ISSN-0972-2548
Vol. 14 No. 2 July 2008

FITT FORUM

Newsletter of Foundation for Innovation and Technology Transfer, Indian Institute of Technology, Delhi

Professional Development

Technology transfer is much more than mere economic transaction of a product or process. From a holistic viewpoint it is the process of sharing of skills, knowledge, technologies, manufacturing methods, samples and facilities among industries, academia and other organizations to ensure wider dissemination of scientific and technological developments.

A key component of the technology transfer process thus involves capacity building initiatives including trainings. One of the core functions of FITT has been to undertake various technology centric training programs – very often customized to enable professional development in key technology domains for industry and other user organizations. The experience so far has been the realization about existence of skill shortages and knowledge gaps across industry segments. Several of our short and medium duration professional development programs address several such issues and there is demand for more such outreach programs. Further to our standard HRD training menu, has been the introduction of Professional Candidate Registration program at IIT Delhi designed to foster targeted information dissemination initially amongst the industrial units and other scientific and technical organizations in the National Capital Region. The program proffers relevant but, regular Masters' course modules in the Institute to appropriately qualified personnel from industry and scientific organizations. This is part of our commitment to reach out to the business and other groups and thus strengthen Institute – Industry interaction. We believe that the industry community should latch on to this opportunity to enable knowledge up-gradation and skill-set enhancement of their key professionals and thereby leverage on this refreshed resource. From our perspective this seems a reasonably scalable model that would also help us address the broad issue of skill-gaps which seem to haunt the competitiveness of many a business unit!

Anil Wali

FITT invites Proposals from Industries for Collaborative R&D and Customized Training Programmes

For information please contact
Managing Director
e-mail: mdfitt@gmail.com

FITT invites corporate memberships from Industries and R&D Organizations

Contact:
Mr. Partha Bhattacharya
e-mail: parthab@fitt.iitd.ernet.in

Design Degree Show 2008

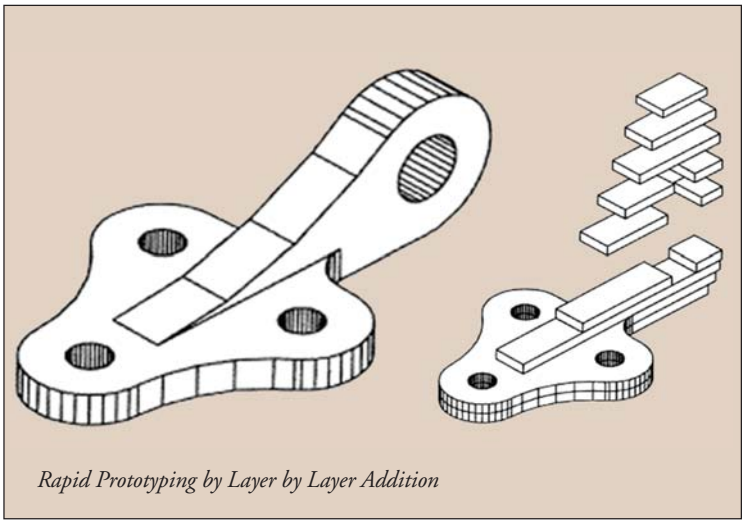
The design degree show is an annual event that is put up by the M. Des students of Industrial Design Programme. This year the Design Degree Show opened on the evening of 9th June 2008 at the Industrial Design Studio, IIT Delhi. The show closed on 13th June 2008.

Contents

Product Innovation through Rapid Prototyping

The term rapid prototyping (RP) refers to a class of technologies that can automatically construct physical models from Computer Aided Design (CAD) data. Rapid prototyping machines are like three dimensional printers which allow engineers and industrial designers to quickly create physical artifact of their designs, rather than just two dimensional pictures. It is often said that *'A picture is worth thousand words'*. By virtue of RP technology now one can say that *'A physical prototype is worth thousand pictures'*.

Rapid prototyping also known as *layered manufacturing* or *solid free-form fabrication* is an additive process which builds product layer by layer, as shown in the figure below. The very nature of the process does not put any limitation on complexity of object which can be realized. This aspect gives geometric freedom for designers to work with varieties of shapes without any manufacturability constraints. RP processes have been successful in producing some parts which are otherwise not possible to manufacture by any other known manufacturing processes.



Rapid Prototyping by Layer by Layer Addition

Based on the above principle, more than 50 technologies have been introduced in last two decades of which about half a dozen technologies are commercially successful.

It is often said that *'A picture is worth thousand words'*. By virtue of RP technology now one can say that *'A physical prototype is worth thousand pictures'*.

- One of the first successful RP processes to be introduced in 80's was *Stereolithography* in which a prototype is built by curing selected areas of photo-curable liquid using a laser.
- *Fused Deposition Modeling* is another process in which molten plastic is extruded through a heated nozzle to deposit material, layer by layer.
- *Selective Laser Sintering* technology is based on thermal sintering by laser scanning selected areas of thin layer of powder.
- In yet another process known as *3D Printing,* powder particles are brought together by injecting a binder through multiple nozzles analogous to an inkjet printer.

Initial attempts to build RP prototypes were restricted to polymeric materials only which included ABS, nylon, polycarbonate etc. Through rigorous R&D efforts, the RP technology has now been extended to numerous other materials which include reinforced polymers, metallic materials both ferrous & non-ferrous materials, sand, ceramics, elastomers and many more. Some of the materials used in rapid prototyping are biocompatible and the parts made of these materials can be directly used as implants and scaffolds.

RP models have numerous uses. They make excellent visual aids for communicating ideas with co-workers or customers. In designing consumer products, RP prototypes are widely used for demonstration of new concepts by both industrial designers as well as design engineers. In today's competitive world where new products and their variants are introduced frequently, RP technology has facilitated to carry out *form, function and fit* studies quickly, thus helping in cutting down product development time considerably. Industries involved in making toys, jewellery, handicrafts and footwear have benefitted immensely by RP technology in coming up with new and innovative designs.

One of the major application areas of RP technology is in functional testing of new designs. RP Processes like "Selective Laser Sintering" (SLS) can manufacture parts which have mechanical properties close to that of injection molded parts. This facilitates complex products to be fabricated, assembled and tested for desired functionality. Wind tunnel studies using RP parts to measure lift and drag forces is very common. Mechanism synthesis and mobility studies are commonly done using RP parts in building new machines. Some RP processes can produce parts which are transparent, thus facilitating experimental stress analysis using photo-elasticity and visual studies concerning fluid flows.

RP parts are used for producing indirect and direct tooling for further manufacturing of parts in mass. RP prototypes have been used as patterns for sand casting, vacuum casting and investment casting. Metallic molds made of tool steel and other materials have been

built directly using RP technology. Such metallic molds are ideal for low volume production of plastic parts economically as compared to expensive molds used for mass production.

Apart from functional prototypes, and tooling needs, RP technology is now widely used to directly produce useable products or parts. When RP technology is used for producing parts for mass customization, it is often referred as *rapid manufacturing*. Rapid manufacturing of parts of Formula 1 racing cars by RP is well known. Producing porous RP parts for gas and liquid filtering is gaining attention. Industries worldwide which include Aerospace, marine, defense, automobile, medical, sports, consumer products, electronics have been benefitted by rapid manufacturing of directly useable parts and products.

One of the largest application areas of RP in recent times has been in biology, medicine, pharmacy and dentistry. Most of the RP machines can build prototypes using CT scan and MRI data as input. Prototypes, thus built are extremely useful for pre surgery planning and post surgery verification in case of complex surgeries. RP techniques have proven useful in making prostheses and implants for many years for now. RP route to manufacture custom hip sockets, knee joints and spinal implants has been kind of breakthrough in medical field. The medical community is also benefitted by RP made teaching aids used for communication during teaching learning process. The importance of RP in medicine is reflected by the fact that there is no portion of the human anatomy which has either been influenced by RP or being studied as a future application area.

Many commercial RP technologies are used for making porous structures required in tissue engineering. Realizing complex geometric scaffolds for repairing defects caused by accidents, surgery and birth is one potential future application area of RP. In order to build parts and products of interest in medicine, new RP compatible materials have been developed and introduced which include Polycaprolactone (PCL), polypropylene-tricalcium phosphate (PP-TCP), PCL-hydroxyapatite (HA), polyetheretherketone-hydroxyapatite (PEEK-HA), tetracalcium phosphate (TTCP), beta – tricalcium phosphate (TCP), Polymethyl methacrylate (PMMA).

Many believe that major breakthroughs using RP are yet to come. It is not completely wrong if some say that RP has potential to bring second industrial revolution.

