hierarchy shows that you can't motivate a person through his higher needs until his more basic needs are met. In his theory on the hierarchy of human needs he said that an individual progresses through five need levels- physiological (relating to his need for food, sex and other basic requirements), safety (relating to his need for shelter, security), social (the need for friends, family)' esteem (relating to his need for recognition and respect)' and finally his self-actualization reflecting need for achieving greater things. A successful manager will have to discern the changing profile of individual needs. Once employed and confirmed in the job, one would clamour for other things. The needs of a child are different from that of an adult. Again the needs of bachelor would change as soon as one gets married. This again would change when one gets older. Our perception, understanding and needs vary as the years go by. We are constantly changing. Change is the only thing that does not change. As one grows in age and in his profession the needs will vary, and to optimize productivity we will have to find out the growing individual needs. We should work on synergy and synthesis; collaboration and co-operation, avoid unhealthy competition and comparison.

Often people think that money is a big motivator. The higher the salary the greater the motivation. But slowly on it will wear out and some other need will arise. The real motivation will come from recognition. Positive strokes will take care of one's basic need and hunger for recognition and respect. It gives a sense of being acknowledged needed and appreciated, instead of being taken for granted their presence, work and unique contribution. Unfortunately it is short supply, though it is cost free and has magical effects. We must take initiatives and make others feel that they exist and they are important People are your most important resource and if the people you work with can become your friends they would be with you even in hell helping you taste success. Frederick Herzberg, a behavioral scientist learned that money is not a prime motivator in getting people to do better work - although it may be very important as a means of getting things done. He learned that security is not a prime motivator either, nor is a bright cherry atmosphere in the workplace. that do motivate, what really motivates people are factors labeled motivation factors such as prestige and recognition and maintenance factors such as opportunities for growth, on-going formation based on self and organizational appraisal.

5.2 Communication is at the heart of motivation

One of the biggest impediments of good motivation is bad communication. The problem runs all the way from our most stately boardrooms to our most humble homes: workers and children alike are unable to please their motivators because they frankly don't know what's wanted. Motivation will improve when communication improves. When you want someone to do something, make sure you communicate very plainly what's wanted, specifying how big, how soon, what for, how expensive. That means you yourself need to know what you want. Sometimes management is the blind leading the blind out to shoot - and the casualties are people. When the staff knows precisely what's wanted he or she will be able to provide it.

5.3 Minimax: minimize weakness and maximize strengths

The more you're able to minimize weaknesses, the stronger your group will become. If, in addition, you're able to maximize strengths, your staff will be incredibly motivated. Minimax is a valuable motivational tool. The person who uses it is able to get the most out of those he works with.

Step 1: Avoid emphasis on weakness.

If you waste time trying to correct a lot of weaknesses, you'll just end up with frustration and dejection. And if you look for weaknesses to avoid when you're hiring, you'll probably end up with mediocrity. Emphasis on weakness destroys morale. It can destroy your entire operation.

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Step 2: Build on strength.

It's not enough to avoid emphasis on weakness. That first step will make the employee glad you're off his back - but it won't help him grow. So you build on his strengths. Learn what he does best, and then help him do it better.

When you recruited your staff you have seen something outstanding about him, something that made you say to yourself, "This one can really do the job!" Always keep that initial enthusiasm in mind. What job was it you knew he could do? Answer that question and you've got a good lead on his main strength. Now build on it.

5.4 Help teachers to enjoy their work

Here's the secret: If you want to motivate your teachers, make their teaching assignment enjoyable! Apply to work the reasons why playing games are enjoyable. The students in the classroom moan and groan every time you give them an assignment? Turn the assignment into a game, complete with rules and rewards. Then watch them work like never before, because they're having fun!

Teachers gravitate to their types of jobs because initially they enjoy them. Then something happens. Someone, probably a principal/ manager, says, "Hey, work shouldn't be fun. Work should be work! If the workers are having fun that means that they aren't being as productive as they could be. Fun is against the Puritan ethic!"

Then the manager goes about establishing rules and regulations and college policies that methodically destroy the spirit of his workers. And, before too long, they put up with their job only because they have to. The paradox is that people generally get a heck of a lot more done when they're having at least some fun than when work is drudgery. Make work fun for your teachers- and they'll really be motivated to work!

5.5 Create healthy habits

As habits die header, we need to create healthy habits in the college. Aristotle has said, "We are what we repeatedly do, excellence then is not an act but a habit." Ninety-nine percent of everything we do is a matter of habit. Give or take a percent. It is said "sow habit, reap character; sow character, reap destiny".

Too often people will be ordered to change their old patterns, but they won't be given another way to go. Provide a Better Route. If you want someone to change, show him or her the better way you want him or her to go. If you don't they'll only see a threat- and they'll positively balk (and snort) at your proposed. But you need to do more than given them a better alternative: they need to see that it's better. People are usually quite comfortable with how they are. So when you go about changing them, you need to show them that your approach will be even better for them.

5.6 Belief system and self fulfilling prophecy

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It is said that the greatest motivation comes from a person's belief system. That means he needs to believe in what he does and accept responsibility. That is where motivation becomes important. When people accept responsibility for their behavior and actions, their attitude toward life becomes positive. They become more proactive and productive, personally and professionally. Their relationships improve both at home and at work. Life becomes more meaningful and fulfilled.

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Your beliefs determine what you do in life. They become a sort of self-fulfilling prophecy. One person says. "I can't do math." Because he doesn't believe in himself, he fails. And then he says, "See, I told you I couldn't do math." Everything about us stems from our beliefs (or lack of them). "Kids are irresponsible. The won't do anything you ask them." People in organizations are like sheep: they look to their leader for guidance before they'll do a single thing." Think of how much of our lives are controlled by these beliefs. Everything about us stems from our belief (or lack of them).

Reasons for Japanese productivity have been sought for more than two decades. What is the answer? Is it the programs or techniques or approaches? Actually, it's none of the above. Processes or methods are not the answer. The answer lies in the shared beliefs of the Japanese workers. Shared beliefs can make a difference in other ways. Suppose you're a teacher in a classroom and the students share this belief: "We're not as good as the kids in the private school down the road." How will your kids act? Unfortunately, they'll fulfill their own prophecy, and they won't do nearly as well as the kids in the school down the road. But what if you as the teacher can change those beliefs? What if you can get them to believe this: we're every bit as good as the kids in the private school." Then they'll start to act like it. And what if you can take it a step further and they start to believe this: "We're a heck of a lot better than the kids in any other school in town, including the private schools." Then they fulfill that prophecy and become the best students around. What we need is a paradigm shift.

5.7 Faculty development programme

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For motivating the staff our focus and thrust should be on human resource development programming for the staff. Much of the college development would depend on the inner disposition of the staff. On going in-service training programme, refresher courses, attending national and international seminars and conferences will enable and empower them to explore the unexplored frontiers of knowledge. Often stagnation in profession is the result of lack of academic exposure. Encourage the staff to invest their time in research and publication. A good teacher is the one who is willing to learn till the very end. Reading motivational books and the latest books and journals in the subject concerned will give the necessary insights and fresh ideas to become better and more effective capacity builders. Our students are entering into a highly competitive world and they should have the benefit to a really learned professor. He should be able to inspire and motivate the students to have a scientific temper and the required skills and attitude to apply his knowledge to build up a better world. He should be aware of the national and international challenges and should have the ability to respond positively and proactively. A teacher who is a role model in academic excellence and excellent character formation will be able to bring the required transformation in the lives of our youth.

Education is not just filling the empty minds with information but

formation and transformation of the mind, heart and soul. Education is a process of exploring possibilities and blossoming our own innate and God-given talents, so that students can make a difference in the lives of others. Going beyond the concept of giving analytical intelligence (IQ) alone, one should be able to give emotional intelligence (EQ) and spiritual intelligence (SQ). Who else can do this better than a well-informed, committed and motivated teacher? As it is said, a teacher affects eternity, and no one can say when his influence stops.

6. Conclusion

President Theodore Roosevelt, said, "Do what you can, with what you have, where you are." Success comes as the result of growing to our potential. It's been said that our potential is God's gift to us, and what we do with it is our gift to him. Our potential is probably our greatest untapped resource. Henry Ford observed, "There is no man living who isn't capable of doing more than he thinks he can do."

Helping the people carry out the college's strategy and achieve its mission is the job of the college's leadership. The Principal plays a pivotal and crucial role in building the college community. When we study the powers and functions of the Prime Minister of Britain, we see that he is the first among the equals and he is the sun around which the planets revolve. He is the cornerstone of the cabinet arch and he represents the people and government. Similarly, the Principal of a college has the most significant function to fulfill in providing academic and visionary leadership and sustained progress of the college. The way governance is structured in the college can have a great influence on how Heads of various departments carry out their work and produce results.

Today knowledge is power: knowledge of self and others; knowledge and expertise of the subject matter concerned. Such knowledge will lead a person to have the right perception and discernment. SWOT (Strength, Weakness, Opportunities and Threats) analysis will be of

immense help to take stock of oneself. Motivated persons will acquire the necessary skills to handle any situation. Knowledge without skills will like having a car without anyone knowing to drive. Attitude, positive or negative will be decisive of your success. They say that attitude decides your altitude. How rightly it has been said, "they can because they think they can." You must believe that you can. For this, one has to believe in oneself and learn to love oneself. Discover your own hidden talents. Have enthusiasm and passion for your life and your life's goals. Indulge in taking reasonable risks and creativity. Creativity will lead you to serendipity. Serendipity is discovering something totally unrelated to the problem you are trying to solve. Columbus discovered America while searching for a route to India. Pioneers traveling westward stopped for water and found gold nuggets in the stream. As Self-motivated person will believe in change and growth, be willing to take the risk of stepping from the known to the unknown. One who has learned to love oneself will have Self-confidence. Such a person will not be under the tyranny of anger. Anger dissipates your vital energy. A self-motivated person will handle tension and not let it manhandle himself. Conflicts and tensions are part of life. One must learn to handle it with care. Failure is stepping-stone to success. Successful people are those who have learned from their failure. To fail is not to be a failure. You can never be a failure unless you give up and quit trying. Jesus told Peter to cast your net again when he was giving up. We learn from our failures how not to do things. Edison failed at his first 6,000 attempts to develop a light bulb. When asked if he were discouraged, he replied: "No, I am now well informed on 6000 ways you cannot do it." It is perception that matters. Failure is never final. Robert Schuller, the famous author said that success isn't the opposite of failing. A runner may come in last, but if he beats his own record, he succeeds. As Aristotle has said, "We are what we repeatedly do; excellence then, is not an act but a habit." Develop this habit of pursuing excellence and success will follow such a motivated person.

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The Use of Irony in Emma

Jyoti V. Zahir*

Jane Austen's novel <u>Emma</u> published in 1816, reads as if it had been well and timely planned in advance. In <u>Emma</u> irony counterpoints the heroines illusions with reality.

> She [Miss Austen] sustains the irony brilliantly, as well as the point of view on which it depends [. .]. She not merely sustains the irony, but develops it through a series of increasing tense misinterpretations to the climatic moments when Emma discovers what she most wants, indeed what her self is, only to be convinced that she has forfeited, Mr. Knightley by her own actions.¹

Thus, <u>Emma</u> may be described as 'a novel of pervasive irony'.

In this novel Jane Austen has taken the help of irony while creating the plot, characters, atmosphere, setting, dialogues and style. If we take each element of the novel separately we will be able to ascertain and appreciate the brilliant and fluent use of irony in <u>Emma.</u>

To begin with, it should be convenient to ascertain, the use of irony in the creation of the story. Emma reveals Miss Austen's creative range. An engaging story is revealed through a well structured plot. It is a miniature painting of domestic life. The background is the green countryside that includes a ball, dinner, morning visit to friends and relations and so on. The irony of the situation that is slowly revealed to us is that Emma the heroine, continuously commits blunders when she takes up the task of matchmaking.

Assistant Professor & Head, Department of English, St. Aloysius College, Jabalpur

The plot has three main episodes related to (a) Mr. Elton and Emma, (b) Mr. Frank Churchill and Jane Fairfax, and, (c) Emma and Knightley. These episodes are intelligently fused together and form the basis of the plot. Emma's confidence had increased with the marriage of Miss Taylor and Mr. Weston. At first she aims to pair off Harriet with Mr. Elton but it ends in a fiasco. Mr. Elton confesses that all through he had been hoping to get Emma's hand. The situation becomes more ironical when the reader realizes that Mr. Elton had been planning to make a better match as Emma was hoping for Harriet. Emma's consciousness discloses her attitude adequately. She thinks herself :

Competent for the part of amateur Providence, charged with the destinies of her less forseeing neighbours, whom she is prepared to couple off according to her views of matrimonial suitability.²

It is ironic that how little Emma knows about herself.

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Emma's second attempt to pair off Harriet and Mr. Churchill also fails. The gypsy episode had given the romantic or imaginative Emma food for thought. She encourages Harriet and is shocked when she finds Churchill and Jane already engaged and Harriet interested in Mr. Knightley. Emma is surprised to hear from Harriet : "Do you think I ever cared for Mr. Frank Churchill?"³ Harriet further confessed that the object of her admiration was Mr. Knightley who offered himself to be a partner in the dance when Mr. Elton had insulted her. This was a bolt from the blue for Emma. Her sentiments are excellently projected by Jane Austen. "Irony upon irony, and now the unkindest cut of all ! The truth is borne upon her."⁴

Why was it so much worse that Harriet should be in love with Mr. Knightley than with Frank Churchill ? [...]. It darted through her with the speed of an

arrow that Mr. Knightley must marry no one but herself !⁵

Probably this realization is the most ironic situation in the novel. She had been looking for the right man for others, and in her personal case she had not only misunderstood her own feeling but had been angling for the wrong man.

With insufferable vanity had she believed herself in the secret of everybody's feelings; with unpardonable arrogance proposed to arrange everybody's destiny. She was proved to be universally mistaken; $[\ldots]$ she had done mischief. She had brought evil on Harriet, on herself $[\ldots]$.⁶

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This short recapitulation has been sufficient to bring out the irony of the situations in which Emma's blindness has involved her. Irony does not relax till Emma's reunion with Mr. Knightley.

In fact, not only Emma but the rest of the characters have been delineated ironically. Probably the exceptions are Mr. Knightley and Mrs. Weston.

Emma is the most glaring example of misplaced judgement. She never realizes that her desire to help Harriet is an ego satisfying effort. She believes herself to be someone different from what the author and readers think of her. She condemns Mr. Martin for his concern of "profit and loss" but she fails to realize that she had been sailing in the same boat, when she was looking for a profitable match for Harriet.

Mrs. Elton, is another character who has been treated ironically. The portriat of Mrs. Elton is a caricature of snobbery, vanity and pretensions. She is meant to be an object of ridicule and she provides much humour in the story. Her exaggerated airs of finery and breeding, her constant references to the sucklings are examples of her disagreeable nature :

> A bride, you know, must appear like a bride, but my natural taste : is all for simplicity; a simple style of dress is so infinitely preferable to finery. But I am quite in the minority, I believe; few people seem to value simplicity of dress - show and finery are everything.⁷

This statement is unconsciously quite revealing. She does not realize that the remark reveals the baser side of her nature. This is irony at its best. The character of Mrs. Elton invariably leads us to the ironical character of Mr. Elton. He is presented as more of a young, self-centred bachelor than as a religious man. Most of his time is spent in attending dinner parties and outings, at which he is extremely popular. His aspirations to marry Emma is no more than social ambition. He is quite unlike a priest. By introducing him as a priest Jane Austen has ridiculed the materialistic priests of her age. Mr. Churchill also belongs to the same category. Miss Austen if not cruel has been very severe and sarcastic with Frank, who is self-centred and comfortable about manipulating people. He deceives all but Mr. Knightley. Inspite of his apparent charms, he emerges as an unpleasant character. Mr. Woodhouse, Miss Bates, Isabella and Mr. Weston are other characters who have been treated ironically. But because of their short appearances, they have been treated mildly. Thus, we see an ironic but realistic treatment of Jane Austen's characters in Emma.

