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AMEN

The Association of Mechanical Engineers

NEWSLETTER

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Ability can take you to the top, but it takes character to keep you there

FROM THE DEPARTMENT

In the wake of energy crisis staring at our faces and its unprecedented global dimension, a break through in alternative technology is indeed vital for our future survival. Technological advances have led to greater pressure on the fuel resources. The resources of energy are limited on the earth. So, researchers are developing new technologies to optimize the use of energy and also trying to evolve efficient energy conversion processes. In this context, fuel cell has emerged as a potential solution that is energy efficient as well as environmentally clean.

To emphasize the need of fuel cells and spread information about this new face of energy, a workshop titled "Fuel Cells: Power Device of the Future" was organized by the department on 3-4 February, 2006.The main sponsors of this workshop were AICTE, NTPC and CSIR. Shri Swapan Mitra (BARC), Dr.S.Basu (IITD), Dr. J.G. Pharoah (Queens University, Canada), Dr.Sushanta K. Mitra (IITB), Mr. Puneet Sinha (Pennsylvania State University, USA); Dr. Sameer Khandekar, Dr.B.Basu, Dr.P.K.Panigrahi, Dr.Arun K. Saha and (IITK), were the speakers at the workshop.

Fuel cells are electrochemical devices that convert a fuel's chemical energy directly into electrical energy with high efficiency. With no internal moving parts, fuel cells operate similar to batteries. An important difference is that batteries store energy, while fuel cells can produce electricity continuously as long as fuel and air are supplied. In a sense, our bodies operate like fuel cells because we oxidize hydrocarbon compounds in our food and release chemical energy without combustion.

The best thing about the workshop was that it integrated researches being carried out on fuel cells at various places in India. The workshop served as a platform for detailed discussions among engineers and scientists working in this field. It was successful in propagating awareness in the engineering community on the need to develop high performance, cost-effective fuel cells for a variety of applications.

(**Manoj Rao**)

➢ **COMING UP:**

- Distinguished Lecture Series**: Talk by** Dr. Srikumar Banerjee, Director of BARC, on 2nd March at 1700 Hrs in LHC.
- A talk by Dr. Sumantran, Designer of Tata Indica in the later half of March.
- Poster presentation by PG and PhD students on their research achievementson the 25th of March to be organized by AME-PG.

THE SMALL WONDER

How many times when you are working on something frustratingly tiny, like your wife's wrist watch, have you said to yourself, ''If I could only train an ant to do this!'' What I would like to suggest is the possibility of training an ant to train a mite to do this. What are the possibilities of small but movable machines? They may or may not be useful, but they surely would be fun to make.

(From the talk ''There's Plenty of Room at the Bottom,'' by Richard P. Feynman)

Manufacturing processes that can create extremely small machines have been developed in recent years. Electrostatic, magnetic, pneumatic and thermal actuators, motors, valves, gears and tweezers of less than 100 μm sizes have been fabricated. These have been used as sensors for pressure, temperature, mass flow, velocity and sound, as actuators for linear and angular motions, and as simple components for complex systems such as micro-heat-engines and micro-heat-pumps.

Microelectromechanical systems (MEMS) refer to devices that have characteristic length of less than 1 mm but more than 1 micron, that combine electrical and mechanical components and that are fabricated using integrated circuit batch-processing technologies. MEMS are more than four orders of magnitude larger than the diameter of the hydrogen atom, but about four orders of magnitude smaller than the traditional man-made artifacts.

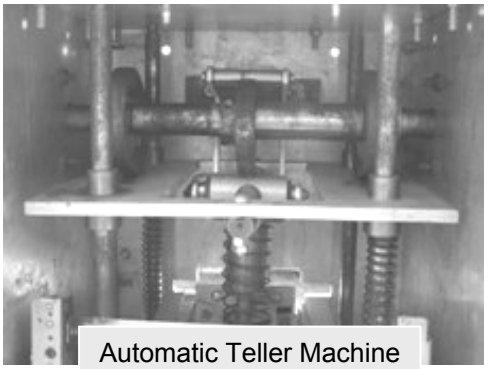
MEMS are finding increased applications in a variety of industrial and medical fields, with a potential worldwide market in the billions of dollars. Accelerometers for automobile airbags, keyless entry systems, and dense arrays of micro mirrors for high-definition optical displays, scanning electron microscope tips to image single atoms, micro-heat-exchangers for cooling of electronic circuits, reactors for separating biological cells, blood analyzers and pressure sensors for catheter tips are but a few of current usage. Micro-ducts are used in infrared detectors, diode lasers, miniature gas chromatographs and high frequency fluidic control systems. Micro-pumps are used for ink jet printing, environmental testing and electronic cooling. Potential medical applications for small pumps include controlled delivery and monitoring of minute amount of medication, manufacturing of nanoliters of chemicals and development of artificial pancreas. We can certainly say that in the coming years, MEMS will revolutionize the world, but we, on our part, have to put a lot of effort for its development.