One of the important application areas of RP includes building surgical guides, such as splints to align a patient's jaws during an operation. Customized dental crowns, bridges and other type of restorations are now built using RP driven investment casting process. Selective Laser Sintering process has been successfully used to build bridges, with up to six teeth in cobalt-chrome alloy. Success of RP in producing customized hearing aids is very well known. An interesting application of RP in pharmaceuticals industry is in making pills which can release controlled dosage of drug with time.

It is needless to say that Rapid Prototyping Technology has influenced every sphere of human endeavour. Many believe that major breakthroughs using RP are yet to come. It is not completely wrong if some say that RP has the potential to bring in the second industrial revolution.

Prof. P.V. M. Rao
Deptt of Mech. Engineering
IIT Delhi

Product Design & Innovation at IIT Delhi through Rapid Prototyping

Product	Faculty Contact & Lead Department	Role of RP	Remarks
Limited torque bolt mechanism	Prof.Sudipto Mukherjee Mechanical Engineering Department	Product visualization and demonstration using RP	The technology has been patented and has been transferred to industry.
Smart cane for visually handicapped	Prof. M Balakrishnan Department of Computer Science & Engineering	RP is used for Product demonstration, & feedback, Functional testing, form and fit iterations, Ergonomic studies.	The technology has been patented and has been transferred to industry.
Improved and energy efficient fan blades	Prof. S R Kale Mechanical Engineering Department	RP Models for aerodynamic experiments	New blade geometries fabricated using RP were proven to be energy efficient (M. Tech. Project)

Product	Faculty Contact & Lead Department	Role of RP	Remarks
Mouth retractor for Tonsillectomy surgery	Prof. L K Das IDDC	RP Model for concept demonstration	Product was built as a part of M. Des. student project.
A novel and improved steering system for automobiles	Dr. P V Madhusudhan Rao Mechanical Engineering Department	Product synthesis studies using RP, Product demonstration, & feedback, Functional testing using RP models.	An Indian patent and PCT has been filed.
Bus identification system for visually handicapped	Dr. Kolin Paul Department of Computer Science & Engineering	Design iterations through RP for form fit and function	The technology has been patented and discussions are on for technology transfer.
Vehicular toys based on animals	Prof. L K Das IDDC	RP for realizing complex geometry and concept demonstration.	Product was built as a part of M. Des. student project.
Acoustic vector sensor	Dr. Arun Kumar, Center for Applied Research in Electronics	RP was used to build some critical components in the product.	The product is presently in use for teaching & research.
Low pressure block manifolds without construction plug	Dr. P V Madhusudhan Rao Mechanical Engineering Department	Use of RP process for efficient design of block manifolds	A patent and PCT has been approved for filing
Bicycle vending system lock	Prof. M Balakrishnan Department of Computer Science & Engineering	Functionality testing and product configuration iterations using RP	This student project was demonstrated at PAN IIT meet in 2007.
Force sensor using functionally graded material	Dr. P M Pandey Mechanical Engineering Department	RP is used for producing functionally graded material	A patent has been approved for filing
Elegant bath fittings	Prof. L K Das IDDC	RP Model for concept demonstration and realizing complex geometries	Product was built as a part of M. Des. student project.
Artifacts for teaching engineering design	Dr. A Darpe Mechanical Engineering Department	Preparation of visual aids by RP for teaching engineering design concepts	Used for teaching engineering design MEN 110 course by faculty.
Passenger bus aerodynamics with open windows	Dr. S V Veeravalli Applied Mechanics Department	RP Models for wind tunnel testing	Wind tunnel tests on RP parts were performed at National Wind Tunnel Test Facility, Kanpur.
Sheep shearing machine	Prof. S K Saha Mechanical Engineering Department	Mechanism synthesis studies using RP models	Development of sheep shearing machine is a sponsored research project at IIT Delhi
An alternate appliance for cleaning cloths	Prof. L K Das IDDC	RP for realizing parts with geometric complexity.	Product was built as a part of M. Des. student project.
Electro-mechanical playing-card shuffler	Dr. P V Madhusudhan Rao Mechanical Engineering Department	RP models for concept demonstration	Product was built as a part of MEP 202 (Design, Innovation & Manufacturing Course)

Research on Impact Biomechanics at IIT Delhi

Crash modeling has been used very effectively in OECD countries to redesign cars to protect the occupant even in 60 kmph crashes. Our focus has been on Vulnerable Road Users (VRU) outside the car, as they constitute a majority of crash victims in India; airbag studies with special focus on its use for two wheelers. This group has been one of the pioneers in studying crashes between motorcycles and cars in line with the ISO 13232 standards and airbag studies with special focus on its use for two wheelers through FE simulation. We have also been analyzing the crash behaviour when pedestrian and bicyclists impact cars and bigger commercial vehicles like buses. Through this, vehicle fronts that are kinder to VRUs are emerging. Through the development of multibody dynamics codes, we have been studying crash initiation problems like rollovers. These models are used as input to FE models to study the injury during crash and design changes required to protect the occupants. The ability to work with the complete cycle, site data recording, crash reconstruction, multibody dynamics, experimental characterizing of impact and dynamic FE has enabled this group to study crash issues India specific devices like the autorikshaw and Mini-Buses.

Biomechanics in the 60's was concerned with mechanics associated with rehabilation and sports. Computation and hence prediction and subsequently design to mitigate impacts evolved in the 70's. Multibody dynamic models were developed that predicted the global kinematics in impact situations. The representation of geometry of the body improved significantly with advances in medical images (MRI, CT Scans, X-rays and Body Cross-Section). With advances in computational capabilities and improvements in Finite Element software, it is now possible to work with 3D Finite Element (FE) models of various human organs, region and even the complete human body. In addition, to simulating global kinematics such FE Human Body models can compute local stresses and strains.

It is accepted that as, accurate constitutive model of the human tissues are available, these FE models are better representations of performance of humans under impact behaviour as compared to ATDs or multibody models. FE models have three major advantages: 1. Accurate geometry representation, 2. Good contact-impact algorithm, 3. Deformable material characterization. In the Mechanical Engineering Department of IIT, we have been working at the forefront of different aspects of human body FE model development. Some of these are mentioned below.

Characterization of soft tissues under impact:

Dynamic tests have been designed to characterize the tissues under impact conditions. The data obtained from these tests are used to update and validate FE based simulations. The aim is to extend the material models available to dynamic conditions. The tests developed include the following:

1. Quasi-Static Compression Tests estimate static material characteristics. This data is useful in predicting a part of the dynamic response.

2. A Split Hopkinson Pressure Bar, uses wave propagation principles to study the behaviour of material at varying strain rates. Strain rates of 100/s to 2000/s upto 50% strain has been achieved.

3. Impact tests on soft tissues at impact speeds of upto about 8 m/s with a 1kg impactor on specimens of 5-15mm thickness upto 50% strain.

Using all three rigs, we have been able to conduct dynamic tests on human body soft tissues at strain rates ranging from about 0/s to about 2000/s. This figure shows a typical variation obtained from these experiments.

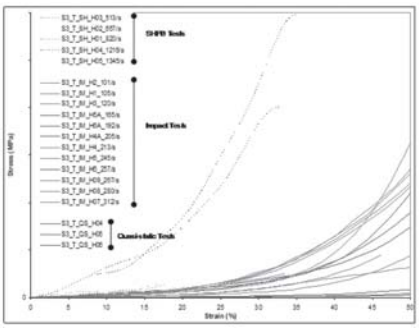
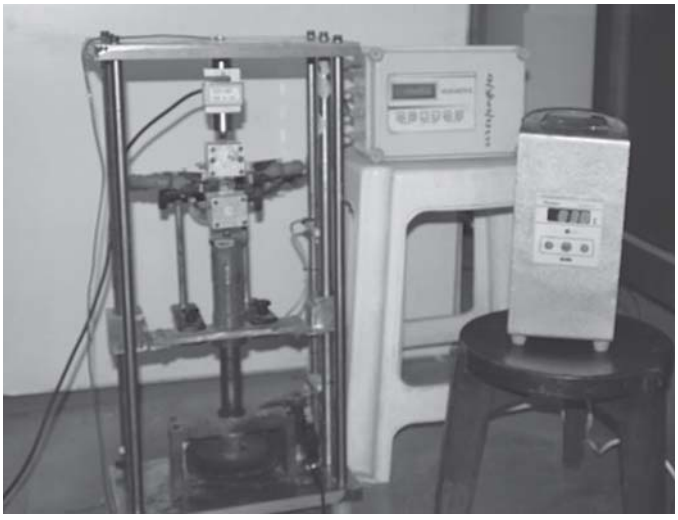


Figure: Typical variation obtained in stress-strain response with strain rate

Obtaining dynamic properties of ligaments:

The variation in mechanical properties of ligaments with strain rate and the energy of the impact has been studied. We have focussed on the ligaments in the knee region with an eye on pedestrian impacts that constitute a bulk of injuries in India. Rigs to measure quasi-static and dynamic properties of human



Ligament testing apparatus

ligaments have been developed. Initial results indicate that the dynamic properties are at significant variance from the static properties and hence FE models used need to reflect this effect.