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In <u>Emma</u> the atmosphere is definitely ironical. What she presents is one side of the picture but what she implies is the other and more important side of it. Apparently everything seems to be pleasant but there are a lot of undercurrents in the pairing off young people. Mr. Elton catches his wife in rebound. Emma, the heiress of Hartfield, had refused to marry him, so he marries Miss Augusta Hawkins in haste as she enjoys a good financial position. The two are paired off because of material gains and not due to genuine liking. This kind of material pairing is not ideal but it takes place. It is satirized by the novelist.

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In similar vein the pairing off Jane and Frank is also satirized. Frank belongs to a high and respectable family while Jane is an orphan. Since such marriages are not acceptable easily, Mr. Churchill resorts to all types of deceit. Obviously, Miss Austen wishes to stress that rich and good families necessarily do not produce honest off-springs. In comparison Jane is more upright. To say that Jane Austen presented only a romantic picture of life is not true. Apparently it may seem to be so but once we delve deeper we find that things are totally different. Even the friendships generated between the characters is not genuine. Irony is inherent as Jane Austen did not present life and society in a plain and simple way but ironically. We do not read Emma as a novel of sweet meeting and ending. Though she has the Shakespearean touch as she is neither very harsh nor crude in her method yet the atmosphere is charged with irony.

As far as the setting is concerned Miss Austen does not stray far from Highbury in <u>Emma</u>. It is only a shift from one drawing room to the other. The setting of the proposal scene between Mr. Elton and Emma is ironically ideal. The lush country side adds to the romantic mood of Mr. Elton. But the romance is fake because neither Emma had any such feelings for Mr. Elton, nor Mr. Elton had any genuine feelings for Emma. His aim was merely to improve his social status.

In the novel, Jane Austen has created the problem of
working women, ironically. Everyone looks down on Jane Fairfax because she has to work for a living. In fact, what Miss Austen wishes to convey is that women like Jane and men like Martin are much better than Mrs. Elton, Emma, Churchill or Mr. Elton. Thus, the setting portrays the complexities of human nature and human life.

Jane Austen's style reflects her relation to the subjectmatter and is incisive, witty and ironic. In her novels we do have glimpses of pure humour but mostly it has a touch of irony. In <u>Emma</u>, the humour can be seen through the behaviour of Mr. Woodhouse, Miss Bates and Mrs. Elton. The presentation of "charming" Augusta Elton is one of the most notable examples of extended irony. She is portrayed as being unmistakably similar to Emma in upbringing, attitude and accomplishments. Irony exists in Emma's blindness to interpret Mrs. Elton's character properly. She fails to recognize that this woman is an exaggerated image of herself.

In <u>Emma</u>, the theme of the novel runs at two levels the apparent and real. Readers of Jane Austen are expected to be intelligent enough to see the difference wherein lies the irony safely enthroned. Irony is achieved through Miss Austen's exquisite style. The most famous is the opening sentence of <u>Pride and Prejudice</u>:

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It is a truth universally acknowledged, that a single man in possession of a good fortune, must be in want of a wife.⁸

Jane Austen simply prompts us to remember the basic facts of experience. And since the true values of human nature are constant, always secure, she may invert them into irony as in the above example. It seems that a rich man is in need of a wife but the implication is that a young girl always wants a rich husband. It is an excellent example of verbal irony. In Emma sarcasm is also joined to irony. Irony is achieved by the use of the point of view, parallelism, the use of particular words and phrases, understatements, indirect comments and the juxtaposing of situations and characters. For example, Emma's point of view is to be seem in the following statement :

Altogether she was quite convinced of Harriet Smith being exactly the young friend she wanted - exactly the something which her home required [. . .]. Mrs. Weston was the object of a regard which had its basis in gratitude and esteem. Harriet would be loved as one to whom she could be useful. For Mrs. Weston there was nothing to be done; for Harriet everything.⁹

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Here, we see Emma's self-satisfying ego. Harriet is of use to Emma and, as Emma sees it she is of use to Harriet. As a result of her fine opinion of herself she sets out to help Harriet who is less fortunate. Her attempts are a series of blunders that ultimately lead her to self-awareness; and on this point of view depends the irony.

Another example of irony may be cited when Mr. Knightley points out to Emma that Mr. Elton "seems to have a great deal of goodwill towards you." And Emma exclaims : "Mr. Elton in love with me ! - what an idea !" And Jane Austen remarks that "she walked on, amusing herself in the consideration of the blunders which often arise from a partial knowledge of circumstances, of the mistakes which people of high pretensions to judgement are forever falling into [...]."¹⁰ This is a marvellous piece of dramatic irony because what Emma says about John Knightley is true about herself but she is ignorant of it.

In the very first chapter Jane Austen speaks directly to the reader. For example :

The real evils indeed of Emma's situation were the power of having rather too much of her own way, and a disposition to think a little too well off herself; these were the disadvantages which threatened to alloy her many enjoyments. The danger, however, was at present so $[\ldots]$ unperceived, that they did not by any means rank as misfortunes with her.¹¹

Here we get a glimpse of Emma's personality and her self ignorance. Miss Austen also made a very subtle use of irony. One such example being Mr. Elton's remark regarding Harriet.

You have given Miss Smith all that she required $[\ldots]$ you have made her graceful and easy. She was a beautiful creature when she came to you; but in my opinion, the attractions you have added are infinitely superior to what she received from nature.¹²

It is a fine piece of irony. Emma thinks that Mr. Elton is praising Harriet and sighing like a lover whereas Mr. Elton is actually praising Emma. We get a glimpse of Emma's imaginative mind which fails to realize the truth. In Emma there are innumerable examples of irony but for brevity only a few have been cited.

Jane Austen has made use of irony in most of her novels but it is more pronounced in <u>Pride and Prejudice</u>, <u>Sense and Sensibility</u> and <u>Emma</u>. However, <u>Emma</u> tops the list with "all pervasive irony."

> Irony is the soul of Jane Austen's comedy; the comic aspects of life are the ironical aspects, visible to good sense in its contemplation of erroneous judgements and $[\dots]$ indolent persistence in error, of the contradiction between our desires and the good that we desire.¹³

At this level it is easy to appreciate that Jane Austen's use of irony has succeeded because of her close observation of life and rationalistic approach towards human existence. Her judgement is never clouded. These facts have enhanced her reputation as a novelist who had very consummately used irony to present her view of life.

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² Earnest A. Baker, <u>The History of the English Novel</u>, vol.
6 (New York : Barnes and Noble Inc., 1957) 108.

³ Austen, Emma 372.

⁴ Baker, The History of the English Novel 109.

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⁶ Austen, Emma 378.

⁷ Austen, Emma 277.

⁸ Babb, <u>The Fabric of Dialogue</u> 14.

9 Austen, Emma 23.

¹⁰ Austen, Emma 104.

¹¹ Austen, Emma 3.

¹² Austen, Emma 38.

¹³ Baker, <u>The History of the English Novel</u> 88.

POWER SECTOR AND THE ECONOMIC REFORMS

sower-for the future development and growth of

Rev. Fr. J.G. Valan Arasu*

Introduction:

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Power is a key infrastructure, which is the backbone of the economic development of any country because power is required for all the sectors of economy which include agriculture, industries, service, information and technology, transport and others. According to Anil Kadodkar, "Energy is the engine for the growth. It multiplies human labour and increased productivity in agriculture, industry as well as services. Easy access to modern energy services holds the key to development." Therefore the availability of quality power in the required quantity is one of the most important determinants in the success of the country's development. In addition providing adequate and affordable electric power is essential for economic development, human welfare and higher standard of living. India being a developing country with increasing percentage of population makes power the critical infrastructure for India.

The draft of Fifth Five-Year Plan thus stated "Electricity is the most versatile form of energy and provides an infrastructure for economic development. It is a vital input for industry and agriculture, and is of particular importance to a developing rural sector, which needs more power for its agricultural operations, for its small scale and agro industries. All sectors of the economy need electricity for their common needs of water supply, transport, communication and domestic lighting. Given the large scale dependence on lift irrigation for food production, food processing and preservation industries, the increase in the power-intensive industries such as aluminum, fertilizer, petrochemicals, etc., and the increasing dependence on electric traction for transport, there is hardly any community or sector which is not affected by a power shortage today. The future

*Assistant Professor & Vice Principal, Department of Economics, St. Aloysius College, Jabalpur. development of the country, therefore, will depend upon the rate of growth of power generation capacity."

The draft of Ninth Five-Year Plan once again stating the need for power for the future development and growth of the country said, "Electricity is the most versatile form of energy and provides an infrastructure for economic development. It is a vital input for industry and agriculture, and is of particular importance to a developing rural sector. The future development of the country, therefore, will depend upon the rate of growth of power generation capacity." As a result India has taken rapid strides since Independence in the Power sector both in terms of enhancing power generation and in making available the power to widely distributed geographical boundaries. The total installed electricity generation capacity has increased from a mere 1363 MW in 1947 to about 136970 MW in 2002-03. The average growth rate over the entire period has been 8.6 percent per year. The annual generation is now over 530 BU. The power transmission and distribution network has also grown substantially. Though fifty-seven years have gone from the day we got independence a large percentage of our population in our country yet has no access to electricity and a number of villages are still out of reach of electrical power. Per capita energy consumption is still very low. In addition, share of non-commercial energy resources continues to be much higher than what it is in the developed countries. Our country has still not been in a position to overcome the power crisis. Power cuts and load shedding has become order of the day in number of States.

Restructuring, privatization, liberalization and globalization being the worldwide phenomenon in the power sector, the energy sector in India has witnessed rapid shift in financial, political and ideologies. That is why even in India many began to comment that power sector reforms in India is an absolute necessity because "the nation should not be left behind while the rest of the world is galloping full steam ahead towards prosperity." Speaking on the same level few years before when Jack Walch first came to India said, "Infrastructure is the biggest bottleneck here... India does not have the infrastructure. The power requirement of the digital world will blow your mind... You have sent so many people back who came to set up power plants. You just do not have a chance if you do not wake up."

The general driver for this transfer has been stated as 'efficiency' in resource mobilization and enhancement of supply. The logic for this argument is that private sector involvement and competition would lead to better resource allocation and eventually improve services for end-users of electricity services. In developing countries, according to 'Washington consensus' only privatization would raise capital for power sector investments, reduce political interference, address the problems concerning non-performing public investments and public sector corruption, establish more efficient pricing and reap efficiency gains to enhance economic development.

At present in developing countries, reform efforts are focused on privatization of the publicly owned sector and establishment of an independent regulator. They also envisage market competition in the sector in the longer run. Here privatization efforts are partly justified on the basis of future potential gains from competition. India too has been immune to the worldwide changes that are taking place in the power sector. The former Finance Minister Dr. Monmohan Singh presiding over the function at the Rajiv Gandhi for Contemporary Studies organized in Delhi justifying power sector undertaken by the government said, "Experts found that power sector needed structural reforms, equipment change, mindset change, efficiency, cost reduction, competitiveness and quality to serve the economy needs." In response to this the reforms were conducted in technical and financial performance and capital availability. That is why the Electricity Bill 2003 has been just passed in the parliament.

In spite of reforms in the power sector, from the year 1991 onwards many states have persistent power shortages. In many states scheduled power cuts, unscheduled outages and fluctuating voltages are common. Also power shortages, both in terms of peak capacity as well as electrical energy, have been common in most of the states. As a result of which every consumer is forced to purchase voltage stabilizers, inverters, small diesel generator sets and burnt-out motors. Consequently all these impose large economic costs. These problems persist even in the 10th year of reforms.

To understand why this has been the case, it is necessary to look at the power sector critically in India. Till 1991 the power sector was mainly in the public sector. With a few exceptions, electricity distribution and supply, was the prerogative of state electricity boards (SEBs) of the state governments. SEBs also set up and operated generating plants. There were also central government agencies that set up and operated large generating plants that served more than one state.

Electricity Requirement and Availability:

The table 1 shows how the sizable shortages of both capacity and energy have persisted from the years 1981-82 to 2000-01 even after economic liberalization. In the above table it is clear that in the year 2000-01 the total percentage of power shortage was only 7.2 per cent. Over the eight years plan the shortage of power percentage is increased to 7.8 per cent. In the year 2000-01 total power requirement is 496266 million units but the total availability of power is 457557 million units and the total shortage is 38709 million units.

The power shortages reflect inadequate investment in building generating capacity and transmission network. With regard to the change in the availability of electricity in the year 2000-01 is just 3.9 per cent which is much lower in comparison to the change in the availability of electricity in the year 1981-82. In the year 1981-82 the total change in the availability of power is 9.8 per cent.

From the year 1981-82 to 1990-91 the total change in the availability of electricity is 90.3 per cent, but between the year 1992-93 to 2000-01 the total change in the availability of electricity is just 66.8 per

cent. This is much lower than what is achieved before the liberalization process. These realities reveal that with regard to the generation of electricity, power sector did not react positively even after globalization and liberation undertakings that were initiated at different intervals from the year 1991-02.

Power Shortages:

The indigenous production of commercial energy in India increased from 74 million tonnes of oil equivalent in 1980-81 to about 219 million tonnes of oil equivalent in 1999-00, registering an average rate of growth of about 5.9 per cent per annum. Despite the resource potential and the significant rate of growth in energy supply over the last few decades, India is facing serious energy shortages. The electricity sector has been experiencing severe shortages for almost two decades now. The table 2 provides an indication of the magnitude of shortages in the last decade. The more critical number here is the extent of peak shortages.

It has been projected that electricity demand would grow at approximately 6 per cent per annum over the period 1997-2012. The magnitude of the challenge in meeting this demand is brought in the following figure. The following figure compares the capacity additions that would be needed in this period to meet supply targets with actual capacity achievements achieved in the last five plan periods.

Poor Financial Performance:

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The financial performance of the power sector in India has not improved considerably even after reforms incited in the power sector. Over the years the gap between user charges and the cost of supply has worsened despite reform efforts. According to 'Economic Survey' reports the gap between the cost of supply and average tariff has actually worsened over recent years. From the table 3 it is clear that "gap between the cost of supply and average tariff has worsened over the years from a level of 23 paise in 1992-93 to about 110 paise in 2001-02. Also revenues dropped from 82.2 percent of costs in 199293 to 68.6 percent in 2001-02." This suggests that reforms in the power sector have not yielded the desired results with regard to recovery of cost through tariff.

Most of the state electricity boards have accumulated huge amounts of losses due to irrational tariff. They cannot even meet the day-today expenditures. The table 4 reveals the financial conditions of the state electricity boards. Financial health of SEBs has been deteriorating over the years. According to Economic Survey 2002-03, barring Himachal Pradesh State Electricity Board and Maharashtra State Electricity Board, all other SEBs have recorded losses between 1992-93 and 2001-02 ranging from Rs. 4 crore to Rs 3682 crore. A highly disturbing feature is that losses have been rapidly increasing over the decade of the 1990s.

Commercial losses reached \$2.3 billion in 1996-97. The Planning Commission has estimated that during the financial years of 2001-02 and 2002-03 the commercial loss excluding subsidy was to the order of Rs. 24063 crore and 24614 crore respectively. These dues are now believed to total almost \$3 billion, up 34 per cent from the previous year. Together the states of Bihar, Delhi and Uttar Pradesh reportedly account for more than 50 per cent of total outstanding dues. These heavy financial losses are the result of tariffs that do not cover costs and of poor management and operational practices.

In 1999-2000 only 7 SEBs had a positive rate of return. The number of SEBs with a positive rate of return of more than 3 per cent has also fallen. In 1999-2000 only 2 SEBs had a positive rate of return of more than 3 per cent. The hidden gross subsidy for agriculture and domestic sectors has increased from Rs. 7,449 crore in 1991-92 to Rs. 34,428 crore in 2000-01 and in 2002-03 it increased to Rs. 38,426 crore. Thus, the restoration of the financial health of SEBs and improvement in their operational performance continue to remain a critical issue even today in the power sector.

Before the State Electricity Regulatory Commission (SERC) were set up, the SEBs had to set tariffs for the final consumers under the recommendation of periodically set up adhoc tariff commissions and guidance of the state governments. There was no compulsion to set tariff in a commercial manner. The SEBs did not retain profits. The state government appropriated the profits and bore the losses. Political considerations of the state governments have played increasing roles in the management of SEBs. Over the years the SEBs became financially sick. The table 5 and 6 shows the financial performance of SEBs. The annual losses reached Rs 20220 crores in 2000-01 even after accounting for Rs 5793 crores provided by the state governments towards subsidies.

Causes of Sickness: approver and a becariout a co-coochesy add

1. Subsidies:

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The sickness of the power sector is directly attributable to the financial sickness of SEBs, which is a consequence of the political power of various lobbies like subsidies. One of these is agricultural lobby. Electricity is provided to agricultural users at highly subsidized rates. Initially, electricity demand by agriculture was a small part of the total demand. It was 3.9 per cent in 1950-51, 6 per cent in 1960-61 and had grown to 30.75 per cent in 1997-98. Net subsidy in the year 1991-92 was 5404 crores but over the year its trend was towards upward rather than towards downward.

Residential and especially agricultural consumers are heavily subsidized. (Table 7) These groups enjoyed a subsidy of \$4.8 billion in 1996-97, equivalent to around 1.4 per cent of GDP. About 80 per cent of the \$4.8 billion went to agriculture. Average revenue per unit was estimated at about Rs. 1.7 per kilowatt-hour in 1996-97, compared to average costs of just over Rs 2 per kilowatt-hour that year.

The rationalization of tariffs continues to be a distant and illusive goal even today. Every state government is in competition with other state government with regard to subsidized tariffs for agriculture. For example in case of Haryana government the subsidy payable in 2001-02 is as high as Rs 1,355.8 crore. In the same year the Government of Madhya Pradesh has paid a subsidy of Rs. 560.27 crore. Maharashtra government gave a subsidy of Rs. 745 crore for subsidized tariffs for agriculture. This was in addition to compensating the SEB for the large loss of Rs 1986 crore during the year.

As the result the net subsidy estimated in the year 2003-24 is 23803 crores. It means that the net subsidy has increased five times higher in comparison to the year 1991-92. Also in the year 1991-92 only 5938 crores of gross subsidy was involved to agriculture sector. In the year 2002-03 it increased to 24759 crores. Within 11 years gross subsidy provided has increased to the extent of fourfold. There is substantial increase in the subsidy provided to the agriculture sector over the years because the political parties consider farmers vote as substantial for their political power. Thus the political parties, which got their support to remain in power, had to concede their demands for various agricultural subsidies.

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But the study conducted by Shonali Pachauri and Daniel Spreng reveal with renewed evidence that "subsidizing energy to the household and agricultural sectors of the economy ... in the form of low tariffs for electricity are essentially appropriated by that part of the population which is less poor. This is because ... the poorest households do not have access to electricity. An energy policy that takes poverty reduction seriously must subsidize energy infrastructure expansion to poor areas rather than the energy itself."

2. Transmission and Distribution Losses:

One of the major points on which there has been a totally disappointing record of SEBs and private sector distribution companies in Orissa is the non-adherence to the targets for reduction in Transmission and Distribution losses. Even more than agricultural subsidies, overstaffing and large transmission and distribution (T & D) losses contribute to the financial sickness of SEBs. It is shocking to see that, in number of cases, instead of the losses coming down, the actual losses have gone up as compared to those of reported loss. In the year 2000-01 MSEB reported 31.87 per cent of T & D loss. In its submission for 2001-02 MSEB has estimated that the actual loss was 39.4 per cent.

Although publicly reported energy losses are about 21 percent throughout India, closer examination of state electricity board losses often shows serious under reporting. The table shows T and D losses. These are, however only notional numbers as they were mostly assumed figures and the missing electricity was impute to users whose consumption was not metered mostly agricultural users. From the table 8 it is clear that after SERC ordered studies to estimate these of T and D losses has increased from 15.2 per cent in 1997-98 to more than 35 per cent in 2001.

In many countries in the world the T & D losses ranged only between 20-30 per cent, but in India in several states the T & D losses are nearly 50 per cent. It is evident from the table above. "T & D losses are caused by a variety of problems including energy sold at low voltage, sparsely distributed loads over large rural areas, inadequate investments in the distribution system, improper billing and theft." Indiscriminate grid extension despite low load densities has resulted in inefficiencies. Unless a serious dent is made on this large and overwhelming problem, there is no possibility of any appreciable improvement in the financial viability of the SEBs.

3. Labour Productivity and Overstaffing:

Even though the number of total employees in all the SEBs together has declined from 0.98 million in 1992-93 to 0.91 million in 1997-98, most of the SEBs are still overstaffed. To some extent overstaffing is the out come of political compulsions. Very often, this degrades staff quality. Some of the SEBs has, however tried to reduce the number of employees. Thus the number has gone down during the period 1991-02 to 1997-08 in Assam, Bihar, Uttar Pradesh and West Bengal. Labour performance is relatively better in some of the SEBs (Table 9) like A.P, Maharashtra, Gujarat, Karnataka and Kerala. Sales per employee vary from 93,000 kWh in Himachal Pradesh to 400000 kWh in Maharashtra. Similar figures in USA and China are respectively 4057000 kWh and 423000 kWh on the average for the whole nation.

4. Arrears:

Despite more than 50 per cent employees of the over-staffed SEBs being involved in distribution and consumer-related activities, almost all the SEBs have accumulated a large amount of arrears (See in Table 10). The receivables are due not only from agricultural consumers and government departments but others as well. The seriousness of the problem of arrears worsening in recent years can be estimated from yet another aspect. Between 1981-93, the board wrote-off just Rs. 2.77 crores. But in the year 1993-94, the board wrote-off Rs 99 crores. This went up to a massive amount of Rs 371 crores in 1996-97, which is high. During the period 1996-97, the total bad debt write-off amounted to Rs 931 crores. Debt write-off generates an expectation of future write-off and leads to default in payments. SEBs should take some serious steps towards improving revenue collection. There is a negative correlation of arrears with employees.

5. SEBs as Agents to Subserve the Social and Economic Policies:

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True to the spirit of a social-democratic State, India had originally evolved her power development policy, and shouldered that responsibility, in line with the State's professed commitment to honouring and ensuring social security equations. Though the State Electricity Boards were statutorily required to function as autonomous service-cum-commercial corporations, they became in effect agents of the Governments to subserve the social, political economic policies of the State. As a result the power sector "became in effect the translatory channel for the populist policies of the political party in power... In such a contest of composite interests, accumulation of disfunctioning has been a natural outcome in the power sector." And hence never felt the requirement to break even or to contribute to capacity expansion programs. This unaccountability culture in turn led to gross inefficiency at all levels - technical, institutional and organizational as well as financial.

6. Gap Between User Charges and the Cost of Supply:

The basic problem being faced by the sector is the gap between user charges and the cost of supply. Despite reform efforts, the table 3 reveals that the gap between the cost of supply and average tariff has actually worsened over the years from a level of 23 paise in 1992-93 to about 110 paise in 200-02. Revenues dropped from 82.2 percent of costs in 1992093 to 68.6 percent in 2001-02. This suggests that as of yet, reforms in the functioning of SEBs have not yielded the desired results, and motivates a prime focus upon the functioning of SEBs in power reforms.

Recent Developments :

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More recently there has been some effort on the part of the government to address some of the problems plaguing the sector. Largely driven by the recognition that energy shortages were threatening the economic growth potential of the country, the government took a serious look at measures to increase energy supply in the late 1980s and early 1990s. The reforms initiated in June 1991 were accompanied by a reduced emphasis on the public sector. Thus public sector reforms and privatization were parts of the reform strategy. Given the state of public finances, it came to the conclusion that participation by the private sector was essential to address the energy bottleneck.

The government had also recognized the problem caused by reduced investment in infrastructure. It had hoped, however that private investment would come forth to take the place of public investment. Thus shortly after the initiation of the reforms process in June 1991, in October 1991 the Government of India opened up the power sector

to foreign-private plants.

However, in order to attract the private sector into helping build the energy infrastructure, several reform measures were identified for implementation. Enactment of the new Electricity Act, 2003 on June 10th 2003 is one major step in this direction. The Act represents a new regulatory paradigm for the Power sector in India and hold promise to transform the economics of this sector. It provides a "liberal framework conducive to development of the sector in an open, nondiscriminatory, competitive, market driven environment, keeping in view the interest of the consumers as well as those of the suppliers." One of the key reforms introduced is related to a distancing of regulatory functions from those of policy making by the government. As a result, independent regulatory commissions have been established at central level and in several states of India. Other states are being encouraged to establish such institutions. The primary functions of the electricity regulators have defined as rationalizing tariff and encouraging competition.

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It also recognized many activities that were subsumed under generation of electricity. It therefore defined captive generation, cogeneration, electricity trader and trading. This act also gave freedom to 'construct, maintain and operate' captive generation plants and dedicated transmission lines. This Bill also provided for open access to captive generation plants to the destinations of their use subject to availability of adequate transmission facility as determined by the central or state transmission utilities as applicable. The bill imposes penalties for failure in meeting standards of quality laid down by the commission after due hearing. For the greater financial independence the Electricity Bill 2003 provides for the commission to retain all fees and also to receive grants and funds from government as well as other agencies. This would give greater financial independence and functional autonomy to the functioning of the commissions.

The Following Framework are Suggested:

1. The product of power has an ever-increasing demand in the

market. So, generate as much as possible and supply power to the consumers at fair price. Corporatise the power sector and apply the concept of productivity - number of employees per 1000 consumers and per millions units sold.

2. It would be much more sense to use decentralize sources of renewable energy such as solar-thermal, solar-photovoltaic, biomass based thermal power or mini and micro-hydropower system in villages where power consumption is less. This would eliminate a large part of the line loss, as also huge investment in setting up of transmission lines meeting the administrative overheads.

3. The entry of private investors will be encouraged wherever feasible and possible, which would ensure higher rate of return on investment.

- 4. In India, the per capita power consumption is the lowest in the world but highest in wastage of energy, which is attributed due to lack of modern fuel-efficient equipment, operations of energy management and culture of saving and conservation. Hence, offer and allow the private enterprises to start power-generating availability.
- 5. The efficient management and educational programmes like use of energy efficient bulbs, tube lights, agriculture pump sets and metering at differential tariff for peak and non-peak seasons are important measures to be implemented on demand side.

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6. For tariff fixation consider only two slabs - agriculture and nonagriculture in the present seven slabs. For the agriculture purpose the tariff is to be charged on the basis of cost of generation of hydropower projects while for the non-agricultural purposes the tariff is to be charged on the basis of average cost of generation of electricity from all other generating units. This would fulfill the Government obligation to the agriculture on the one hand, and commercialization of power tariff for better revenue on the other.

7. "Modernization of the work through extensive computerization in power stations both for process control and general management and in distribution system planning, computers are also extensively used for commercial land establishment applications, in the head office. [Over and above sufficient] attention to human resource development and training for staff at all levels in job-related skills and modern technical and analytical skills and computers right from induction level to all levels." This is the main contributory factor for the good performance of number of Electricity Boards in the World. It is understood therefore that "the solution to the power sector squarely lies on 'Prudent Management with Expertise' - knowhow and do-how, which is a guiding and governing principle."

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- 8. The provision with regards to the electricity bill payment by 'pay date' should strictly be implemented. If not paid by pay date, a penalty will be imposed at specific rate for the first time and permanent disconnection is subsequent instances.
- 9. Loss in transmission is purely technical which should be brought down to ideal figures. Commercial loss means un-metered consumption, which in other words called as power theft. This should be reduced to nil through means of penalized provisions through the anti-power theft Law.
- 10. Energy Audit should be initiated at all sub-station; penalty may be imposed for the theft or loss on erring person. Electricity thefts should be eliminated not gradually but speedily. For this it is to infuse among the employees a sense of accountability based on a well-devised system of incentives or disincentives. Bill readings at the consumers in the area of sub-station and reading at the substation through the check meter provided for the purpose should tally. If not the in-charge employee should be made responsible.

- 11. The Government role should be focused on and confined to policy level; and the regulatory bodies should monitor the regulation of generation, transmission and distribution. So that the functions of generation, transmission and distribution of electricity should segregate with accountability and transparency on the basis of power utility rate with business risk analysis.
- 12. Privatization of distribution should be done in a way that does not turn consumers away from reforms. For this we should set up a process which ensures that consumers are not required to pay any more for the inefficiency of the system. For this it is necessary to create conditions for competition in the electricity industry, between producers, suppliers, transporters and traders so that the power tariff could be linked to the actual quality of power supplied. They pay the higher price if they get good quality power supply; otherwise they pay what they pay now.
- 13. We should work out the minimum cost at which an efficiently working power system without pilferage would supply power to different consumers.
- 14. The private Distribution Company should be asked to make plan of eliminating pilferage over a period time.
- 15. Improve technical performance to reduce fuel cost, auxiliary consumption etc. and control the expenses on salary and wages.
- 16. Keep political influence away from employment and wages.

Conclusion:

The power sector in India needs the concept of an integrated energy strategy. It means a system and process of coordinated decisionmaking and actions that bring various energy activities and decisions into a common framework. The institutional structure that allows integration of energy decision-making would rest on a system of integrated analysis, monitoring and coordinated decision-making that becomes a regular part of policy formulation and implementation. For example T & D losses comprise both the technical and commercial losses. T & D losses appear significantly in Low-Tension system and High-Tension sectors. Therefore Prayas, an NGO, in its study brought out by stating that "the starting point in the battle against excessive T and D losses should be to institute an effective energy audit at the HT level. Such an approach is desirable for many reasons, which include relatively small requirements of investment and managerial efforts, high cost-benefit ratio, higher tariff and small number of consumers."

The success of reforms in India "will depend upon the existence of some sort of restraining or disciplining mechanism in the sector. In the absence of which efforts made will likely result in a transition from inefficient public ownership to profit-gouging monopolies or oligarchies." Thus to enable competition, acceleration of economic growth and to raise the comfort level of the common man, the major challenge of the power sector is to continue with the reforms. improve the financial health of the utilities, so that power could be made available at quality and affordable price.