Dynamic properties of human cartilages and alternate materials for cartilages in joint replacements.

Rigs to test the impact properties of human cartilages are being developed which are to be used to test artificial materials as well as animal tissues. The rigs, coupled with a process of Finite Element Based Inverse Characterization and Wave Propagation based analysis will then be used to measure the impact properties of human cartilages. In collaboration with the All India Institute of Medical Sciences (AIIMS), we hope to get data on the impact properties from different body regions. Simultaneously, another collaborator in this effort, The Mechanical Engineering Department at University of Birmingham will test biomimetic material in their material simulators. Some selected materials will also be tested on the test in IIT to characterize them dynamically. Through the study of dynamic compatibility of the alternative materials with human cartilages and the response thereof we aim to identify/develop synthetic materials that can possibly replace damaged tissues.

Obtaining dynamic properties of human bones:

We have been conducting bending tests on whole bones to characterize them through the inverse FE procedure. High speed photography upto 10,000 frames per second in conjunction with drop setups developed in-house, is used to this end. We are now developing machines for characterizing small specimen of bones in dynamic loading. The machines in use for soft tissue testing would be redesigned for this purpose. We hope to be able to capture the variation of strain dependent material properties across the length of the cross section of bones. The above figure shows a picture of a bone under 3-point impact test.

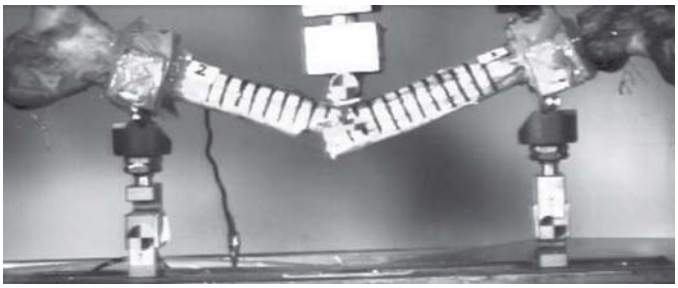


Figure: Three point impact test being conducted on a bone.

Development of a tool for scaling Human Body FE models:

Given that any data obtained for humans is for a unique individual, two intrinsic problems are posed. How is a measurement done on a specific specimen relevant to model building in general? The second is how we can tune a generic FE model to better predict the response of an individual.

Developing a human body FE model in a given position takes many man years. A tool to reduce the time required to reposition and scale the model is being worked on. It is expected that the starting mesh is consistent, without any penetrations or mesh quality problems and would be meeting a known time step criterion. In FE terms, the problem is to obtain an FE mesh for the human body defined in terms of some characteristic key points through transformation of a human body FE model consisting of shell, solid and bar elements in one initial position.

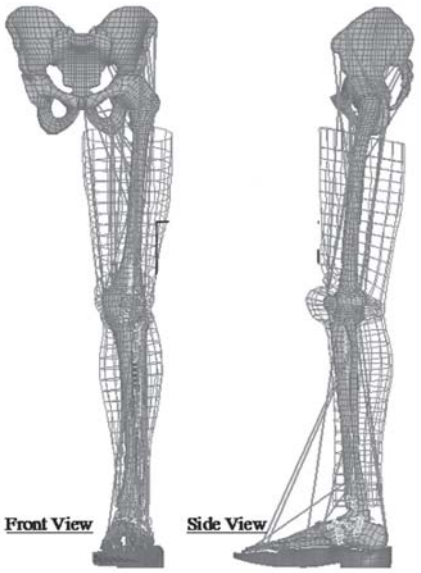


Figure: FE model of the lower leg used in study of affect of active muscles under impact conditions

Crash data collection and accident reconstruction:

Collecting road crash data is a well established procedure in OECD countries of the world. However, this is yet to be initiated in India. Such accident data is necessary from a policy planner as well as a vehicle designer's perspective. In a Transportation Ministry funded project concluded in July 2006, about 140 vehicular crashes were recorded. In a new broader effort we have proposed four different centres in Delhi and one at a selected highway location. Through liaison with the Delhi Traffic Police and trauma centres, AIS classification of resulting injuries is targeted.

Through damage measurement of the vehicles involved, "delta-V" or the velocities before the accident would be estimated. A database on the line of the CCIS database in UK is proposed, that can be extended to cover the whole country. Cluster analysis of this data and accident reconstructions of 100 cases is targeted to demonstrate the analysis potential and understand the demographics of the crashes.

Acknowledgements: The above work has been made possible only through an extensive support from our collaborators as well as sponsors. The collaborators include All India Institute of Medical Sciences, Birmingham Automotive Safety Centre, University of Birmingham, University of Strasbourg, France, University of Virginia, Charlottesville, USA, Transportation Research and Injury Prevention Program, IIT Delhi and our sponsors include Mercedez-Benz, R&D India; General Motors; Japan Automobile Research Institute; Volvo Research Foundation; Ashok Leyland India; Ministry of Science and Technology, GoI and the Indian Council of Medical Research.

Prof. S. Mukherjee & Prof. A. Chawla
Deptt of Mechanical Engineering, IITD

Government Develops Schemes for More Industry, Academia Interaction

Mechartes Researchers Pvt Ltd, a company that was incubated at IIT-Delhi for three years and will move out of the campus in August. Mechartes designs earthquake-proof buildings and also optimizes ventilation and air circulation services in buildings.

VirtualWire Technologies Pvt Ltd., a company that operates in the area of wireless data that was incubated at IIT-Delhi and has moved out of campus, received funding around 10 months back for the research and development of its so called ultrawide bandchip for short-range wireless applications and personal computers and laptops, from the Council of Scientific and Industrial Research (CSIR) under its New Millenium Indian Technology Leadership Initiative, or NMIT-LI. "The total cost of our project is Rs.15 crore, and CSIR has funded less than half of that amount. We cannot reveal the exact amount but the CSIR fund varies from project to project," said Vishal Chandra, Chief executive officer of VirtualWire Technologies. According to Chandra, there are just three government schemes that really benefit start-ups such as his. CSIR's scheme; the 'Support International Patent Protection in Electronics and IT (SIP-EIT)' scheme announced by the ministry last year; and the financial assistance provided by the Technology Development Board (TDB) constituted by the Government in 1996 as a statutory body under the Department of Science and Technology, Government of India.

(Source: Mint 08-04-08)

Google Sees Big Biz for Mobile Search

Internet search engine leader Google Inc. expects more mobile subscribers in India to use its SMS or text-based search service for local information, such as on restaurants and movie timings, than in the US, the world's largest Internet search market where the company began offering the service more than three years ago. Local start-ups such as SM Onyomo Infotech Pvt Ltd and Suncom Infotech Pvt Ltd, both based in New Delhi, have built a database of business listings to offer such services to users. But the response has been mixed from mobile phone subscribers.

(Source: MINT, 29-3-2008)

IITs Take Start-up Mentoring Pan-India

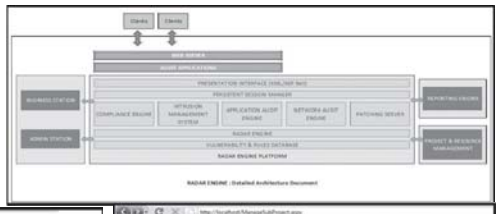
Sixteen cities hosted mentoring sessions for 1020 entrepreneurs on Republic Day as part of the pan-IIT Entrepreneurship Mentoring Event organized by alumni of the Indian Institutes of Technology (IITs), along with The Indus Entrepreneurs and the National Entrepreneurship Network. While it was an afternoon of mentoring in most cities, the day-long event in Bangalore included a showcase of 12 start-ups and talks by venture capitalists and past-entrepreneurs. The start-ups that made presentations included a mix of concept stage products by students and companies that have been operating for a few years. The event ended with a simultaneous 16-city live web-cast from Hyderabad of a speech by former president A.P.J. Abdul Kalam. The programme saw an entrepreneurial mix of 120 students, 540 start-ups, 140 growth-stage companies and 220 working professionals across the country, including cities such as Bhubaneshwar and Guwahati.

(Source: MINT, 29-01-2008)

Appin Security Group

Appin Security Group's major success was procuring information security audit, implementation or management clients such as Hindustan Times, Tulip IT, Ballarpur Industries, Jaypee Group, India Today, IFFCO TOKYO and GHIAL (GMR Hyderabad International Airport). These clients were provided Information security in a mixed model, with consultants present onsite working in co-ordination with Security Operation Center professionals working offsite. For GHIAL, Appin got a 2 year contract for providing comprehensive Information Security to Hyderabad International airport. These clients were served using Appin Radar Engine, currently a semi-automated engine that does security audit and provides detailed patching assistance to clients. Appin Radar has been and is currently being built exclusively at Appins incubation unit at IIT Delhi.

For further information contact:
Mr. Anuj Khare
TBIU Block- I, IIT Delhi
E-mail: anuj.khare@appingroup.com



LeadInvent Technologies

LeadInvent is a life sciences company focussed at New Drug Discovery. LeadInvent is based out of Technology Business Incubation Unit at Indian Institute of Technology Delhi. LeadInvent is presently working on several drug design projects at various stages. Some of the key projects are:

a) Collaborative project between LeadInvent and AIIMS on finding novel molecules for Tuberculosis which is funded by DBT under SBIRI project.

b) Industrial project between LeadInvent and Ranbaxy.

c) Internal projects on Cancer and Diabetics.

For further information contact:
LeadInvent Technologies Pvt. Ltd.
TBIU Module 5 & 6
IIT Delhi

Care Pro Biotechnologies

Care Pro Biotechnologies (CPBt), a TBIU, IIT, Delhi company is engaged in research for development of philanthropic technology and bioproducts. In the changing world where agriculture, environment and ecology should be the prime importance, CPBt is endeavouring for development of ecofriendly and cost effective microbial products and technologies for betterment of agriculture and environment, with a highly dedicated team of research scientist and experts and functional collaboration with many key R&D organizations and universities in the country, using recent trends and tools of biotechnology.

Company's main focus is towards:

- The development of microbial consortium for reclamation of sodic and saline soil and its validation at laboratory level, reclamation at pilot project and farmer's field level.
- Isolation and characterization of plant growth. Promoting bacteria from sugarcane plants.
- Development of a common PGPR consortium for rice, wheat, maize and sugarcane.
- Fermentation based high quality microbial products for agriculture and environmental use.
- Bioremediation of petroleum contaminated sites by the use of microbial products.
- Enzymes to be used in animal feeds.

For further information contact:
Mrs. Shyama Prasad Singh
Care Pro Biotechnologies
TB-I, Block-I, TBIU, IIT Delhi

EnNatura Technology Ventures [P] Ltd

EnNatura team has been actively involved in the development of vegetable oil based environment friendly inks. The company has successfully completed the process development for the bench-scale production of multi-colour (CMYK) inks and are currently engaged in pilot scale process development and commercialization of these inks under the brand name-Litho-Natura Inks.

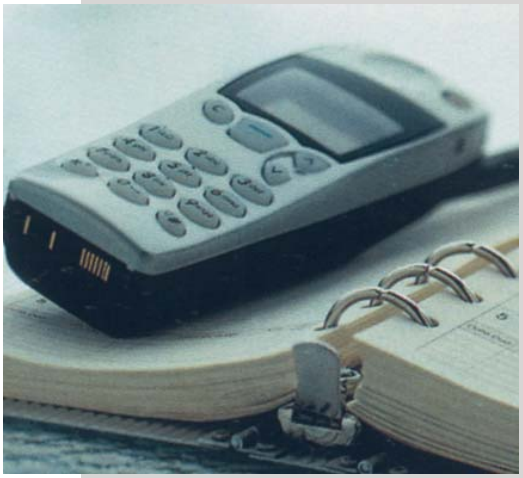
Product offers following health and economic benefits:

- Litho-Natura Inks are free of any Volatile Organic Compounds (VOCs) that are present in the conventional petroleum based inks, ensuring a cleaner pressroom and safer environment;
- Vegetable oil based inks are washable with a proprietary "VOC free wash solution" as opposed to hydrocarbon solvents that are used as wash solutions for conventional inks, making it only VOC free ink in the country;
- Being developed on a renewable raw materials platform, ink costs and printing costs are lower vis-a-vis petroleum based inks.

For further information please contact:
Mr. Sidhartha K. Bhimania
EnNatura Technology Ventures (P) Ltd.
TBIU, IIT Delhi
E-mail: skbhimania@gmail.com

SM OnYoMo

OnYoMo has actively launched SMS Store Locator service with a couple of large brands within India. SMS Store Locator service allows customers of a brand to locate their nearest brand outlet by sending out an SMS specifying their preferred location, and the service responds back with nearest brand outlets to that location. Clients have included The MobileStore, LG, Acer, Lenovo. On the mobile based local search front, OnYoMo's services have now been integrated into Reliance's R-World, and all Reliance subscribers that have access to the R-World portal can now access the service. OnYoMo is currently in the process of launching its services on SMS in association with a large media company.



On the internet front, OnYoMo recently launched a points based system to closely integrate its users with the OnYoMo service. Here, any user that makes positive contributions to the service in form of Reviews, Votes on Issues, Invitations to friends etc is awarded points that can be redeemed against a set of items such as movie tickets, online shopping/flight/hotel booking discounts etc.

For further information contact:
Mr. Shailesh Mehta
OnYoMo TBIU, Block -1,
Extension Suite 7
IIT Delhi
E-mail: info@onyomo.com

Mecharte's Researchers

Mechartes provide services and develop software products in the domain of Computer Aided Designing (CAD), Finite Element Methods (FEM) and Computational Fluid Dynamics (CFD). Mechartes uses a combination of analytical and numerical tools to simulate real life phenomenon and compare them with experimental observations. The company's focus is on providing following services:

Thermal & Flow Analysis; Acoustic Analysis; Crash Analysis; Vibration and Modal Analysis; Structural and Stress Analysis

For further information, contact:
Mr. Shishir Kumar Gupta,
Mechartes Researchers Pvt Ltd
Module 2, TBIU Block
IIT Delhi
E-mail: shishir@mechartes.com

Focus on Distinguished Faculty of IIT Delhi

Professor Ashok N. Bhaskarwar earned his B.Tech. from L.I.T., Nagpur, in 1981, M.E. (1983) and Ph.D. in 1987 from IISc, Bangalore; all, fortunately, in Chemical Engineering and notably from within the "mother of all nations". He had post-doctoral stints at LPT (State University of Gent), Belgium, and IISc. He was later a Visiting Professor at CEMS (University of Minnesota), USA, during 1995.

He was inspired by the wonderful spell of elementary Chemistry, and decided to be a researcher and a teacher at a rather ripe age of 11. The questions (and no answers, of course!) about existence of God and considerations of required twin paths of exploration (renunciation and mortification) arrived two years later, and were thoughtfully but quickly deferred to the next birth although not entirely happily! Paradoxically, even the abandoned ideas of a child continue to influence his sphere of later existence and activities. Like a ripple in the universe of mind reverberating in the mind of the universe!

His choice of Chemical Engineering over Chemistry for a career was a pragmatic acceptance of the principle of irreversibility, rather than any knowledge of having made a "late start". Blissfully, time did not exist then in the company of loving parents, friends, books, and a rural setting – a perfect world with no competition.

These products are expected to pave the way for a whole new spectrum of **"absolutely zero-pollution" products and technologies** like textile-fiber finishing, pharmaceutical processes, floor and wood polishes, photolithography for making microelectronic circuits, and agents for de-icing of airplanes in extreme-cold weather conditions, etc.

Over the years, he has developed and combined his expertise in **chemical reaction engineering, interfacial engineering, and transport phenomena** to design **new pollution-preventing products and technologies.** In parallel, his work also extended to fundamentals governing **novel pollution-control devices, re-refining of oil, alternative fuels, and purification of water,** besides the basics of environmental science and chemical process engineering.

His work on **pollution-preventing inks** has provided the key scientific understanding of **the no-VOCs** (volatile-organic compounds) **based line of products** which could be washed with water with either a slightly elevated or lowered pH. These products are expected to pave the way for a whole new spectrum of **"absolutely zero-pollution" products and technologies** like textile-fiber finishing, pharmaceutical processes, floor and wood polishes, photolithography for making microelectronic circuits, and agents for de-icing of airplanes in extreme-cold weather conditions, etc. Printing inks of the new kind based on vegetable drying oils and pH-sensitive synthetic functional resins have already become a commercially successful product and ***patents for the pH-sensitive resins and temperature-sensitive polymers*** synthesized from locally available ingredients and ink formulations made thereof have been applied for. Recently, based on the first of these inks, a start-up has been launched (***EnNatura Technology Ventures Pvt. Ltd.***) at IIT-Delhi in June 2007 to manufacture these novel printing inks, under a technology-incubation program of FITT.