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Source: Planning Commission (2001)

Table 1

Year	Requirement (million KwH)	Availability (million KwH)	% Change in requirements	% Change in availability	Energy Deficit
1981-82	120118	113928	7.6	9.8	-11.9
1982-83	136849	121311	5.9	6.5	-11.4
1983-84	145284	130122	6.2	7.3	-10.4
1984-85	155432	145393	7.0	11.7	-6.5
1985-86	170746	157301	9.9	8.2	-7.9
1986-87	192356	173803	12.7	10.5	-9.6
1987-88	210993	187873	9.7	8.1	-11.0
1988-89	223194	206326	5.8	9.8	-7.6
1989-90	247762	228784	11.0	10.9	-7.7
1990-91	267632	246941	8.0	7.9	-7.7
Total	late sa'il a si	s 1. gamaz	83.8	90.3	turt d
1991-92	288071	260136	8.0	9.0	-6.9
1992-93	305266	282384	5.6	4.9	-7.5
1993-94	323252	303681	5.9	7.5	-6.1
1994-95	352260	329255	9.0	8.4	-6.5
1995-96	389721	356441	10.6	8.3	-8.5
1996-97	413490	371395	6.1	4.2	-10.2
1997-98	436258	394989	5.5	6.4	-9.5
1998-99	446584	421488	2.4	6.7	-5.6
1999-00	480430	453205	7.6	7.5	-5.7
2000-01	507216	470777	5.6	3.9	-7.2
Total	and a garoo		66.3	66.8	

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Electricity Requirement and Availability

Source: Planning Commission (2001)

Table 2

All	India	Energy	Peak Demand	and	Supply	and Pov	ver
		2001-002	Shortage	S			

Year	Peak Demand (MW)	Peak Supply (MW)	Deficit (MW)	. Deficit per cent
1992-93	27306	20121	111	20.5
1993-94	54,875	44830	10045	18.3
1994-95	57530	48066	9464	16.5
1995-96	60981	49836	11145	18.3
1996-97	63853	52376	11477	18.0
1997-98	65435	58042	7393	11.3
2000-01	79856	69475	10381	13.0
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Source: Planning Commission (2001)

Recovery of cost through tariff						
Year	Average cost/Unit (paise)	Average Tariff/Unit (paise)	Percent Recovery of cost			
1992-93	128.2	105.4	82.2			
1993-94	149.1	116.7	78.3			
1994-95	163.4	128.0	78.3			
1995-96	179.6	139.0	77.4			
1996-97	215.6	165.3	76.7			
1997-98	239.7	180.3	75.2			
1998-99	263.1	186.8	71.0			
1999-00	305.1 00 00 00	207.0	67.8 de en 9 al			
2000-01	327.3	226.3	69.1 69.1			
2001-02	349.9	239.9	68.6			

Table 3Recovery of cost through tariff

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Source: Ministry of Power

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A subject of the same	1991-92	2000-01 *	2001-02 RE	2002-03 AP
Gross subsidy Commercial Losses	7449	34428	36713	38836
Commercial Losses (excluding subsidy)	4117	25395	27306	34321
Commercial Losses (including subsidy)	N.A.	16575	17207	16340
Revenue Mobilization Rate of Return %	-12.7	-41.8	-39.5	-32.1

Table 4Financial Performance of the State Power Sector

Note : RE: Revised Estimates. AP: Annual Plan Projection. % : In per cent. *: Provisional.

Table 5 Financial Performance of SEBs

Particulars	1996-97	1997-98	1998-99	1999-00	2000-01
1. Cost of supply (paise / Kwh)	215.60	239.70	262.50	283.80	303.80
2. Average tariff (paise / Kwh)	165.60	180.30	180.50	199.00	212.00
3. Percentage of recovery	76.70	75.21	70.70	70.10	69.80
4. Average agriculture tariff*	21.20	20.22	20.62	21.09	28.48
5. Commercial losses&	4674.31	7597.95	2396.77	18266.11	0220.50
6. Commercial lossesS	11305.00	13963.00	19972.00	23028.11	13092.50
7. Net internal Resources.	2090.70	6209.00	11401.70	11531.60	3092.50
8. Subsidy for domestic consumers	4386.00	5258.40	6433.00	8671.00	0061.80
9. Subsidy for agriculture consumers	15585.20	17706.67	20685.43	24598.77	7083.47
10. Gross Subsidy @	20209.96	23.422.23	27672.09	33081.47	7037.11
11. Subvention received	6630.60	6364.80	7574.80	4801.80	5792.80
12. Uncovered Subsidy	5800.41	8046.61	12255.85	20031.33	3638.35
13. Gross subsidy unit of sages*	75.40	82.60	92.70	103.40	108.40

Notes: @ Gross subsidy includes subsidy for domestic consumers, agricultural consumers and on interstate sales.

* (paise / Kwh), & (with subsidy), \$ (without subsidy)

Source: Planning Commission.

Year	With Subsidy	Without Subsidy
1992-93	1.00 0.8	12 P. DOTT DIDDINA, JI
1993-94	6.2 1 24.9	-12.8
1994.05	25.9	-12.2
1994-95	0.22	-13.0
1995-96	9.81	-15.4 idiaCi .M
1996-97	-7.93	-19 57 toupo 20
1997-98	-12,30	13.57 22.04
1998-99 (prov.)	-18 78	-22.94
999 00 (DE)	-18.76	-30.84
1999-00 (RE)	-26.34	-33.78
2000-01 (AP)	-27.13	-35.06

Table 6

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Note: - numbers indicate negative return, i.e., loss; RE: Revised Estimate; AP: Advance Projection.

Source: Planning Commission June 2001, Annual Report on Working of SEBs.

Year	Agriculture	Residential	Total
1992-93	51.4	20.3	74.5
1993-94	67.4	21.3	88.7
1994-95	85.4	25.4	110.7
1995-96	109.9	31.6	141.5
1996-97	12912	3897	16809
1997-98	15987	4295	20282

Table 7

Power Sector Subisidies (Rs billion, Current Prices)

Source: Ministry of Power 1997.

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	1995-96	1996-97	1997-98	Yen
01 Andhro Dradesh	18.9	30.1	25.0	199
01. Anuma Tradesh	26.2	24.9	24.0	and the
02. Assain	25.9	25.9	23.0	
03. Billai	48.0	45.0	43.0	
04. Denn	18.3	18.2	18.0	
05. Gujaran	31.4	31.7	32.2	
06. Haryana	17.5	17.9	17.4	2001
07. Himachai Fladesh	48.6	48.0	47.5	
08. Jaminu and Kasimin	17.5	18.5	18.4	
09. Kamalaka	20.1	20.0	19.0	
10. Kerala	19.5	19.3	19.0	
11. Madnya Fladesh	15.4	15.3	15.2	S-mit-
12. Manarashua	17.8	19.3	16.8	
13. Megnalaya	46.9	45.1	39.0	
14. Orissa	18.2	18.0	18.0	
15. Punjao	28.5	25.3	23.0	
16. Rajastnan	17.0	17.0	17.0	
17. Tamil Nadu	22.8	24.6	23.0	
18. Uttar Pradesn 19. West Bengal	20.7	20.1	19.7	

Table 8Transmission and Distribution Losses

Note: In Per cent

Source: Planning Commission (1999).

Table 9

Indicators	of Labour Productivity and Labour Cost
	per Unit Supply (1996-97)

SEBs	Per Emp	loyee	Labour cost (1994)		
18	Sales 000 Kwh	Consumer (Number)	Revenue 000 Rs	Rs / Kwh of Supply	as % of sales revenue
Andhra Pradesh	290	135	479	0.15	16.30
Assam	101	38	208	0.66	38.78
Bihar	204	58	417	0.43	27.73
Delhi	294	88	909	N.A	· IIIIo
Gujarat	556	128	1000	0.16	12.04
Haryana	167	63	313	0.30	25.93
Himachal Pradesh	93	45	152	0.57	47.60
Jammu and Kashmir	97	37	37	N.A	
Karnataka	333	175	476	0.23	21.22
Kerala	286	200	286	0.30	33.02
Maharashtra	380	103	773	0.28	20.39
Meghalaya	123	108	883	0.65	78.49
Madhya Pradesh	250	26	164	0.23	14.18
Orissa	159	40	370	0.37	24.55
Punjab 📖	217	56	333	0.28	24.21
Rajasthan	250	82	417	0.24	17.27
Tamil Nadu	278	123	588	0.28	18.33
Uttar Pradesh	270	72	526	0.26	20.27
West Bengal	233	74	500	0.24	17.18
USA	4057	110	5606		obald hado
China	423	242			

Notes : China's average is better than most Indian SEBs, China is also a labour intensive economy where regional electricity boards are run by the state with a high share of coal-based thermal power.

Source: J.Parikh and A. Das (2000).

List

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Table 10

SEBs	Revenue Rs Crores	Arrears Rs Crores	Arrears or revenue	No. of days
Andhra Pradesh	4236	932	22	81
Assam	414	290	70	255
Bihar an an an	1529	2784	182	665
Delhi	2274	887	39	143
Gujarat	5065	1165	23	83
Haryana	1694	610	36	130
Himachal Pradesh	433	69	16	59
Jammu and Kashmir	69	14	20	75
Karnataka	2743	1289	37	172 els to
Kerala	692	305	44	159
Maharashtra	9242	2495	27	99
Meghalaya	71	102	144	525
Madhya Pradesh	4474	1834	41	149
Orissa	1399	742	53	194
Punjab	2861	486	17	61
Rajasthan	3029	757	25	90
Tamil Nadu	5606	280	5	18
Uttar Pradesh	4813	3754	78	283
West Bengal	1899	931	49	178
All SEBs	37	36	0.1.	

2

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Arrears of SEBs as on March 1997

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Effect of Annealing on the Surface Microhardness of PVDF:PMMA:PS Ternary Blends

A. K. Mishra *, P. Agrawal * and R. Bajpai *

ABSTRACT

Specimens of poly(vinylidene fluoride) (PVDF):poly(methyl methacrylate) (PMMA) : polystyrene (PS) polyblends with different weight percentage ratios of the three polymers were prepared using solution cast technique. The effect of annealing temperature and time on the Vicker's microhardness, Hy, was studied. It is found that annealing imparts hardening of pure PMMA in the annealing temperature range of 50 to 150°C. Similarly, pure PVDF and PS specimens are hardened up to annealing temperature of 120°C. This increase in Hv is attributed to the packing or ordering of chains. Moreover, the maximum values of Hv are obtained at the annealing temperature range close to the Tg of PMMA and PS. The annealing treatment to PVDF: PMMA: PS ternary blend specimens provide hardening due to crosslinking in the blend system up to annealing temperature of 120°C. The Tg region and associated morphological changes also contribute to this effect. Annealing, enhances the role of PMMA as compatibilizer in the ternary blend system. The annealing treatment increases the mechanical strength of the specimens in comparison to corresponding unannealed specimens. The effect of annealing treatment further strengthens the various specimens with the increase in time of annealing to 2 and 3 hr.

1. INTRODUCTION

The morphology of the polymer blends depends upon the individual properties of the constituent polymers. Compatibility, composition, glass transition temperature and the method of blend preparation are the significant factors affecting the ultimate properties and the physical nature of the polymer blend. Polymer scientists are showing

^{*} Department of Postgraduate Studies and Research in Physics, Rani Durgavati University, Jabalpur 482001, India.

^{*} Assistant Professor & Head, Department of Electronics, St. Aloysius College, Jabalpur 482001, India.

interest in studying the effects of various thermal pretreatment on the mechanical properties of polymers. The thermal pretreatment to the polymers is found, usually, to moderate their structures hence, some positive changes in their properties can be expected. In annealing the polymer is subjected to slow cooling providing plenty of time for rearrangement of polymeric chains, while quenching imparts maximum imperfections in the chemical structure. The study of the effect of thermal pretreatments on various properties of polymeric blends are reported in the literature 1-4. This has introduced a new field of research as many of the properties of the polymeric material can be altered even after the blending process is over.

The major emphasis is being given on the study of polymer blends these days because of the possible improvement in physical properties of the mixture incorporating the individual properties of polymers 5-6. Studies relating to polymer blends have been reported by various workers 7. Poly(vinylidene fluoride) : poly(methyl methacrylate) : polystyrene is one of the possible ternary blends. PMMA is a versatile polymer with wide commercial applications exhibiting good mechanical properties and outdoor weathering. The use of PMMA is well known because it is a hard and rigid polymer9. It is atactic, amorphous and has a high glass transition temperature (105°C). On the other hand, PVDF has good heat resistance and may be used continuously at temperature up to 150° C. It can be melt processed by the standard techniques of the injection moulding and extrusion. Polystyrene is a hard, rigid, rather brittle material. It has a relatively low softening point and does not withstand the temperature of boiling water. It also has a high refractive index of 1.59 which gives it particular brilliance. It has a low heat distortion temperature of 85º C. It was, therefore, considered to be important to prepare and characterize a blend by mixing these three polymers. It is well known that microhardness is a very important property as it helps in understanding various physical properties of materials10-11 but only a limited work has been carried out as yet on the microhardness of polymers in general and those of polymer blends in particular. The

present paper reports the study of the effects of annealing on the surface microhardness of the PVDF:PMMA:PS polyblends.

2. EXPERIMENTAL

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The powders of PMMA (BDH, UK), PVDF (Aldrich, USA) and PS (BDH, UK) were supplied by M/s Chemical Agencies. Mumbai. India. The quoted values of molecular weights of PMMA, PVDF and PS were 5,00,000, 3,50,000 and 2,58,000; glass transition temperatures 105, 13 and 100°C; melting temperatures 225, 171 and 270°C, respectively.

The solution cast technique12 was utilized to prepare the blends of the three polymers PVDF, PMMA and PS. Selected weight percentages (5, 10, 15, 20 and 25 %) of PMMA were added in PVDF:PS matrix. For every blend PVDF and PS were taken in equal weight proportions. The known weight proportions of these polymers were dissolved in a common solvent dimethyl formamide at a temperature of 130°C inside a temperature controlled electric oven. The solution was constantly stirred during the heating process. After complete mixing the transparent solution was poured into the optically plane glass moulds placed inside the oven. The solvent was then allowed to evaporate at a drying temperature of 70°C so as to obtain pellets of blend specimens of size 6 sq cm and 0.04 cm thickness. After obtaining perfectly dried samples, pieces of appropriate size were cut from the pellets.

The blend samples were then mounted on a mhp 160 microhardness tester with a Vicker's diamond pyramidal indenter having a square base and 136^o pyramidal angle attached to Carl Zeiss NU2 universal research microscope. The load ranging from 10 to 100 g, was applied for 30s. A micrometer eyepiece was used to measure the diagonals of the indentation. The Vicker's hardness number, Hv, was calculated from the relation13

Hv = 1.854 L/d2 (kg/mm2);

where L is load (kg) and d is the diameter of indentation (mm). For

each test the duration of indentation was 30 s. For each load at least five indentations were made at different points of the specimen, and the average Hv was computed. Usually, the values of Hv were within 5 % of the average value. During the test the specimens were kept strictly horizontal and rigid.

ANNEALING

The PVDF, PMMA and PS pure polymers and ternary blend specimens of size 1 sq cm and 0.04 cm thickness were thermally pretreated. The specimens were heated uniformly in an electric oven attached with a thermostat which could control the temperature with an accuracy of $\pm 1^{\circ}$ C. The temperature was increased till the desired temperature was achieved. The specimens were kept inside the oven at various annealing temperatures ranging from 50 to 150°C for different duration of 1, 2 and 3 hr. The oven was then switched off and was allowed to cool by itself to the room temperature.

2. RESULTS AND DISCUSSION

Figures 1 and 2 illustrate the effect of different annealing temperatures on Hv of the pure PVDF, PMMA, PS and PVDF: PMMA: PS ternary blend specimens annealed for one hour at a load of 80 g. It can be observed that specimens exhibit both increasing and decreasing trends in Hv within the annealing temperature range of 50 to 150°C. Fig. 1 illustrates that in pure PMMA specimen Hv increases progressively with increasing annealing temperature from 50 to 150°C, whereas, in case of pure PVDF and PS the increase in Hv is up to the annealing temperature of 120°C and thereafter, Hv decreases at the temperature of 150°C. The rate of decrease is more in PVDF, while it is less in pure PS. The Hv-temperature profile for PVDF is highest followed by PS and PMMA. This trend is similar to unannealed specimens. Annealing treatment probably induces packing or ordering of the polymer chains in the amorphous phase and formation of a network in which the microcrystals, previously formed acts as tie points. The restructuring and trend to uniformity in size of crystallites, characteristics of each annealing temperature, leads to gradual hardening of the material.