Current work of his research group explores, besides **pH,** the more benign **temperature as a "switch" for washing** of inks. The latest advance made in formulating **microemulsion-based inks** eliminates the need for any "switch" at all. The theory for washing of the newest ink has also been developed based on the observation of **spontaneous emulsification** and modeled through the instability of jets leading to pinched-off droplets in a regular array of water and oil micro-domains at the ink-drop – wash boundary.

Other industrially significant work has targeted the recovery of oil from tough emulsion effluents such as of steel-rolling mills and other mechanical and chemical process industries. New continuous recovery processes based on **colloidal-gas-aphrons flotation or microfoam flotation** and on **alternating current electro-coagulation,** and the **combination** of these two techniques have been developed and IPR applications also recently filed.

Foams and froths are promising media for **removal of pollutants in air** using small amounts of liquids. Dr. Bhaskarwar and his students have extensively investigated **foam-bed reactors and froth-bed reactors,** both experimentally and theoretically, for conducting gas-liquid reactions over the past 26 years. The high gas-liquid interfacial areas, long times of contact, and moderate pressure drops in these novel reactors are ideally suited to removing gaseous pollutants, including the chief green-house gas, namely, carbon dioxide.

The current quantitative understanding of foam-bed reactors has also been used to develop a **design procedure for a system of foam-bed reactors** in series, which would be useful in practice. New chemical techniques of **production of near-micron sized barium carbonate particles** have also been achieved recently.

Monte Carlo simulation of flow of fluids through porous media would help pave the way to develop novel experimental methods, being investigated in his Laboratory, **to recover residual oil in reservoirs which accounts for the low petroleum recoveries currently possible.** This is an *important area* of practical application of the very best in chemical engineering, if we have to have any real hope for petroleum after about 2039.

For the present, a **new alternative fuel based on microemulsions** has been developed which would reduce the pollutants in vehicular exhausts and eliminate the respirable particulate matter *completely*. Consonantly, a new environment-friendly **re-refining technology** has been developed. Finally, the ongoing research of his group is tackling the difficult, but again critically important, problem of **splitting of water molecules through photo-catalytic and photo-electrochemical routes** economically.

Alongside, a sizable consortium of faculty colleagues is exploring with him the area of **thermo-chemical cyclic S-I process** in quest of the clean fuel of future, namely, **hydrogen.** Would nature eventually relent to the brave souls?

Professor Ashok N. Bhaskarwar
Petrotech Chair Professor
Department of Chemical Engineering
Indian Institute of Technology, Delhi
e-mail: ashoknb@chemical.iitd.ernet.in
Website:www.ashoknbhaskarwar.freeservers.com

Dr. Anshul Kumar is currently the Philips Chair Professor in the Computer Science and Engineering at IIT Delhi and also the Head of the Mathematics Department. He has been associated with IIT Delhi since 1969 when he joined the Institute as an undergraduate student. He graduated in 1974 with a B.Tech. degree in Electrical Engineering and was awarded the President's Gold Medal for obtaining the first rank in all disciplines. Subsequently, he obtained his Ph.D. degree from IIT Delhi in 1980 in the area of Computer Aided Design of Digital Systems.

Since 1984 he has been with the faculty of the Department of Computer Science and Engineering at IIT Delhi, where he became a Professor in 1990 and Head of the Department during 1998-2001. He has been the Dean of Undergraduate Studies during 2003-06 and has served in other key positions like Coordinator of the School of Information Technology, Coordinator of the VLSI Design, Tools and Technology Program and Coordinator of Computer Applications Program.

Prof. Anshul Kumar has held visiting appointments at Univ of Southern California Los Angeles (1981-82), University of Edinburgh (1987), KTH (Royal Institute of Technology) Stockholm (1995-96, 1997) and EPFL (Federal Institute of Technology Laussane) (2001).

Prof. Kumar's main areas of research interest are VLSI synthesis, embedded systems design methodology and high performance computer architectures and he has published more than 100 research papers in reputed journals and proceedings of refereed international conferences. He has guided 10 Ph.D.'s and more than 80 M.Tech./B.Tech. projects. His research has been supported by the Department of Electronics/ Ministry of Communication and Information Technology, Naval Research Board, ANURAG (Defence Lab) and NXP Semiconductors. He has also been a consultant to Gateway Design Automation (now Cadence Design Systems), Technology Parks Ltd, ST Microelectronics and Poseidon Design Systems.

Prof. Kumar has been associated with the annual International Conference on VLSI Design since its inception in 1985 and contributed to its growth in various capacities. He is a General Co-Chair for the forthcoming conference in 2009. He has also contributed professionally through various national level committees including, Working Group on Microelectronics and Advisory Committee for CDAC.

Prof. Kumar's main areas of research interest are VLSI synthesis, embedded systems design methodology and high performance computer architectures and he has published more than 100 research papers in reputed journals and proceedings of refereed international conferences.

In 2002, along with some colleagues and graduating students of his department, he founded a start-up company called Kritikal Solutions under the Technology Business Incubation Program of IIT Delhi. He has served it in various capacities including Hon. Chairman, Hon. Director and Mentor and helped it grow nearly tenfold.

Recently he received the ACM Transaction on Design Automation of Electronic Systems (TODAES) 2007 Best Paper Award for a paper coauthored with a colleague and a student.

Prof. Anshul Kumar
Department of Computer Sciences & Engineering (CSE) &
Head, Department of Mathematics, IIT Delh
Email: ansul@cse.iitd.ernet.in

Record Number of Tech PhDs from IIT-Delhi

A whopping 140 PhDs in engineering disciplines were awarded by IIT Delhi last year, the most ever in the Institute's history. The reason is the changing nature of private-sector operations in India in recent years, say experts. "Research in engineering is in, and career prospects of PhDs are changing," said M. Balakrishnan, Dean, Post Graduate Studies and Research, IIT Delhi. "Industrial research and development is becoming big in India. Today, the private sector employs PhDs in all disciplines-automobiles, energy, environment, materials." The returns, in monetary terms, are attractive as well. "A PhD in any engineering discipline is today paid between Rs 8 lakh and Rs 16 lakh per annum," said Balakrishnan. "Companies such as Yahoo and Google, which work with new technologies, pay the highest," he said.

(Source: The Hindustan Times, 08-05-2008)

Delhi's Power Structure

In times when energy conservation and eco-friendly technologies are setting the agenda worldwide, a research student at IIT Delhi has found a way to make houses comfortable through the year, relying on the sun rather than electricity. The secret to these power houses lies in their building material and shape. Arvind Chel, a Ph.D student at IIT's Centre for Energy Studies (CES), has used bricks on the outer layer of an inverted U-shaped mud house that prevents erosion during rains and harsh weather conditions. This structure comprising six rooms, says Chel, is four to five times more energy efficient than modern day RCC (reinforced cement concrete) structures and can be built both in rural and urban areas.

(The Sunday Express, June 1, 2008)

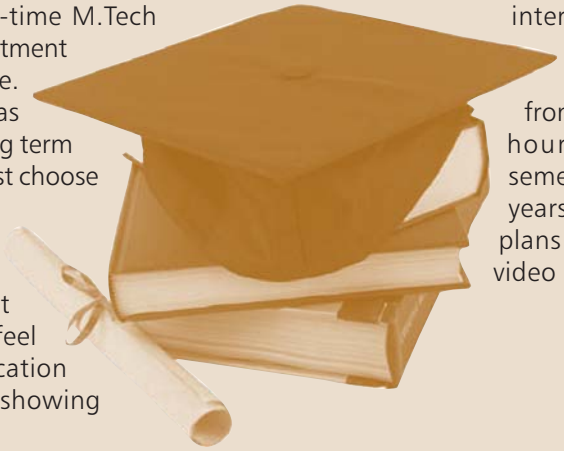
School Students Taken on a Tour of IIT Campus

IIT Delhi opened its gates for the city's school students on Saturday. Over 1500 students from different schools across the city got a chance to interact with the students of IIT Delhi for the first time during its annual Open House event on Saturday. The engineers-in-the-making at IITD counselled aspiring engineers while showing them around on the campus. As IIT hosted Open House I^2 Tech 2008, aspiring engineers and science enthusiasts got a flavour of life at IIT by visiting laboratories, using equipment and checking out innovative cars and jazz robots. "We got an over whelming response from students in our 'Meet the Students' programme. We had organized guided tours for them in which our volunteers took them on a round of all departments and labs. They learnt what it is like studying at IIT," said Prof. Subrat Kar, Chairperson, IITD Open House. IIT Delhi has been organizing the technology fest, I^2 Tech, for four years now in which the research projects and innovative inventions of students and the faculty are put on display for the public. This time IITD took the initiative to invite schools to visit the campus between 9 am to 5 pm and was a huge hit, IITD students said. "We had set up a JEE desk where school students asked us for tips to make it to IIT. They had so many questions in mind. In school, students usually know if they want to become a civil engineer or a computer engineer. But to know what the course really entails and what its scope is, we made the students meet IITD faculty also," said Geetika Bajaj, who is doing a PhD in Physics at IIT. Even as senior school students were busy seeking tips, their juniors were much fascinated by the Formula-1 car with 600 cc sports bike engine developed by IITD students. In fact, the gaming robots developed by19 IITD students was an absolute show-stealer. The other eye-catching projects by IITD students were the earthquake-resistant hut, smart homes, smart cane for blind, bio-fuels and cycle-turned pedal-boat.

(Source: Times of India, 20-4-2008)

Professional Candidates Registration@IIT Delhi

IIT Delhi understands part-time M.Tech requires a high intensity commitment of 3 years and Ph.D. even more. Unfortunately, not everyone has the time for making such a long term high-intensity commitment. Just choose a course (from nearly 400 + courses offered each semester) that you would like to attend and register for it. For the first time, it is possible to get the feel and benefit of IIT Delhi education with just an application form showing interest in a regular course at IIT Delhi. (subject to acceptance by the Dept./Centre). Course fee ranges from Rs.15000/- to Rs.20000/- for a 42 hour lecture course spread over a semester of 16 weeks. In the coming years, fr a few select courses, IITD has plans to reach your sites using two way video links.



For details, please contact :
MD, FITT, IIT Delhi.
E-mail: mdfitt@gmail.com

New Source for Bio-CNG Production

It is the result of two-year-long trials with help from IIT, Delhi.
It is the first indigenously made bio-CNG plant in the country.

JAIPUR: Vehicle owners who use eco-friendly compressed natural gas (CNG) here in the Rajasthan Capital would soon be making a beeline for an unusual destination—the local *gaushala*. After supplying cow's milk, value-added items from cow urine and medicines based on cow products over the years, the Gandhian institution, Rajasthan Gau-Sewa Sangh, has entered into a new area: bio-CNG.

Rajasthan Home Minister Gulab Chand Kataria inaugurated a bio-CNG plant, which can produce 24 kg of gas daily from cow-dung, at the Durgapura-based cow-yard here on Monday. The plant, commercially operational now, is the result of two-year-long trials with the support of the Science and Technology Department of the Union Government and technical know-how from IIT Delhi.

"The cow should be made more relevant for the present day connecting it with economy. People would no more keep the cow for piety," Mr. Kataria said referring to the economics of the holy cow.

The 85 cubic metres capacity plant at the Gau Sewa Sangh is said to be the first indigenously made bio-CNG plant in the country. The scientists who joined the launch programme appreciated the quality of the gas produced at the plant.

"The plant will provide better quality gas than CNG based on petro-carbon sources," affirmed B. Subba Rao, senior scientist from IIT Delhi.

Former SEBI (Securities and Exchange Board of India) chief D. R. Mehta, who presided over the brief function to mark the launch of the plant, however, talked about the rather disappointing experiments the groups had in Kanpur and Gorakhpur in the past. The one-plant Jalgaon gaushala is proving self-sustainable, he noted.

The production cost of 1 kg of bio-CNG is Rs.15-16, which is much cheaper than the petro-based CNG. The plant with a capacity of 85 cubic metres costs Rs.7 lakh to come up. Sanjay Vajpayee, senior scientist with the Central Science and Technology Department, said five more such plants are on the anvil in Rajasthan.

"The cow is *Kamadhenu* (the cow goddess which fulfils all wishes). If properly utilised, cows can solve all the problems we are facing now," quipped Rajasthan Gau-Sewa Sangh chairman Bhanwar Lal Kothari.

Rajasthan reportedly has 22,200 gau-shalas and just imagine, the State is sitting over a gas field!

(The Hindu, June 25, 2008)

Kerala Quotes IIT-Delhi Study to Argue Mullaperiyar Dam is Unsafe

Giving a new dimension to the dispute about the safety of the Mullaperiyar dam, Kerala on Tuesday said a team of experts from IIT, Delhi, has concluded after a study that the present dam would prove to be "hydrologically unsafe" in the event of heavy rain and consequent flooding. The team members comprised of Prof. A.K. Gosain & Dr. Subash Chander from IIT Delhi.

(Source: Times of India, July 02, 2008)

Variable Length Rack & Pinion System

Dr. P.V.M. Rao and Dr S K Saha
Mechanical Engineering Department, IIT Delhi

The purpose of steering linkage in automobiles is to provide pure rolling motion to all four wheels when turning. In order to provide pure rolling to the road wheels and to reduce slip of the tires, and consequently, their wear and tear, a steering linkage must handle the vehicle to follow Ackermann condition. In commercial automobiles, Ackermann condition is satisfied only for one or two turning radii and is never satisfied for all turning radii of the car. The link lengths of an RPS linkage are chosen or optimized in such a manner that Ackermann condition is satisfied as closely as possible for different turning radii. The steering error which measures non-conformance to Ackermann condition should be ideally zero for free turning of wheels with pure rolling motion.

We propose a novel system where conventional rack is replaced with a new rack assembly to eliminate the error between desired motion and the motion obtained. The purpose of new rack assembly is to vary the length of rack in a predictable manner. The proposed variable-length rack and pinion system can be used to achieve the desired motion without any error during the entire range of motion and not at a few places as is possible with fixed-length rack. This type of rack and pinion system is shown in the figure. In this case the conventional rack is replaced with a new rack assembly.

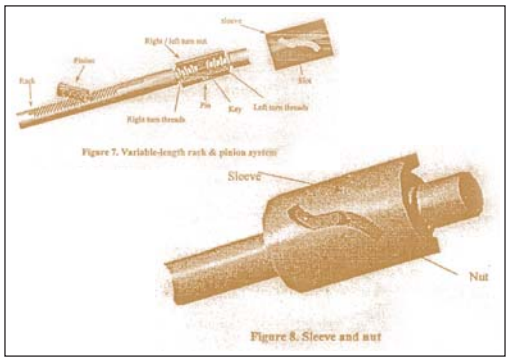


Figure 8. Sleeve and nut

It is not sufficient to vary the rack length but rack length should be varied in a predictable manner to reduce/eliminate the error between desired motion and the motion obtained, to zero. In order to achieve this suitable mechanical modifications have been done in the proposed new system based on design calculations.

Novel Structural Mechanical Designs and Systems for Indusrial Applications

S.No.	Title
1	A novel hingeless foldable and unfoldable device and mechanism for robotic applications
2	An improved intershaft squeeze film damper device
3	A novel trenchless steerable drilling machine
4	An automatic light transmission measurement device
5	A method and system for monitoring vibrations of rotating blades of turbines
6	Universal electrode holder for shielded metal arc welding and method of use thereof
7	A novel torch assembly for submerged arc welding
8	A novel limiting torque bolt mechanism for irreversible locking of nuts
9	A novel Rack and Pinion System for overcoming ackermann error
10	A novel design of pilfer proof, collapsable, secure, light weight box / container for packaging applied
11	Hand tools used by the craftsmen engaged in the carpet industries of India
12	Novel design of solar cells with more efficient back panel insulation and heatflow
13	Low pressure block manifolds without construction plugs
14	Force sensor using functionally graded material
15	Biaxial tensile test fixture for uniaxial machines
16	A folding mechanism for folding flat structures
17	A folding/unfolding transport container and a method of folding and unfolding a transport container

National Technology Day

The National Technology Day was celebrated in the Institute on May 13, 2008 under the aegis of FITT in the Senate room of IIT Delhi. There were two lectures—one by Prof. C.V. Ramakrishna from the Department of Applied Mechanics, IIT Delhi; the other talk was delivered by Commodore (Dr) R.K.Rana, Additional Principal Director, Directorate of Naval Design, Ministry of Defence, Government of India.

The first talk was delivered by Prof. Ramakrishna on "Open Source Technology for Engineering Software Application; the second talk delivered by Commodre Rana was on "Emerging Ship Propulsion Technologies". There was a lively discussion at this event. The event was chaired by Prof. B.N. Jain, DD(F) IIT Delhi. The vote of thanks was proposed by Dr. Anil Wali, MD, FITT.