The increase in Hv up to 150°C in pure PMMA and up to 120°C for pure PVDF and PS specimens is associated with an initial packing or arranging of the polymer chains. The increase in Hv at 100°C and above for PMMA, at 100°C and up to 120°C for pure PVDF and PS can also be correlated with the glass transition temperature (Tg) of the polymers. The Tg value for PMMA and PS is around 100°C and that of the PVDF is around 35°C. This region of increased hardening reveals that some degree of ordering 14 of polymer chains is produced during annealing process which is frozen in by slow cooling of the specimens. The decrease in the value of Hv, beyond the annealing temperature of 120°C for pure PVDF and PS specimens suggests softening of the specimens due to isothermal annealing process15, which imparts higher mobility to polymeric chains. The local ordering gets destroyed due to increased molecular motion. However, the Hv values for annealed specimens of pure PVDF, PS and PMMA are greater than those of corresponding unannealed specimens. Annealing of pure PVDF, PS and PMMA specimens in the range of 50-150°C, provides sufficient time for rearrangement of molecules and the microhardness increases with annealing temperature. This indicates crystallization of all the three pure polymers due to annealing. This effect is maximum around 120°C for pure PS and PVDF and up to 150°C for pure PMMA.

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Fig. 2 exhibits the effect of annealing temperature on Hv of various ternary blend specimens at the load of 80 g. It is evident from various curves that the values of Hv for all the blend specimens increase with increasing annealing temperature in the range of 50 to 120°C, beyond which the Hv for all specimens tend to decrease at the annealing temperature of 150°C. The increase in the value of Hv up to the annealing temperature of 120°C, is attributed to the cross linking of polymers in the ternary blend of PVDF:PMMA:PS. This effect is more prominent at 120°C. This temperature region is close to the Tg of two polymers PMMA and PS (near about 100°C), where remarkable morphological changes cause hardening. Moreover, the Hy value of annealed ternary blend specimens are higher than those of corresponding unannealed specimens. This suggests that annealing process facilitates the miscibility of polymers in the blend system and the role of PMMA as compatibilizer for PVDF:PS matrix is envisaged. The increase in hardening character of annealed ternary blend specimens is due to the considerable cross linking developed during annealing process giving rise to specific crystallites 16 in the blend system. However, the degree of cross linking decreases with increase in the content of PMMA in the ternary blend, as the level of Hv -temperature profile lowers for specimens with increasing content of PMMA (wt %) from 5 to 25 wt %. Moreover, the Hv values of all the annealed blend specimens are still higher than those of unannealed specimens. Thus, the overall effect of annealing treatment is to facilitate the cross linking and to increase the crystallinity in the ternary blend. The annealing treatment, therefore, strengthens the specimen as their microhardness increases. It has been reported17 that PVDF:PS which are immiscible blend and have a very rough morphology showing large phase domains. When PMMA is used as compatibilizer in the ternary blend then its morphology reveals a dispersed structure. Also, the phase domains decrease with increasing PMMA content. Which is not observed for unannealed blend specimens. The Hv-annealing temperature study of PVDF:PMMA:PS blend suggests that annealing process decreases the size of phase domains with the rearrangement of macro-molecules in the blend system, thereby, exhibiting better mechanical strength as compared to unannealed specimens. These features are therefore, in correlation with the findings of Siqueria et al17. The decreasing trend in the value of Hv beyond the annealing temperature of 120° C is due to relative phase separation within the blend system as the result of increased molecular motion at 150° C.



Fig - 2

Effect of Annealing Time

The effect of different annealing time (2 and 3 hr) on the microhardness of PVDF, PMMA, PS and their ternary blends are shown in figures 3-6. The behaviour of the curves for different annealing temperatures on the various types of specimens are found to be similar to that obtained for specimens annealed for 1 hr. However, greater degree of hardening is imparted to the specimens when annealed for 2 and 3 hr.

Figs. 3 and 4 show the variation of Hv with annealing temperature of specimens annealed for 2 hr. In general, the microhardness level of pure PVDF, PMMA, PS and the various ternary blend specimens with 5 to 25 wt % of PMMA increases with 2 hr of annealing time as compared to the specimens annealed for 1 hr (Figs. 1 and 2). Thus, a longer annealing time offers further increases in the local ordering. Similarly, in the blends, the degree of crosslinking increases when annealed for 2 hr. The role of PMMA as compatibilizer for PVDF/PS matrix in the blend system is further strengthened. Probably, the crystallite size increases due to the increase in the crosslinking density. Also, the phase domains are further reduced and thereby decreasing the heterogeneity of phase morphology. However, the nature of Hv-temperature variation for pure specimens as well as ternary blend specimens with varying content of PMMA remains similar as that obtained for annealing time of 1 hr.

Annealing of specimens up to 3 hr also produces hardening as shown in figs. 5 and 6. Both the pure and ternary blend specimens, when annealed for 3 hr, exhibit further enhancement of the crystallinity. compatibility and crosslinking as discussed for 1 and 2 hr annealed specimens, as Hv vales for 3 hr annealed specimens. The morphological changes described as a result of annealing treatment are therefore, elevated with the increase in the duration of this process. More time is available for the chain mobility and morphological modification to a greater extent.





It can, therefore, be concluded that annealing imparts hardening of pure PMMA in the annealing temperature range of 50 to 150°C. Similarly, pure PVDF and PS specimens are hardened up to annealing temperature of 120°C. This increase in Hv is attributed to the packing or ordering of chains. Moreover, the maximum values of Hv are obtained at the annealing temperature range close to the Tg of PMMA and PS. This also indicates the crystallization of pure PVDF, PMMA and PS specimens due to annealing. The annealing treatment to
PVDF:PMMA:PS ternary blend specimens provide hardening due to crosslinking in the blend system up to annealing temperature of 120°C. The Tg region and associated morphological changes also contribute to this effect. Annealing, enhances the role of PMMA as compatibilizer in the ternary blend system. The annealing treatment increases the mechanical strength of the specimens in comparison to corresponding unannealed specimens. The effect of annealing treatment further strengthens the various specimens with the increase in time of annealing to 2 and 3 hr.



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Fig -6

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Studies on drug resistance profile of isolates obtained from various aquatic environment

Mahendra K. Gupta*, Richa Tiwari★, Dipa Bardhan & and Inder Singh Rana *

Abstract

Bacteria with intrinsic resistance to antibiotics are found in nature. Such organisms may acquire additional resistance genes from bacteria introduced into water or soil and the resident bacteria may be the reservoir or source of widespread resistant organisms found in many environments. The present study is a small attempt to evaluate the multidrug resistance profile of Gram-negative bacterial isolates obtained from river water, lake water & sewage water samples. The most common drug resistant organisms belonged to the genera Aeromonas & Pseudomonas.

Key Words: Drug resistance, Aeromonas, Pseudomonas

Introduction if daily to up astis hereitik end most babelies

The presence of drug resistant bacteria in aquatic environment throughout the world has been documented. Occurrence of these drug resistant varieties in nature may result from transfer of drug resistance by soil microorganisms or microorganisms from waste disposals. Natural reservoirs of resistance genes may provide a source of transferable traits for emerging pathogens II.

The emergence and spread of drug resistance in bacteria, and its association with serious infectious diseases have recently increased. Thus, it is becoming difficult to treat infectious diseases caused by drug-resistant bacteria. An extremely serious problem with drugresistant bacteria is the emergence and spread of multidrug-resistant bacteria hence it is very difficult to treat infections due to such multidrug- resistant bacteria.

*Assistant Professor and Head, Department of Botany & Microbiology, St. Aloysius' College, Jabalpur.

★ Assistant Professor, Department of Microbiology, St. Aloysius' College, Jabalpur.
 ⊗ Assistant Professor, Department of Microbiology, St. Aloysius' College, Jablpur.
 * Assistant Professor, Department of Botany, St. Aloysius' College, Jabalpur.

Although multidrug resistance in Gram-negative bacteria has been reported many times but drug resistance in environmental isolates is of great importance because ingestion of these resistant bacteria by man and animals may lead to transfer of their resistance to recipient's intestinal flora and / or to susceptible pathogens by cross infection causing potential health hazards 3. When these drug resistant or susceptible varieties of Gram-negative bacteria enter the human body, the normal human immune system is potentially not capable of fighting against them. Present investigation is an effort to throw some light on multidrug resistance profile of Aeromonas & Pseudomonas isolates obtained from fresh water & sewage water samples from different sites of Jabalpur.

Materials & Methods

□ Sampling sites & processing of water samples:

Bacterial isolates were obtained from water samples which were collected from three different sites, out of which two were fresh water sources i.e. river Narmada (Gwarighat), Hanumantal Lake and one of them was the city drainage at Omtinala. The collected water samples were brought to the laboratory under ice-cold conditions. Isolation was done on a differential medium GSP (Glutamate Starch Phenol red) agar medium using standard pour plate dilution agar technique 4. Morphologically distinct colonies (Yellow colonies -Aeromonas; Pink Colonies- Pseudomonas) were pure cultured on Nutrient agar slants and were tentatively identified on the basis of biochemical characterization.

□ Antibiotic sensitivity / resistance test:

27 environmental isolates were tested for drug resistance pattern by disc diffusion assay method as described by the National Committee for Clinical Laboratory Standards 5. Antimicrobial discs with 12 different antibiotics namely Amoxycillin (AM), Cefuroxime (CR), Cephalexin (CP), Cefotaxime (CX), Sparfloxacin (SP), Ceftriaxone (XO), Ciprofloxacin (CL), Ceftazidime (CZ), Ampicillin (I), Gentamycin (J), Amikacin (AK), Ofloxacin (OF) specific for Gramnegative bacteria, were used.

Results & Discussion

During the present course of investigation, out of 4 isolates of Aeromonas & 23 isolates of Pseudomonas tested against 12 antibiotics. In case of Aeromonas, 50% resistance was exhibited against Amoxycillin (AM), Cefuroxime (CR), Ceftazidime (CZ) & Ofloxacin (OF); 75% were resistant against Cephalexin (CP) & Ampicillin (I) while 25% resistance was observed against Cefotaxime (CX). Overall 31.25% and 27.90% multiple drug resistance was observed respectively, in case of Aeromonas and Pseudomonas isolates (Fig.2). In case of 23 isolates of Pseudomonas, 91.3% resistance was observed against Amoxycillin (AM), 26.1%, 52.2%, 21.7%, 4.4%, 65.2%, 69.6% & 4.4% drug resistance was exhibited respectively against Cefuroxime (CR), Cephalexin (CP), Cefotaxime (CX), Ceftriaxone (XO), Ceftazidime (CZ), Ampicillin (I) & Ofloxacin (OF) antibiotics (Table 1).

ABALPU

The potential importance of bacteria acting as a reservoir of plasmids coding for antibiotic resistance has been suggested by Linton et al 6. Thus the ingestion of these resistant bacteria by man may lead to transfer of their resistance to the recipient's intestinal flora and / or to susceptible pathogens by cross infection causing potential health hazards 3. Where antibiotic resistant opportunistic pathogens posing concern to public health are present in the water bodies caution might be advisable specially to the patients using immunosuppressive drugs or undergoing chemotherapy. Extraordinary efforts will be needed to prevent global dissemination of multidrug resistant Gram-negative bacteria in the next millenium 7. An extensive knowledge of molecular mechanism underlying bacterial drug resistance especially multidrug resistance is required to control multidrug - resistant bacteria and to treat patients infected with these bacteria successfully.

Acknowledgements

Authors are thankful to Rev. Dr. Fr. Davis George, Principal, St. Aloysius' College, Jabalpur for providing laboratory facilities & financial aids for successfully conducting this short term project work.

S	Isolate No.	COLONY Colour	ANTIBIOTICS											
No.			AM	CR	СР	СХ	SP	X0	CL	CZ	I	J	AK	0F
1	W-1	Pink	0	2.7	1.2	2	1.2	1.5	1.9	2.3	0	1.6	1.7	1.6
2	W-2	Pink	0	0	0	1.9	1.1	1.2	2.1	1.7	0	1.1	1.2	2
3	W-3	Pink	0	0.8	0	1.8	1.3	1.4	2.1	1.8	0	1.2	1.5	2
4	W-4	Pink	0	0	1	1.1	1.9	1.7	1.8	0	0	2	1.6	1.9
5	W-5	Yellow	1	0	1.1	1.2	2	1.6	1.6	0	1.1	1.6	1.8	1.4
6	W-6	Yellow	0	0	0	1.5	1.8	2	2	2.1	0	1.4	1.7	2
7	W-7	Yellow	0	1.8	0	0	1.2	2.2	1.5	0	0	1.9	1.6	0
8	W-8	Yellow	1.1	1.9	0	1.1	2	2.2	1.2	2	0	1.7	2	0
9	SW-1	Pink	2.3	2	1.1	0.9	1.8	1.1	2	0	0	1.8	2	2
10	SW-2	Pink	0	0.7	1.1	1.5	1.8	1.2	1.6	0	0	2.3	1.9	1.9
11	SW-3	Pink	0	1.5	.0	0.	1.9	- 1.1	1.5	0	0	1.2	1.9	1.4
12	SW-4	Pink	0	0	0	0	2.2	1.2	2.6	0	0	2	2.5	2.5
13	SW-5	Pink	0	1	0	1.1	1.5	2	1.8	1.6	2	2.1	2.1	1.5
14	SW-6	Pink	1.1	1	0	1.8	1.6	2	2.3	1.5	2	2	1.9	2.3
15	SW-7	Pink	0	1.1	1	0	1.6	1.7	1.5	0	1.5	1.6	1.8	1.3
16	PW-8	Pink	0	1.1	0	0	1.9	0	2	0	1.1	1.2	1.3	1.8 .
17	PW-9	Pink	0	1.1	0	1.6	2	1.8	2	0	1.8	1.2	1.2	1.8
18	PW-10	Pink	0	1.1	1	1.7	1.8	2	1.9	0	0	1.3	1.2	1.9
19	PW-11	Pink	0	0	1	0	1.8	2	1.4	0	1.7	2.4	2	2
20	PW-12	Pink	0	1.7	0	1.5	1.5	1.9	1.5	2	0	2.3	1.3	2.2
21	PW-13	Pink	0	1.8	0	1.6	1.6	1.8	2	0	2	1.5	1.6	1.6
22	RW-1	Pink	0	0	1.2	1	1.4	2	2	0	0	1.3	1.6	0
23	RW-2	Pink	0	0	0	1.1	1.6	1.5	1.8	0	0	1.5	1.7	1.8
24	RW-3	Pink	0	1.6	1.1	2.1	1.7	2.1	2.3	1.5	0	2.1	1.8	2
25	RW-4	Pink	0	1.6	1.2	1.4	1.6	2.1	2	0	0	2	2.5	1.8
26	RW-5	Pink	0	1.9	1.2	1.2	2.1	2.2	2.1	0	0	1.5	1.9	1.8
27	RW-6	Pink	0	1.8	0	1.2	1.5	2	2.3	1.5	0	1.7	1.9	1.3

Table: 1 ANTIBIOTIC SENSITIVITY/RESISTANCE OF ISOLATED BACTERIA AGAINST DIFFERENT ANTIBIOTICS IN TERMS OF ZONE SIZE (IN CM.)



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NON-LOCAL CHARACTER OF A THEOREM ON THE NON-LOCAL CHARACTER OF IN, pn, qn I-SUMMABILITY

Dr. Mrs. Bilquees Aslam*

Abscract

Introduction : In this paper the authoress extends Daniel's result (1) on non-local character of I N, pn I summability of a Fourier series at a point to the non-local character of I n, pn, qn I summability of a Fourier series at a point which includes theorem given by L.S. Bosanquet and Kestelman (2) R. Mohanty, Theorema (3) and E.C. Daniel (4) as particular cases.

<u>Definitions and notations</u>:- Let $p = \{p_n\}, q = \{q_n\}, r = \{r_n\}$ be sequences of real numbers such that $r_n = p_n q_0 + p_{n-1} q_1 + \dots + p_0 q_n$, $p-1 = q-1 = r-1 = 0, r_n ? 0 (n = 0)$.