DMRC & IIT Delhi start Course in Metro Technology

To develop a cadre of Metro specialists, Delhi Metro Rail Corporation (DMRC) has collaborated with Indian Institute of Technology (IIT), Delhi, to start a new post-graduate professional course for young engineers. The post graduate diploma in metro technology (PGDMT) would teach students various subjects specially connected to the operations and technology of Metro train. IIT academicians and DMRC experts have jointly developed the contents of the course keeping in mind professional requirements as metro engineers. IIT Delhi has already started screening process to take first batch of engineering graduates for the diploma course.

(Source: Hindustan Times., 15-06-2008)

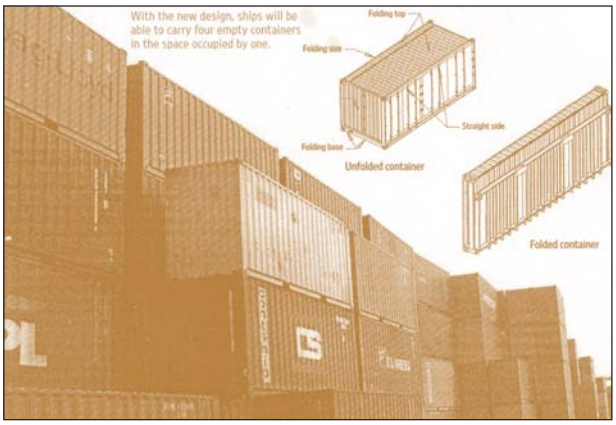
Professors to Turn Entrepreneurs Now

In a move that would transform knowledge professionals into entrepreneurs, the government plans to allow professors and research scholars to set up commercial entities while being employed in academic institutes. Academics will also be allowed to invest their knowledge and skills to pick up equity stakes in companies. For instance, a scholar may offer his skills and knowledge to a company to pick up equity in it. The model is on the lines of the ones followed at renowned institutions such as Massachusetts Institute of Technology, Stanford and University of Cambridge. The scheme would help central universities and premier institutes such as IITs, IISc, NIT and JNU attract talent. A Cabinet note in this regard is already in circulation. Under the law, academics and institutes including government promoted societies, availing income-tax benefits are not permitted to pick up equity stakes in commercial ventures. Confirming the move, an official in the Ministry for Science & Technology said: "The move follows the Prime Minister's direction to encourage development and commercialization of innovations." The government may also exempt researchers working in publicly-funded research organizations and universities from central civil services (CCS) conduct rules, enabling them to set up companies while continuing in government service.

(Source: Economic Times – 19-05-2008)

Indian Professors Devise Way to Pack Away Empty Shipping Containers

Every day, millions of shipping containers export goods from Asia to other parts of the world. In the cycle of global trade, these containers would be used to bring imported goods back to their Asian home ports. But, because of trade imbalances, many return empty. Storing and moving empty cargo containers impose huge costs and waste valuable space and energy. VOA Correspondent Steve Herman reports from New Delhi that an Indian invention could eventually cut in half the total volume of empty containers shipped.



In ports, on ships, rail cars and trucks they are ubiquitous - those reusable steel rectangular boxes that carry the bulk of the world's international cargo. Every year nearly 150 million of the standard sized containers are on the move. But an imbalance of trade has caused shippers a major headache. Consumer goods made in Asia fill those containers headed for the Americas, Europe and Africa but they return mostly empty. And moving and storing those empties costs freight haulers and shipping companies tens of billions of dollars per year. That got investment banker Avinder Bindra thinking as he stared out of his office window overlooking Hong Kong's port a few years ago, noticing the stacks of containers growing higher and higher.

"I found out that it was a problem because a lot of the containers were coming back empty," said Bindra. "In fact some of them were being used to bring back scrap and wastepaper which were really very low volume just to generate some revenue. But the bulk of them, almost 20, 23 percent of the volume of container movement globally is of empties." Bindra, who now lives in New Delhi, found a solution to the expensive quandary of how to handle all those empty containers.

"As you can look around probably a lot of these containers which are lying around are empty," he said. "Now if you can just imagine a picture where you can fold or where you can keep four containers in the space of one - in other words you have four containers, imagine the land which is being freed up. So you will be able to store the same amount of containers in one quarter the size of this plot."

Bindra was not the first person with such an idea. Others had tried but failed to create a replacement that would be as sturdy as the conventional container. But Bindra thought the brains at the mechanical engineering department of the Indian Institute of Technology might be able to devise a feasible design that would fold automatically. He approached professors Anoop Chawla and his colleague, Sudipto Mukherjee.

"In our design what we managed to achieve is that there are very stringent specifications on how much load it has to take and how much deformation it will allow," said Mukherjee. "So the folding scheme that we have allows the container to take that load which a normal non-folding container would do."

Mukherjee adds that their design is feasible because a simple folding mechanism - a hydraulic base station - operated by one or two unskilled workers can collapse containers horizontally and stack them in several minutes. Professor Chawla says, in retrospect, the design looks simple, but took three years to go from the drawing board to something viable.

"One often hears of cases when a product is designed on the board and it never sees the light of the day, the light at the end of the tunnel," he said. "So it was very nice to see something working and we really hope it takes off commercially also."

There is a significant monetary incentive for the shipping industry to minimize empty containers. To recover the costs of containers returning empty, shipping companies impose stiff surcharges on full containers exported from industrialized nations. One consulting firm estimates that ocean carriers spend about $16 billion annually just moving the empties to the next loading point.

The IIT professors say they have accomplished their mission and handed the project back to the investment banker who initially approached them.

"Now most of the work is with Mr. Bindra to try and commercialize it," said Mukherjee. "But it's there and over the years there can be many more variants of this. We're looking at something in which you can load water. It will mostly be covered by the same sort of patents that we have so we have to look at it."

Bindra says the next step is getting a prototype certified by global agencies, which have to approve the sea-worthiness of any container model.

"And once that is done then it'll be fit to be used on the ships," he said. "So that's the status right now. And we're optimistic we will be able to achieve that in about nine to 12 months time."

Although the foldable container will cost ten to 15 percent more than a conventional one, shippers should be able to recoup the additional cost within one or two sea journeys. It is predicted that within the next 15 years, about 350 million container units will be transported annually.

If a foldable variety is among those, the professors could end up with containers of cash. The scholars have agreed to share the intellectual property rights for the invention with the investment banker. The trio says the feedback from the shipping industry has been enthusiastic. They plan to license the foldable containers to manufacturers in China and other countries.

Source: By Steve Herman
New Delhi
29 May 2008; Voice of America

Patent Office Launches Interactive Web Services

Making a call at a Government office to get answers related to patents or trademarks may have been a disappointment. But now, the Indian Patent Office has launched a Web-based interactive service that would respond to your queries. The chat services that were started from Monday by the intellectual property office of India would be available everyday from 3 p.m. to 4 p.m. The officials from the patent office would be at your service to solve any of your problems in their respective capacity. And in any case they are unable to, they would guide you to the right link. "This is mainly to provide patent or trademark related guidance, which we were finding difficult to answer over the phone," said Government officials. The help desk would try to address as many issues as it can in an hour's time and in case it is not able to answer some of them, it would save those queries and send their response through e-mails.

(Source: Hindu Business Line, 04-06-2008)

Patents do not Require Big Bucks

Patents do not require big bucks and nor do massive R&D spends necessarily translate into an increase patent filing. This can be seen from data provided in the latest annual report (2007-08) of the Department of Scientific and Industrial Research, Ministry of Science and Technology, on R&D expenditure of companies and online records of patents granted to them from 2005 onward.

(Source: HINDU Business Line, 06-06-2008)

50 Patents Granted Every Day this Fiscal

India, which has usually been miserly in granting patents, has suddenly started issuing more of them. In the first three quarters of this fiscal, the country's patent office issued some 10,130 patents, more than double the annual number they granted just two years ago. The country which has one of the most stringent patenting regimes in the world after Japan and Germany, has been granting an average 50 patents a day. This rate is comparable to the patent grants made in advanced intellectual property regimes such as the US and the EU when measured as a proportion of patents granted to the number of applications made. The four patent offices in India granted 10,132 patents between April and December 2007, a period in which they received about 30,000 applications. In the 12 months ended March, the numbers were 7,500 out of 29,000, and in 2005-06, the offices issued 4,320 patents after receiving 24,415 applications.

(Source: Mint , 22-04-2008)

List of Patent Applications from IIT, Delhi filed during January 08- June 08

S. No.	Title	P.I./Deptt.
1	Biaxial Tensile Test Fixture for Uniaxial Machine	Dr. Naresh Bhatnagar, DME
2	Split Bamboo Composite Panel for Efficient and Cost Effective Solar Flat Plate Collector	Dr. P. Sudhakar, Visiting Faculty, CRDT
3	Novel Clinical Kit to Estimate Iron Overload in Humans	Dr. Nivedita Karmakar, CBME
4	An Ultra Filtration Membrane for Arsenic Removal	Prof. G. P. Agarwal, DBEB
5	Development of a Suitable Bioreactor System for Azadirechtin Production from Hairy Roots of Azadirachtaindica	Prof. A. K. Srivastava, DBEB
6	A Process for Obtaining New Deodorants from Naturally Occurring Alueritic Acid	Prof. H. M. Chawla, Chemistry
7	New Absorptive Method for Isolation of Alueritic Acid from Lac Bearing Natural Resins	Prof. H. M. Chawla, Chemistry
8	A New Formulation for Shelf Life Extension of Lives, Passion Fruit and Mandarin Oranges	Prof. H. M. Chawla, Chemistry
9	Improved Method for Obtaining Dewaxed Bleached Shellac	Prof. H. M. Chawla, Chemistry
10	Direct Thermal Sensation Index Based Control and Apparatus for HVAC System	Dr. I. N. Kar, DEE
11	A Computerized Air Filtration Apparatus	Dr. Apurba Das, DTT
12	An H-Bridge VSC Based DSTATCOM with a zig-zag Transformer for Shunt Compensation in Three-Phase Four-Wire Distribution System	Prof. Bhim Singh, DEE
13	Design of Externally Controlled Spray Pyrolytic Nanoparticle Fabrication System	Prof. Viresh Dutta, CES
14	A Topical Formulation for Prevention and Management of Peripheral Vascular Diseases and a Process of Preparation thereof	Prof. Harpal Singh, CBME
15	Process for the Production of Human Interferon Alpha 2b in Pichia Pastoris	Dr. Vikram Sahai, DBEB
16	Novel Polyurethane Nanocomposite Fibers and Tapes	Dr. (Ms.) Mangala Joshi, DTT
17	A Mercury Accumulating Enterobacter Species for Mercury Bioremediation	Dr. S. K. Khare, Chemistry

Short Course on Recent Process Biotechnology Advances

This course was held in the Department of Biochemical Engg & Biotechnology, IIT Delhi, under the aegis of FITT, from June 11-27, 2008. The co-ordinator(s) of the course were Prof. S.N. Mukhopadhyay & Prof. T. R. Sreekrishnan from DBEB, IIT Delhi. There were 10 participants for the Programme.

Workshop on Development of Energy Resources

This work shop was held at IIT Delhi under the aegis of FITT from June 12-13, 2008. The topics covered were developments in Renewable Energy Sources for Power Generation for replacement of fossil fuels; Photovoltaics based Power generation; Biofuels; Biomass derived fuels; Biogas Engg & Technology; Hydrogen fuel; Regenerable energy sources; Power Generation through Wind Energy etc. There were 30 participants for the course. The course co-ordinator was Prof. D.K. Sharma.

Open House I² Tech 2008

IIT Delhi opened its all Laboratories & infrastructures for the people in India on April 19, 2008.

Visit from Hitachi Corporation

A high level delegation from Hitachi Corporation visited IIT Delhi on July 03, 2008 for exploring Research Collaboration with IIT Delhi

Technology Development Projects (January 2008- June 2008)

Sr. No.	Title	PI	Dept	Client
1	Development of a Wireless Sensor Network based gait assessment system for fall prediction in elderly patients	Prof. Subrat Kar	Elect Engg	Deptt of Science & Technology, New Delhi
2	Development of Polymeric Resins for Transfer Finishes	Prof. Veena Choudhary	CPSE	M/s. Max Speciality Products Max. India Ltd., Chandigarh
3	Development of Optimization Techniques for Product Design	Prof. Anup Chawla	Mech. Engg	Mitsubishi Heavy Industries Ltd.Japan
4	Flow Patterns on Corrugated Structured Packing	Dr. Shantanu Roy	Chem. Engg	M/s. Air Products & Chemicals Inc. USA
5	Providing Road Signage at Maulana Azad Road	Dr. Geetam Tiwari	Civil Engg	New Delhi Municipal Corporation
6	Multi bladed Vertical Axis Wind Turbine	Prof. T.S. Bhatti	CES	BP International LtdU.K.
7	Reprocessibility of Polymeric Master Batch	Prof. A.K. Ghosh	CPSE	HPL Additives Ltd.Delhi
8	Optimization of Maleated Coupling in Industrial Polymer	Prof. A.K. Ghosh	CPSE	M/s. Pluss Polymers Pvt Ltd New Delhi
9	Design of Furniture (Office & Home)	Shri. L.K. Das	IDDC	M/s. Godrej & Boyce Manufacturing Company LtdMumbai
10	Development of Room temperature Curable Acrylic	Prof. Harpal Singh	CBME	M/S XL-Orthomed (P) Ltd, New Delhi

Training Programmes

Since January 2008, 22 customized HRD programmes were held under the aegis of FITT. A list of some HRD programmes completed/forthcoming are given below.

HRD Programmes (Concluded)	
Sr. No.	**Title**
1	International Workshop on Advances in Asbestos-free Friction Composites-II (IWAAFC-II)"
2	Training Programme on Environmental health Effects for CPCB
3	Short course on NP-Completnecs and Approximation Algorthms
4	Solidworks CAD Training Programme
5	Workshop on CDM, Carbon Management (CO2 – Sequestration and Storage) and Current Environment Management Issues
6	Workshop on Design Experiences in Silicon-II
7	National Workshop on Health Monitoring Nano Destructive Evaluation and Rerafitting of Structure
8	Workshop on Laser Spectroscopy and Nanophotonics
9	Digital Image Processing Workshop for DRDO Scientists

HRD Programmes (Concluded)

Sr. No.	Title
10	Computer Aided Scheduling Resource Leveling, Tracking & Reporting for a Construction Project
11	Lecture on Power Plant Steam Generation & Turbines
12	Advanced Short Course on Passive Underwater Surveillance
13	Advanced Workshop Training for Engineers
14	Management of Construction for Enhanced Operational Efficiency
15	Manufacturing Engineering and Industrial Engineering
16	Refresher Course for Graduate Engineers on Advanced Workshp Training for ARI
17	RF and Microwave Circuit Design – Course-I
18	Intelligent Imaging Techniques in GIS
19	Training programme on Various Aspects of Renewable Energy Technologies
20	Recent Process Biotechnology Advances
21	Developments in Biomass Derived Fuels and Other Renewable Energy Sources and Enhanced Energy Efficiencies in Power Generation and in Other Fuels
22	Yarns for Knitting, Wearing and Management Aspects of Textile Industry

Forthcoming Programmes

Sr. No.	Title	Date & Venue	PI/Deptt.	Sponsored/Participation
1	Workshop cum hands on training on ISCST3 Model Software for Air Quality Modelling 2 days	4 - 5 July, 2008	Dr. Mukesh Khare, CE	Participation based
2	CPCB-Residential Training Programme on "Treatment and Reuse of Textile Industry Effluents" at Dept. of Textile Technology, IIT Delhi	10^{th} –12^{th} December 2008.	Dr. Manala Joshi, TT	CPCB, New Delhi
3	Seventeenth International Symposium on Processing and Fabrication of Advanced Materials (PFAM XVII)	15-17 December, 2008	Dr. Naresh Bhatnagar, DME	Participation based

FITT Team

Chairman, Governing Council	Prof. Surendra Prasad
Managing Director	Dr. Anil Wali
Executive Consultants	Shri K.K. Roy, Shri Partha Bhattacharya, Shri Mohit Mahajan
Consultant	Shri Akhilesh Gupta
Support Staff	Mrs. Seema Lamba, Shri Raj Kumar Mehta, Shri Viswaroop Bhattacharya, Shri Jagdev Singh, Shri Uttam Aswal, Shri Mahendra K. Rajoriya

Foundation for Innovation and Technology Transfer
(A Regd. Society)
Indian Institute of Technology, Delhi, Hauz Khas, New Delhi-110 016
Tel: 26857762 / 26581013 / 26597164 / 26597289 / 26597153
Fax: 91-11-26851169 Website : www.fitt-iitd.org
Compiled by: Mr. Partha Bhattacharya
e-mail: parthab@fitt.iitd.ernet.in