The (N, p_n, q_n)-transform of s_n = $\sum_{v=0}^{n} a_v$ is defined by the following

$t_n = 1 / r_n \sum_{v=0}^{n} p_{n-v} q_v s_v$. *(1)

The series $\sum_{v=0}^{n} a_v$, or the sequence $\{s_n\}$ is said to be summable (N, p, q) to s if $t_n ? s$, as n? 8, and is said to be absolutely summable (N, p, q), or summable $\{N, p, q\}$, if $\{t_n\} \in BV$, that is,

? $|_{t_n} - t_{n-1}| = K \cdot (5)$

The method (N, p,q) reduces to the Nölund method (N, p_n) when $q_n=1*(6)$ and to the method (N, q) when $p_n = 1.*(6)$.

The necessary and sufficient conditions for the method (N, p, q) to be regular (this follows from the classical regularity theorem of Köjima-Schur.), are:

(i) $\sum_{v=0}^{n} |p_{n-v} q_v| = K |r_n|$, where K is a number independent of n, (ii) for each integer v = 0, $(p_{n-v} q_v / r_n)$? 0 as n? 8.

We define the sequence of constants {c n} by means of the identity :

 $(\sum_{n=0}^{8} p_n x^n)^{-1}$, $c_{-1} = 0$, whenever it holds. In particular, this relation holds for $x \mid < \delta$, for some $\delta > 0$, whenever $\Sigma p_n x^n$ has a positive radius of convergence and $p_0 = P_0$? 0. We observe that in the case of Cesaro summability when $p_n = A^{\alpha-1}$, we have $c_n = A_n^{-\alpha-1}$.

Let f(t) be a periodic function with period 2π and integrable (L) over($-\pi$, π) and let its Fourier series be given by

(1.1.1) $1/2 a_0 + \sum_{n=1}^{8} (a_n \cos nt + b_n \sin nt) = 1/2 a_0 \sum_{n=1}^{8} A_n(t)$.

It has been pointed out by Bosanquet * (3) that summability $| R, \log n, 1 |$ is equivalent to $\{1 / \log n \Sigma_1^n S_m / m\} \in BV$. Again, it follows from this and a result of lyer*(8) that summability $| R, \log n, 1 |$ is equivalent to summability

N, q_n where $q_n = 1 / n$. The summability $| R, \lambda_n, 1 |$ is the same as summability $| (N, q_n) |$, where $q_n = , \lambda_{n+1} - \lambda_n$.

Regarding the non-local character of absolute summability the following theorems are known.

<u>Theorem A.</u>*(3) If $0 < \alpha < \beta < 2\pi$, there is a function summable over (α, β) and zero in the remainder of $(0, 2\pi)$, whose Fourier series is not summable |C, 1|, at t=0.

*Assistant Professor, Department of Mathematics, St. Aloysius College, Jabalpur

<u>Theorem B.</u> *(9) If $0 < \alpha < \beta < 2\pi$, there is a function summable over (α, β) and zero in the remainder of $(0, 2\pi)$, whose Fourier series is not summable $| R. \log w, 1 |$ at t= 0.

<u>Theorem C</u>.*(4) If { p_n } is a positive sequence such that P_n ? 8, as n? 8, $\Sigma 1/P_n = 8$, and $\Sigma_1^{\dagger} C_n^{\dagger} < 8$, then the summability $| N, p_n |$ of the Fourier series of f(t) at t = x is not a local property of f(t), that is, if $0 < \alpha < \beta < 2\pi$, there is a function f(t), integrable (L) over the interval ($x + \alpha, x + \beta$) and zero in the remainder of ($x, 2\pi + x$) such that its Fourier series, at t = x, is not summable $| N, p_n |$.

The object of the present paper is to obtain a general theorem on the non-local character of $[N, p_n, q_n]$ which includes theorem A, B, and C as particular cases, when $p_n = 1$, it includes theorem B when $q_n = 1$, it reduces to an improved version of theorem C in the sense that we do not require the condition P_n ? 8 ,as n? 8 ' in theorem C.

We established the following theorem:

THEOREM: If $\{p_n\}$ and $\{q_n\}$ are positive sequences such that

- (i) $\Sigma q_n/r_n=8;$
- (ii) $\Sigma_1^{l} C_n^{l} < 8;$

(iii) $n ? q_n = O(q_n);$

(iv) $\sum_{\mu=0} v \mid ? r_{\mu-1} \mid = O(r_v)$; then the summability $\mid N, p_n, q_n \mid$ of the Fourier series of f (t) at t = x, is not a local property of f(t) i.e. if $0 < \alpha < \beta < 2\pi$, there is a function f(t), integrable (L) over the interval (x + α , x + β) and zero in the remainder of (x, $2\pi + x$) such that its Fourier series at t = x, is not summable $\mid N, p_n, q_n \mid$.

We require the following Lemmas for the proof of the theorem.

<u>LEMMA 1*(3)</u>. Suppose $f_n(x)$ to be summable in (a, b) where b - a < 8, for n = 1, 2, ..., ... Then a necessary and sufficient condition that, for every function $\varphi(x)$ integrable (L) over (a, b) the function $f_n(x) \varphi(x)$ should be summable over (a, b) and

 $\Sigma_{n=1}^{8} + ?_{a}^{b} f_{n}(x) \phi(x) dx_{1}^{1} <?,$

. is that $\sum_{n=1}^{8} |f_n(x)|$ is essentially bounded in (a, b). LEMMA 2*(10). Let $\{p_n\}$ and $\{q_n\}$ be such that

(1. $\Sigma_n | C_n | < 8;$

(2. $n ? q_n = O(| q_n|);$

(3. $r_n^* = \sum_{v=0}^{n} |p_{n-v} q_v| = K |r_n|;$

(4. $\Sigma_{\mu=0}^{\nu_{+}} ? r_{\mu-1} = O(r_{\nu}).$

Then the necessary and sufficient condition that $\sum a_n \in a_n$ should be absolutely convergent whenever $\sum a_n$ is summable $| N, p_n, q_n |$ is

 $\epsilon_n r_n / q_n = O(1)$, as n? 8.

<u>LEMMA 3*(11)</u>. If the series $\Sigma_{k=0}^{8} \stackrel{!}{\mid} A_k(x) \stackrel{!}{\mid}$ converges for x belonging to a set of positive measure, then the series $\Sigma_{k=1}^{8} \stackrel{!}{\mid} a_k \stackrel{!}{\mid} + \stackrel{!}{\mid} b_k \stackrel{!}{\mid}$) is convergent. <u>PROOF OF THE THEOREM</u>:- Let $0 < \alpha < \beta < 2\pi$ and let f(t) be integrable (L) in $(x, 2\pi + x)$. We assume (if possible) that the Fourier series $\Sigma A_n(t)$, at t = x, is summable $\stackrel{!}{\mid} N$, p_n , $q_n \stackrel{!}{\mid}$.

Then by Lemma 2,

 $\sum q_n / r_n + A_n(x) + < 8$, or what is the same thing as

 $2/\pi \Sigma q_n / r_n / ?_a^{\beta} \varphi(t) \cos nt dt < <?$ Therefore, by virtue of Lemma 1, we have (1.1.1) $\Sigma_n q_n / r_n \mid A_n(x) \mid < K$, for almost all t in (α, β) . On the other hand for $0 < t < 2\pi$ (t? π), by taking $a_n = q_n / r_n$, $b_n = 0$ in Lemma 3, we have $\sum_{n} q_{n} / r_{n} < 8$, Which contradicts the hypothesis (i) of the theorem. This completes the proof. **COROLLARY:**-If $\{p_n\}$ is a positive, monotonic non-increasing sequence and $\{q_n\}$ is a positive sequence such that (i) Q_n? 8, as n? 8 (ii) Σ | C_n | < 8; $n?q_n = O(|q_n|)$ (iii) $\Sigma_{\mu=0}^{\nu}$? $r_{\mu-1}$ = O(r_v); (iv) Then the summability ! N, p, q, of the Fourier series of f(t), at t = x, is not a local property of f(t). The Corollary follows at once by an appeal to the following Lemma. LEMMA:- If $\{p_n\}$ is a positive, monotonic non-increasing sequence and $\{q_n\}$

is a positive sequence such that

 Q_n ? 8, as n? 8, then $\Sigma_n q_n / r_n$ is divergent. <u>PROOF</u>:- We have

 $\mathbf{r}_n = \sum_{v=0}^n \mathbf{p}_{n-v}$, $\mathbf{q}_v = \mathbf{p}_0 \mathbf{Q}_n$, and so for every m > 0,

 $\Sigma_{n=0}^{m} q_n / r_n = 1 / p_0 \Sigma_{n=0}^{m} q_n / Q_n.$ Now, since by a well--known theorem of Abel-Dini,*(12)

 $\Sigma_{n=0}^{m} q_n / Q_n$ is divergent, the Lemma follows.

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CLATHRATES

Dr. Mrs. A. D'Souza.*

2

Introduction-

Sir Humphrey Davy discovered hydrates in 1810. Gas hydrates are crystalline solid, which look like ice and which occur when water molecules form a cage like structure around a smaller guest molecule. Common guests are CH4, C2H6, C3H8, isobutane, and butane, N2, CO2 and H2S of which methane exists most abundantly in natural hydrate1.

Although hydrates, which are clathrates, have been known since the early days of chemistry it is only during recent years that their nature has been recognized. Powell first introduced the term "clathrate" in 1950 for the solid phases formed when quinol crystallizes from water in the presence of Argon or Krypton under pressure. The term "clathrate" is derived from a Latin word clathratus meaning "enclosed or protected by crossbars or grating."2A clathrate is a single phase solid in which atoms or molecules of a guest component are completely surrounded and kept as in a cage by the crystalline lattice of host component without any sensible interaction between them except Vanderwaal forces. For inclusion, the guest molecule must be small enough to be accommodated in a cage, but not be so small that it can escape through the interstitices between the atoms forming the cage2. These are also referred to as cage compounds. It is not necessary that all the cavities in the host structure be filled. As a result, the clathrates are normally non-stoichiometric compounds1. However not all clathrates are hydrates.

There are other host lattices formed by hydrogen-bonded aggregate of hydroquinone, phenol, and similar organic compounds. Non-hydrogen bonded structure are also known for example ammine

^{*}Assistant Professor & Head, Department of Chemistry & Biochemistry, St. Aloysius College, Jabalpur

of nickelous cyanide in benzene. Noble gases are trapped in crystal lattices of organic and inorganic compounds. Those organic and inorganic compound having cavities are hosts or encapsulant and the noble gases are called guests encapsulate.

 Bulky Organic
 +
 Inert gas or Alkali Metals
 --> Clathrates1

 Or
 or

 Inorganic molecule
 Neutral molecules

 (HOST)
 (GUEST)

The general formula - m .H n.G1 where

H ----- Host

G ----- Guest

m ----- no. of molecules of Host

n ----- no. of molecules of Guest

Classification -

Clathrates can be classified into various types depending on the nature of host and guests. 1. Gas Hydrates -Water molecules crystallize in presence of neutral molecules to for hydrates. Gas hydrates have a limiting formula 6X. 46H2O3 (Fig.1) where X = Guest = Ar, Kr, Xe, Cl2, CH4 etc. The basic building block for this type of structure is a dodecahedron formed from twenty molecules of water. Each water molecule is bonded to three others by hydrogen bonds. When this do- decahedra pack come together to form larger units relatively large voids are formed in the structure and it is in these spaces that the guest molecules, X, reside. In methane hydrates several different hydrate structures are known with one structure as the most common. In this structure, the cages are arranged in bodycentered packing, the unit cell contain 46 molecules of water and up to 8 molecules of methane [(CH4) 5.75(H2O)]3 (Fig.2) Gas hydrates can be further classified into -

- Simple hydrates No hydrates of Helium and Neon are known. In this type the host molecules are 46.
- 2. Hydrates with heavy water -are formed by Kr and Xe.
- 3. Double hydrates are formed in the presence of small atoms of noble gases or molecules4.



2. Quinol Clathrate-Quinol acting as a host can form clathrates with noble gases, SO2, H2S, CH4, HCl, CH3OH etc. the guests are trapped in the lattice of quinol where three molecules of quinol are bonded through hydrogen bonds. The general formula for the [C6H4 (OH)2]3, Where G = Ar, Kr, Xe. A spherical cage is formed having a diameter 4 A°. The crystals are stable (Fig3).



3. Phenol and b - hydroquinone clathrates - Phenol and b - hydroquinone forms cages by

forming hydrogen bonding to trap Ar, Kr and Xe. The clathrates are less stable than quinol clathrate.

4. Clathrates of ammines of nickelous cyanide - The ammines of nickelous cyanide2 forms interesting clathrates when crystallized in the presence of benzene. Nickel atoms are bonded to cyanide radicals to form a network in which alternate atoms of nickel are united to two molecules of ammonia. In presence of benzene, these networks become united, a unit cell being shown in Fig4. In this the plane of benzene ring is perpendicular to the plane of network. It is difficult to see how the benzene ring can unite with the sheets except by Vanderwaal forces ability of a molecule to unite the sheets will depend on its being suitable size. In addition to benzene union can be affected

by phenol, aniline thiophene, pyrrole and furan, but neither by the homologues of benzene nor by paraffin.



6. Another notable class of clathrate compounds is the salt hydrates5, which are formed when tetraalkylammonium or sulfonium salts crystallize from aqueous solution with high water content. Their structures are very similar to the gas and liquid hydrate structures in a general way though different in detail.

7. Other clathrates -

Several compounds have a monocyclic structure having a hole in its center which can accommodate foreign molecules i.e. cyclodextrins. Graphite gives sandwich type of inclusion compounds with alkali metals and fluorine.

Many other crystalline substances have hole channels or honeycomb structures, which allow inclusion of foreign molecules, however they are not known as clathrate compounds, and urea is such an example. In urea crystals there are uniform capillaries (channels), which can trap linear molecules, hence they are used to separate straight chain hydrocarbons from branched chain compounds5.

Preparation -

Clathrates are prepared by crystallizing the host from its aqueous solutions in the presence of the guest under a pressure of 10-40 atmospheres6. In gas hydrates, the water is allowed to freeze in the presence of Ar, Kr, or Xe under pressure .The atoms of noble gas gets trapped in the crystal structure of ice yielding clathrates. Crystallization of solutions of quinol [p-dihydroxybenzene, p-C6H4(OH)2] in water or alcohol under pressure of 10-40 atmospheres of, say, Kr, produces crystals composed of cages, there being one cage for every three molecules. If each cage imprisoned one molecule of an inert gas, the limiting composition of the resulting solid would be [C6H4 (OH)2]3.G, where the imprisoned molecular species is symbolized by G. Clathrates given by phenol and b - hydroquinone with Ar, Kr and Xe have been prepared by dissolving any of these gases in phenol or b - hydroquinone followed by slow crystallization6.

Conditions for formation of Clathrates -

- 1. Host should have cavities of appropriate size.
- 2. Size of the guest should fit in the cavities of host (without chemical interaction)1

Stability

Gas hydrates occur wherever methane and water are available .The stability is limited by temperature and pressure .Gas hydrates are stable at low temperatures and or at high pressures. Because of the required conditions of temperatures, pressures and availability of methane clathrates are restricted to two regions: 1) high altitudes 2) along the continental margins in the oceans. The stability of the clathrates is due to the reasons namely: (i) The guest molecules are tightly held in the cavities of the host molecules (ii) The guest molecules are within the cages are at minimum potential energy1. Quinol Clathrate crystals are stable, however Phenol and β-hydroquinone clathrates are less stable than quinol clathrates.

Importance :-

Clathrates have caught the attention of many due to their role in many phenomenons, which are of vital importance. Clathrates are used in the separation of noble gases, e.g., Ne can be separated from Ar, Kr, and Xe, since Ne is the only gas that does not form a clathrate with quinol. Kr-85 clathrate is used as a safe and useful source of beta radiations, which are used for measuring thickness of gauges. Xe-133 clathrate is a source of gamma radiations. Clathrates provide a convenient means of storing radioactive isotopes of Kr and Xe produced in nuclear reactors. Noble gas clathrates are used for storing noble gases 1.

Clathrates of Werner complexes have been used to bring about resolution of optically active ammines7.

Several factories, especially in USSR use clathrates of urea for dewaxing petroleum products and for producing straight chain paraffin8.

Several processes based on formation of hydrates mostly propanehydrate clathrates have been used for the desalinization of seawater8.

Radiometric determination of gaseous Fluorine in concentration of only a few parts per million has been made possible by the reaction of Flourine with quinol/ K85 clathrates8.

Clathrate compounds can be utilized to study the physical property of isolated molecules under condition when measurements could not normally be made.

Clathrates are also interesting because they show good thermoelectric properties; they exhibit a cubic crystal lattice that conducts electricity well. They have glass like properties because "rattler" atoms disorder them. Rattlers are weakly bound atoms that are somewhat free to rattle about the interior of the cubic cage. Scientist feels that an appealing application for these materials would be in refrigeration or heating.

The green house effect - Global warming from the increase in green house gases has become a major scientific issue during the post

decades. Green house effect is due to some gases and particles in an atmosphere preferentially allowing sunlight to filter through to the surface of the planet, relative to the amount of radiant infrared energy that the atmosphere allows escaping back up to space. Greater the concentration of green house material, less infrared energy can escape. Therefore increasing the temperature of the planet surface. The temperature of earth will rise given a certain increase in green house gases such as CO2, also other like chloroforms carbons (CFCs), CH4, nitrogen oxides, troposphere ozone etc. some have complicated biogeochemical interactions. It has been also pointed towards possible interaction between CH4 and water vapor in the stratosphere, with night affect polar stratospheric clouds, which are believed to enhance photochemical destruction of O3 by chlorine atoms. The temperature increase depends on microbial decomposition of carbon stored in soils in the form of dead organic matter to CO2. The decomposition depends on temperature and so enhanced rates of microbial decomposition of necromass (dead organic matter) would enhance CO2 buildup. Considerable CH4 is trapped below frozen sediments as clathrates in the tundra region. These clathrates could release vast quantities of methane in to the atmosphere if substantial artic warming takes place. It has already been pointed out the CH4 is some 20 to 30 times more effective per molecule at absorbing infra red radiation than CO2. Methane concentrations in bubbles in ice cores in antartica show a close relation with the climate during the past many years. Methane is a green house gas, and discharge of large amounts of CH4 in atmosphere would cause global warming. The dissociation of gas hydrates during deglaciation has therefore been linked to the ending of ice ages.

Clathrates have received attention as a possible energy source - In last few years possibilities of methane hydrates as fossil fuel has been largely discussed, methane hydrates ice like crystals of methane are said to have energy potential equal to more then twice that of all fossil fuels combined. Since huge reservoirs of methane hydrates occur on the ocean floor and in permafrost regions, efforts are being made to try and find out how to use hydrates as energy how source by depressurization but the process may be technically difficult and expensive. At few places attempts for recovery of CH4 has been successful. A study reveals ice-like crystals of methane have the energy potential equal to twice that of all fossil fuels combined.

Clathrates may lead to plausible answers to, two main problems the world faces, Global warming and energy crisis.

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BIOTECHNOLOGY: A NEW APPROACH FOR HEALTHIER LIVING

Dr. Joydeep Dutta *

Biotechnology- defined as "any technique that uses living organisms or substances from those organisms, to make or modify product, to improve plants or animals and our environment". Thus, biotechnology encompasses two major categories tools and techniques.

Biotechnology help in the production of new and improved foods, industrial chemicals, pharmaceutical products, and livestock, disease resistant plant crops, diagnostics, cancer and AIDS therapy, gene therapy and vaccines. It has proved to be an excellent tool in maintaining a pollution free environment, cleaning up of toxic waste and also in protecting the endangered species of animals by cryopreservation. Thus biotechnology finds varied applications for human welfare.

Since the time of Charak, medical technology has reached a greater stature and in progression towards achieving an improved standard of living. New generation therapeutics is targeting towards both genetic and acquired diseases such as cystic fibrosis, hemophilia, familial hypercholesterolemia, heart diseases, cancer etc. Biotechnology played a vital role in achieving greater heights by engineered vaccines, antibodies, "designer" drugs, synthetic DNA, therapy at the genetic level and even the replacement therapy. Through intensive research, biotechnology has paved the way for the treatment of various complex diseases.

1. Gene therapy:

Gene therapy is a technique for correcting defective genes responsible for disease development. Biotechnology provided the way for correcting the faulty gene by replacing it with the normal gene in

*Assistant Professor, Department of Zoology, St. Aloysius College, Jabalpur.

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place. Gene therapy has an important role in the implications of acquired and genetic diseases, cancer and even AIDS. Gene therapy is performed at two levels, they are somatic and gametic gene therapy. Researchers may use one of several approaches for correcting faulty genes:

- A normal gene may be inserted into a nonspecific location within the genome to replace a nonfunctional gene.
- An abnormal gene could be swapped for a normal gene through homologous recombination. The abnormal gene could be repaired through selective reverse mutation, which returns the gene to its normal function.
- The regulation (the degree to which a gene is turned on or off) of a particular gene could be altered.

The first step in the gene therapy is the delivery of the normal gene in the body. Researches have found in various ways in the delivery method, they are

I. Viral delivery- In this the harmful genes of the virus are replaced by the therapeutic genes.

II. Non-viral delivery- like microinjection, liposome complex, molecular conjugates, naked DNA etc.

In the year 1990 Drs. W. French Anderson, Michael Blaese and Kenneth Culver performed the first gene therapy. In this study, a girl child Ashanti DeSilva who was suffering from Severe Combined Immunodeficiency disease was treated with the copy of normal gene. The treatment showed a remarkable response with 50% of the T lymphocytes with the new gene.

To date gene therapies are being designed for many of the diseases they are: diseases associated with liver, lung, circulatory system, cancer etc. Cystic fibrosis (CF) affects the airways and other organs such as pancreas and intestines. Patients suffering from Cystic fibrosis have increase production of mucus, bacterial infection in the lungs, altered epithelial cell functioning of the intestine because of mutation of the gene {CFTR (Cystic fibrosis transmembrane conductance regulator)} on chromosome 7. Gene therapy has been the successful technique in the treatment of Cystic fibrosis. Experiment with man with



disrupted CFTR gene showed that the normal CFTR gene can be transferred by liposomes into lung epithelia, alveoli, and trachea. Gene therapy has promised for the management of defective immune system i.e. cell mediated and antibody mediated immunity, blood cancer, and in blood related disorders.

Therapies in the treatment of cancer has been explored and found that Herpes Simplex Virus (HSV) is a vital vector in the treatment of brain cancer. HSV helps in transferring thymidine kinase to the tumor cells of the brain, which then transformed brain cells to become sensitive to antiviral drug.

Other potential therapies involve genetic manipulation of the immune system in the treatment of cancer, tumor cell transduction inhibition of oncogenes, and the introduction of tumor suppressor genes.



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Gene therapies also are being developed for the treatment of AIDS.

2. Vaccine technology:

Vaccines are essential to the ongoing struggle to eradicate infectious diseases. Recombinant DNA technology has made a great contribution towards the development of new generation of vaccines. New skills are developed in the delivery method of the vaccines they are vaccine vectors, Nucleic acid vaccines, and Immunoenhancing technology.

Elevating the immune response in the body by live or attenuated derivative of the disease-causing organism is an old technique of immunization. However, through the use of biotechnology the pathogenic genes can be given orally with the help of non-pathogenic organism or vectors, thus, can invoke an immune response. Salmonella sp., adenovirus, herpes virus, poliovirus etc are used as a vector for vaccines.

Nucleic acids are now being tested for the delivery system of vaccines. Plasmids are used as vectors for the delivery of specific sequence of DNA for elevating cell-mediated and humoral immunity in the body.

3. Antisense Technology:

Antisense therapy is an important treatment for diseases in which either there is a loss of control over gene regulation or a gene is over expressed. In Antisense technique, antisense DNA encodes antisense mRNA, which then blocks the mRNA encoded by viruses or by cancer cells. Thus Antisense drugs would decrease the expression of a particular gene by inhibiting the translation. This technique is useful in the treatment of viral disease like AIDS and cancer as well.

4. Development of Synthetic drugs:

Biotechnology paved the way for the development of synthetic drugs, which would be beneficial in the treatment of diabetes, arthritis, AIDS etc. Companies like Genetech, Inc, San Francisco are engaged in the discovery of synthetic drug that could replace recombinant human growth hormone currently used to treat dwarfism. Synthetic drugs as antagonists are also helpful in preventing the entry of virus in the body.

5. Engineering of Tissues and antibodies:

Tissue or organ damage often leads to death. Tissue engineering provides a viable alternative to the problem; it combines the principle of biology and engineering to aid in the formation of new tissue or in the implantation of functional cells. Isolated cells, engineered before transplantation if necessary, can replace non-functional cells. A variety of tissues derived from ectoderm, mesoderm, and endoderm are being engineered and are providing the base for the replacements for nervous system, skin, cornea, liver, pancreas, bones, cartilage, muscles and even blood vessels.

Antibody molecule binds to a specific antigen and helps in fighting diseases. Antibody engineering has become as exciting area in which antibodies are directed towards a specific region inside the cells. Thus, antibodies can block viral replication or the action of proteins that can adversely affects the health, such as oncoprotein activity, which results in uncontrolled growth of cells.

6. Discovery of drug delivery system:

An effective drug is useful only if a reliable method of delivery of drug is available. Biotechnology provided the way for an efficient method in the delivery of the drugs. Experiments have shown that nasal spray and transdermal system are the unique way of drug delivery. For the treatment of osteoporosis, nasal spray provides to be a good example of drug delivery. Painkillers, medication for motion sickness, nitroglycerin for angina etc are delivered via transdermal system.

7. Stem cell technology:

Research in human development has resulted in the discovery of human stem cells. The "stem cells" is a term to describe a precursor cell that can give rise to multiple tissue types. Stem cells have the capacity to undergo an asymmetric division such as that one of the two "daughter" cells retains the properties of stem cells while the other begin to "differentiate" into a more specialized cell type. Thus stem cells are central to human growth and development, and are also a potential source of new cells for the regeneration of diseased or damaged tissues such as Alzheimer's disease, cardiac failure, diabetes and Parkinson's disease.

The above are the only some of the areas, where biotechnology will play a significant role for human welfare. There seem to be immense possibilities, and it may be neither possible nor desirable to consider all of them here. But the traditional methodologies will continue to be used and will remain important. There will also be many failures in the area of biotechnology and some of the expectations may not be realized. It will, therefore, be desirable and necessary to utilize the



approaches of biotechnology blended with other traditional approaches for the welfare of mankind. Nevertheless, the curious human mind, biotechnology will, in future continue to provide the opportunities and challenges in the area of applied and basic research, unforeseen in the past.

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Ceramic Materials

Pradeep Kumar Dubey*

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1.1 INTRODUCTION :-

Ceramic materials are defined as those containing phases that are "compounds of metallic and nonmetallic elements." In short, ceramics are inorganic, non-metallic materials. A wide range of ceramic materials are found to occur and used as very useful engineering materials. In recent years ceramic materials have been used as lubricants (molybdenum disulphide) and fuels (uranium oxide for nuclear reactors and boron hydride for solid propellan rockets.) Most of ceramic materials are silicates, aluminates, oxides, carbides, nitrides or hydrides. The following are major groups :

1.	Abrasives.	7.	Bricks and tiles
2.	Whitewares.	8.	Cements and concretes.
3.	Chemical Stonewares.	9.	Mineral ores.
4.	Porcelain enamel	10.	Refractories.
5.	Electrical porcelain.	11.	Slags and flexes.
6.	Glass.	12.	Insulators.

Ceramic materials stability at relatively high temperatures many of them retain strength to much higher temperatures than metals. Generally excellent high temperature strength, many of the ceramics are susceptible to thermal shock. Porous ceramics (for thermal insulation) are resistant to thermal shock.

*Assistant Professor, Department of Physics, St. Aloysius College, Jabalpur

1.2 Classification of Ceramics:-Table (1) Functional Classification of Ceramics:-

SN	Group	Examples				
1.	Abrasives	Alumina, Carborundum.				
2.	Pure oxide ceramics	MgO, Al203, Si02.				
3.	Fired-Clay Products.	Bricks, tiles, Porcelain.				
4.	Inorganic glasses	Window glass, lead glass				
5.	Cementing materials	Portland cement, lime.				
6.	Rocks	Granites, sandstone.				
7.	Minerals	Quartz, Calcite.				
8.	Refractories	Silica, bricks, magnesite.				

Table (2): Structural Classification of ceramics:-

SN	Group	Examples
1.	Crystalline ceramics	Single - phase like MgO or multiphase from the MgO to Al2O3 binary system.
2.	Non-crystalline ceramics	Natural and synthetic inorganic glasses (e.g. window glass).
3.	"Glass-bonded" ceramics	Fired clay products - Crystalline phases are held in glass matrix.
4.	Cements.	Crystalline or Crystalline and non crystalline phases.
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1.3 Structure of Ceramics :-

Most ceramics phases, like metals, have crystal structures. Ceramics crystals are formed by either a pure ionic bond (as in sodium chloride), a pure covalent bond (as in silicon carbide), or by bonds possess the

ionic as well as covalent characteristics (as in SiO2 and MgO).

Ionic bonds give ceramic materials relatively high stability. They have a much higher melting point, on the average, than do metals or organic materials. Generally they are also harder and more resistant to chemical reaction. Covalent crystals also possess high hardness, high melting point and low electrical conductivity at room temperature.

The crystal structures of ceramics are invariably more complex as compared to those of metals since atoms of different sizes and electronic configurations are assembled together. Ceramics are classified in terms of their internal structures, common crystal structures found in crystalline.

Cesium chloride structure :-

In this structure, cesium chloride is prototype, chloriden ions are arranged in a simple cubic structure and all interstices are occupied by the cesium ions. The size ratio of its ions is 1.65/1.81 or approximately 0.9, which favours the coordination number of eight.



Fig: (I) Crystal structure of Cesium Chloride

Wurzite Structure :

Other cubic ceramic compounds, which have atomic coordination in the ratio of 4:4 include Wurzite (a second ZnS polymorph). Zincite (ZnO) and Beryllium oxide (BeO) in which each type of atoms forms an hcp structure, half of the tetrahedral interstices being filled by the smaller cations so that maximum action separation occurs.



Fig : (II) Crystal structure of Wurzite.

1.4 Mechanical Properties of Cermaic Phases :-

The mechanical behavior of ceramic phases is determined in a number of ways depending upon force is applied: -

Compressive Strength :-

Compressive strength in ceramics are many times greater than tensile strength. The ceramics like brick, cement and glass are always used in compression and not in tension. "Tempered glass" is used for glass doors, rear windows of cars and similar high-strength applications for their high compressive strength.

Shear Strength :-

High shear strengths and low fracture strengths are characteristics of ceramics with exception of a few materials such as clay.

Tensile Strength :-

Tensile strength in ceramics is theoretically high, but in practice are quite low. Glass fibers, possess tensile strength of very high magnitudes, often in excess of 700 MN / m2.

Transverse Strength or modulus of rupture :-

Transverse strength is difficult to ascertain in ceramic materials. Ceramics are not used in places where transverse strength of materials is an important criterion.

Torsional Strength :-

Torsional strength is critical property of ceramics since tensile and cantilever will show the torsional strength of the material.

Impact values :-

The impact values range from 0.72 to 1.22 Nm for vitriffied ware, 1.12 to 1.33 Nm for dense stoneware and 1.6 to 2.3 Nm for stealite and high-titania.

Modules of elasticity :-

Ceramics have high modules of elasticity, ranging from $7X10\ 10$ to 42 X10 10 N/m2 which indicates strength of the bond.

1.5 Electrical properties of ceramic phases :-

Electrical properties depends on the composition, texture, size and density of the material and also temperature and time, ceramic materials are used as insulators, conductors, semi-conductors and dielectrics, ceramics are used as ferroelectric and piezo-electric materials.

Ceramic insulators :-

Ceramic materials are used in an electric circuit both as electrical insulators and as its functional parts when they are used as insulators, ceramics are electrically inert to isolate two conductors of different potentials. Insulators are designed with lengthened surface paths to decrease the surface shorting. The insulators are glazed for making non-absorbent because the presence of internal pores and cracks provide additional surface failure. Porcelains are commonly used as electrical insulators and resisters.

Dielectric Ceramics :-

A dielectric is another name for insulators because a material separating two charged bodies is known as 'dielectric.' For a substance to be good dielectric, it must be an insulator. The dielectric characteristics retained by different materials are dielectric constants, dielectric strength, insulation resistance and dielectric losses.

Ceramic Conductors :-

In ceramic materials there is no movement of free ions and electrons or electronically unbalanced ions. Hence they are practically nonconductors at lower Temperature and particularly in clod conditions. Mobility increases with number of defects in the atomic structure. Ordinary glass and silicates are insulators but in the molten state they are very good conductors.

Ceramic Semiconductors :-

Materials which display properties of conductors at high temperatures and of insulators at low temperatures are called "semiconductors." Both silicon (Si) and germanium (Ge) are common semi-conductor materials. The conduction which occurs is known as 'intrinsic' when the material is ultrapure, this is called 'extrinsic' when certain impurities are introduced in the material.

Ferroelectrics Ceramic :-

The ceramic materials having no identical centers of positive and negative charges are known as "ferroelectrics" ceramics. This type of material e.g. quartz, either elongates or contracts in an electric field since dipole lengths are changed with voltage gradients. The changing electrical energy into mechanical energy as the crystal vibrates in proportion to voltage differential with frequency of an alternating current. This mechanical electrical devices called "transducers", are used to produce sound waves and for tuning electrical circuit. The most commonly used ferroelectrics ceramic BaTiO3 at room temperature below 120°C.

Piezoelectric ceramics :-

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Conversion of mechanical to electrical energy is called "piezoelectric effect." A quartz crystal under pressure is called pressure electric. This effect is found in ceramics like BaTiO3, SiO2, a PbzrO3.

Magnetic Ceramics :-

Ceramic compounds which contain iron, cobalt, nickel can be magnetic if structures are such that aforesaid ions can have their magnetic moments spontaneously aligned. The spinal structure is magnetic and is therefore widely used.

1.6 Thermal properties of Ceramic phases :-

The thermal properties of ceramics are quite different from metals because they contain few free electrons and ceramic phases which are transparent to radiant type energy. The most important thermal properties of ceramic materials are:-

Thermal Capacity :-

The specific heat of fire clay bricks is 0.25 at 1000° C and 0.297 at 1400° C. Carbon bricks have specific heat of about 0.812 at 200° C and 0.412 at 1000° C.

Thermal conductivity :-

Heat is conducted by phonon conductivity and the interaction of lattice vibration, while at high temperatures conduction takes place by transfer of radiant energy. Thermal conductivity decreases with impurity content, porosity and temperature.

Thermal Shock :-

Thermal shock resistance is the ability of a material to resist cracking or disintegration of material under sudden changes in temperature. Thermal shock is because of thermal expansion or contraction. Thermal expansion or contraction is a function of the internal structure or inter-atomic bonding, common ceramic materials graded in order of decreasing thermal shock resistance are: hot pressed silicon nitride, fused silica, cordierite zircon, silicon carbide, beryllia, alumina, porcelain and steatite.

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1.7 Applications of Ceramics :-

The older ceramics refer to "white wares" and are largely used as tile, sanitary ware, low and high voltage insulators and high frequency applications. White ware is used extensively in chemical industry as crucibles, jars and components of chemical reactors. The properties of newer ceramics include borides, carbides, nitrides, single oxides, mixed oxides, silicates, metalloid and inter metallic compounds have high hardness values, heat and oxidation values. They are largely used in diverse applications as refractories for industrial furnaces to fuels for nuclear reactors.

In electrical and electronic industries, ceramics find wide applications. In modern times, ceramics are used in nuclear applications as fuel elements, fuel containers, moderators, control rods and structural parts. Ceramics such as UO2, UC, and UC2 are used for these purposes.

Optical applications of ceramics are not unknown, Ceramics are useful as a pigment. It is completely oxidised and not subject to chemical attack and variation. "Yttralox" is a new ceramic material useful in optical applications because it is as transparent as window glass and can resist very high temperature. Generally ceramics are opaque because of presence of tiny pores that scatter light. Yttralox is completely free from pores.

Cutting tools ceramic materials also have uses. Ceramic metal cutting tools are made from glass free Al2O3. The tool inserts are fabricated by hot pressing a powdered composition of 98% to 99% Al2O3 at 1200°C, these inserts have excellent hot hardness and wear resistance.

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NATIONAL SPORTS POLICY - AN APPRAISAL

Dr. Varghese C. Antony*

The aim of sports is development of human personality. The importance of participation in sports and physical education activities for good health, a high degree of physical fitness, increase in individual productivity and also its value as a means of beneficial recreation, promoting social harmony and discipline, is recognized in national sports policy adopted by the Government in 1984. The National Policy on Education, 1986 has clearly stated that sports and physical education are integral part of the learning process and will be included in the curriculum. The statements made in the 1986 National Education Policy were in line with the National sports policy, 1984.

It was felt that many objectives contained in the old National Sports and Educational Policies have remained substantially unrealized. Therefore, in order to tackle the emerging trends in sports the National 'Sports Policy has been formulated.

The National Sports Policy - 2001 focuses on enhanced participation of women tribal and rural youth in sports activities and encouragement of traditional games like archery, kabaddi and kho-kho. It seeks "broad basing" of sports and "achieving excellence at the national and international levels" by integrating sports and physical education more effectively and efficiently with educational curriculum.

BROAD BASING OF SPORTS

Broad basing of sports will primarily remain a responsibility of the State Governments, the Union Government will actively implement their efforts in this direction for talent search, including in the rural and tribal areas. Efforts will also be made to promote and encourage women's participation in sports. In this context, the Village Panchayats/Gaon Sabhas as well as rural youth and sports clubs will be mobilized to facilitate development of the requisite infrastructure and for the identification of talent through an appropriate competition

*Sports Officer, St. Aloysius' College, Jabalpur
structure in the rural areas as also in the disadvantaged and remote parts of the country which appear to merit special consideration under various schemes including for the North East. Efforts will also be made for tapping such potential as swimming in coastal areas and Archery in tribal areas. The available talent will be nourished and actively supported. Geographically disadvantaged regions will be extended additional support for the promotion of Sports. There has been a strong tradition of Indigenous and traditional games in practically all parts of the country through ages. Indigenous games will be promoted through schemes related to rural sports.

INTEGRATION WITH EDUCATION

The integration of sports and physical education with the educational curriculum, making it a compulsory subject of learning up to the Secondary school level and incorporating the same in the evaluation system of the student, will be actively pursued. A National Fitness Programme would be introduced in all schools in the country, steps initiated to augment the availability of infrastructure, including play fields/ sports equipment and action taken to provide Physical Education Teachers in educational institutions through, inter-alia, the training of selected teachers in these disciplines. Specialized sports schools may also be set up. An appropriate Inter-school and Inter-college/University competition structure would be introduced at the national, state and district levels.

INFRASTRUCTURE DEVELOPMENT

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The sports policy also has put great thrust for infrastructural development, for which steps would be taken to evolve low cost functional and environment friendly design so that maximum benefits could be derived through relatively low levels of investment, besides making optimum use of the existing infrastructure.

Rural, traditional and indigenous sports would be accorded special attention and it would be the responsibility of the Panchayat Institutions with the help of local youth organizations to develop and maintain infrastructure for this purpose. The Union and state governments as well as the National Sports Federations/Associations will endeavour to promote "Club Culture" for the speedier development of sports in the country. High priority will also be accorded to the development of sports in the rural areas to harness the available talent and potential.

NATIONAL SPORTS FEDERATIONS

The sports policy also recognized the autonomous status of the IOA and the National Sports Federations, and has laid emphasis on the need by the Government and other agencies concerned to "work together" harmoniously and in a coordinated manner to fulfill the objectives. Each National Federations would draw up the annual national calendar of these events sufficiently in advance. Greater emphasis will be placed on promoting the development of sports amongst the juniors and sub-juniors.

Effective participation in International events, especially the Olympics, Asian and Commonwealth Games, is a matter of National prestige. For this Long Term Development Plans (LTDPs) will be prepared for each sports discipline, incorporating details of standard of performance, targeted levels of performance, participation in competitions at national and international levels, sports exchanges, scientific support and the holding of international competitions in the country. The implementation of the LTDPs will be reviewed periodically and the release of Government assistance would be considered on the basis of performance.

SCIENTIFIC BACK-UP TO SPORTS PERSONS

The scientific approach to sports stands well established for higher performance. Suitable mechanisms would be introduced to achieve co-ordination between the laboratory and the field, that is, between the Coaches and the Sports Scientists, and particular care taken to ensure nutritional support to talented sports persons and to sustain their mental health and competitive spirit. Sports Authority of India (SAI) has accordingly, developed sports science centers at Patiala, Bangalore, Kolkata, Delhi, and Gandhinagar. These centres provide the scientific back-up and support needed for the national athletes for achieving excellence in sports.

INCENTIVES TO SPORTS PERSONS

Incentives provide recognition and financial security to distinguished sports persons, during and after their sporting careers, and also motivate the youth in the serious pursuit of sports activities. Adequate assistance will be extended for Insurance Cover and Medical Treatment in the event of such eventuality/requirement. Job reservation for sportspersons as per the prescribed categories will continue. Social Recognition, the Conferment of Awards and Honours at the National, State, and District levels, incentives in the form of Cash Awards and Avenues of Employment will be important elements of the National Sports Policy, 2001. Alongside sports persons, suitable incentives will be provided to Coaches, Judges and Referees for developing skills and enriching their experience.

TRAINING AND DEVELOPMENT OF COACHES / SPORTS SCIENTISTS / REFEERES

The Policy recognizes that the standards of coaching and scientific back up in the country and those pertaining to umpires, and referees needs to be upgraded. Concerted steps will be taken to train Coaches, Sports Scientists, Referees and Umpires, in line with international standards. So the promising persons are to be sent for Training Courses, Conferences, Seminars, Workshops and Tournaments abroad, so that they remain abreast of relevant developments in their fields.

SPORTS EQUIPMENT

The latest and better quality proper sports equipments are very important aspect of the development of the game or sports. Sports Federations/Associations and other recognized Organization involved in Sports Promotion, as also eminent Sports persons, may be extended exemption of Customs Duty. The matter relating to exemption from sales tax for sports goods and of free movement of raw materials and finished sports goods in the country would be pursued with the State Governments.

SPORTS TOURISM

The Policy recognizes the inter-dependence and inter-relationship between the Sports and Tourism sectors, the integrated development of which is capable of generating very substantial revenues and ensuring a high volume of tourist traffic from within the country and from overseas, while simultaneously promoting a sports and fitness culture in the country. Adventure Sports, in particular, have great potential for the promotion of tourism.

RESOURCE MOBILIZATION FOR SPORTS

The financial resources have been a major constraint in sport promotion in India. So the involvement of corporate sectors in sports promotion is also a part of new National Sports Policy. A National Sports Development Fund has been created with initial contribution of the Union government. All contributions to this fund have been extended to 100% exemption from income tax.

MASS MEDIA

The role of Mass Media is central to the popularization of Sports amongst the people at large. The Electronic Media, including the National Broadcasters, the Private Channels and the Print Media would be suitable for strengthening a Sports Culture in the country.

GLOBALISATION

As a resurgent India confidently enters the New Millennium, Sports (and related activities) will be increasingly utilized as a medium for promoting cooperation and friendship in the region, as also globally. Sports Exchange Programmes will be pursued with all friendly Nations, with emphasis, on the one hand, on Advance Training for Sports persons and Coaches, Scientific Support, the latest Research Aids and Development of Infrastructure, and earning laurels for the country, in Sports and Games, on the other.

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The National Sports Policy 2001, which has been approved by the Union Cabinet, puts the Central Government, in conjunction with the State Governments, the Olympic Association (IOA), the National Sports Federations to "concertedly pursue the twin objectives of broad basing sports, and achieving excellence in sports" While the broad basing of sports will primarily, remain a responsibility of the State Governments, the Union Government will actively implement their efforts in this direction and for tapping the latent talent, including the rural and tribal areas. Sports and games should be promoted as a mass movement by making it a way of life. The Union Government and Sports Authority of India (SAI), in association with IOA and National Sports Federations, will focus specific attention on the objective of achieving excellence. Efforts will also be made to promote and encourage women's participation in sports.

The Union and State Governments, as well as the National Sports Federations/ Association should promote sports as a profession like any other profession. 'Club Culture' may be introduced for the fast development of sports and games in the country. The sports policy has also put great thrust for infrastructure development, for which steps would be taken to evolve low cost functional and environmentfriendly designs so that maximum benefits could be derived through relatively low levels of investment, besides making optimum use of the existing infrastructure.

The sports scenario here in India is only focused on Cricket, and every State wants to prepare only Cricket pitches and stadiums of International standards with flood light facilities, Why? In comparison to Cricket stadiums how many Hockey stadiums do we have? A small country like Holland has more than 350 astro turf / poly grass stadiums for Hockey and we all know that they are good in Football, Volleyball, and Swimming. Cricket has really made the Nation lazy. Due to media projection, money, and fame, all the children are attracted to this game. So the indigenous games in the country are slowly dying out. In our country only cricket players are getting good financial support. This system should change and the National players of all sports and games should get the same treatment. It is the duty and responsibility of the Governments and the Federations to mobilize the sponsors for each and every game. The media plays a vital role in the promotion of sports and games in the country and they should seriously take some measures in this http://yas.nic.in/yasroot/policies/sports_policy.htm.noitos

Sports related scientific research and development in India has not been able to keep pace with International standards in the fields of injury management, training methodology, physiology, psychology, kinesiology and biomechanics etc. To excel in sports at the International level, more attention should be given to research and development in sports sciences. Whenever Indian players are injured they go to Australia or USA for treatment. For training our Federations invite foreign coaches, trainers, physiotherapists from other countries. Coach and husband of Olympic medal hope Athens 2004, Mrs. Anju Bobby George, has no belief in Indian coaches and he trains her in USA.

There is a need to generate sports consciousness in the States and this need not be through the British initiated games such as Cricket, Golf, or Tennis but rather, it could be through the indigenous games and sports reflecting local talents, interest etc. The National Institute of Sports (NIS) is producing more than 300 coaches every year. They should really know the number of vacancies and select the candidates according to that. Here there are no new vacancies and 300 coaches are without job every year and this number continues to increase.

The National Sports Policy should be reviewed periodically to evaluate the progress in its implementation. We hope and pray that this new National Sports Policy will promote Sports and Games and a culture of physical activity in the people, which is a good sign for Healthy India. May this Sports Policy make our Prime Minister's vision of "a fit and strong India" come true!

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