Ravi Bhadauria

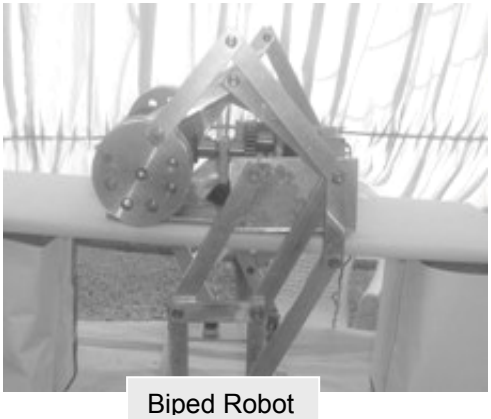
DID YOU KNOW?

The can opener was invented 48 years after cans were introduced! Cans were opened with a hammer and chisel before the advent of can openers. The tin canister was invented in 1810 by a Londoner, Peter Durand. The year before, French confectioner, Nicolas Appert, had introduced the method of canning food by sealing the food tightly inside a glass bottle or jar and then heating it.

The can opener was invented in 1858 by American Ezra Warnet. There also is a claim that Englishman Robert Yeats invented the can opener in 1855. But the can opener did not become popular until, ten years later; it was given away for free with canned beef.



Automatic Teller Machine



Biped Robot

Heat Pipe Demo

AME @ TECHKRITI '06

Engineering, now a days, is synonymous with Computer Science and Electronics. Core engineering, of which Mechanical Engineering is a vital part, has been relegated to lower positions by the emergence of the Software industry. To reinstate the presence and importance of Mechanical Engineering, the AME put up a Mechanical Engineering Exhibition in Endeavour, the working model contest of Techkriti '06.

On display were a Biped Robot, an automatic teller machine, heat pipes and simulations of Fluid flow.

The first two were B.Tech projects made by the Y1 Batch. The Biped robot uses a four bar mechanism to simulate the walking motion. The ATM machine which was a major attraction at the exhibition consists of a very meticulous design comprising cams and springs. The demo of heat pipes was another thing that pulled the crowd. A simple experiment was carried out so that people could see for themselves the high heat transfer rate of a heat pipe. Heat pipes are devices that utilize the phase change of a fluid to transfer heat. The resulting thermal conductivity is much higher than that of any known material.

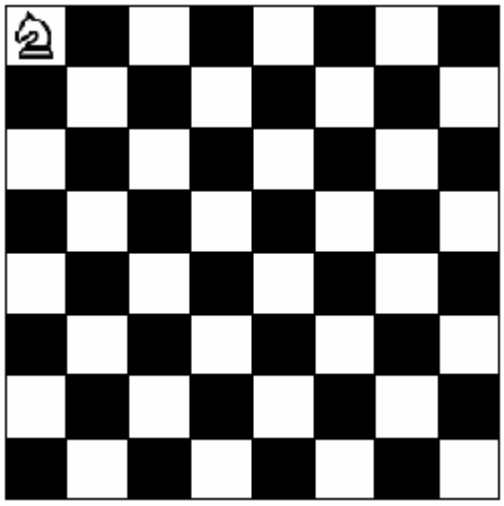
To invoke the interest of the people in flow visualization, there was also a demonstration of unsteady flow past a cylinder simulated on FLUENT, calculation of the vortex shedding frequency by decomposing lift force data to find out the Strouhal no., the non-dimensionalized frequency of vortex shedding.

This was the first time that such an exhibition was organized by the AME. The effort was appreciated by all visitors.

KNIGHT 'S TOUR

A sequence of moves on a chessboard by a chess piece in which each square of a chessboard is visited exactly once is called a tour. Try this out for a knight.

Shashank Mishra



TECHFEST '06

It was the first experience of participating in a technical festival of some other institute and the problem statement was also non-conventional. The problem was to make a wired/wireless remote controlled machine, which could traverse a grid 1250 mm high, collect a cylindrical object located at a specific point below the grid, and then place the cylinder in the hollow cylindrical container provided.

We faced several problems regarding its balance, speed and cost effectiveness but finally decided to make the robot consisting of 2 parts joined by means of clips.

The clips open and close back at the intersections allowing the robot to easily traverse the intersection of the pipes. The clips can move freely attaching themselves to carry the load of the robot. This part also houses the lifting mechanism comprising of a motor, a bobbin, string and a loop for lifting the bucket. The balloons attached to the L shaped rod helps to bring back the rod when the clip has crossed the intersection .The threads attached ensured that the rods come back and remain at there initial position and didn't move under gained momentum. (*Check out the photographs on*: *http://www.iitk.ac.in/robotics/techfest_06.htm*)

In knockouts, we went up to top eight positions (out of 47 teams) with fourth best time (10 seconds) against the best time of 7 seconds. The other team members were Shantanu Agarwal, Sumeet Kale and Sharad Sinha (all second year students).

The versatility of this robot lies in the fact that it can move on pipes made of any substance (need not be magnetic) with sufficiently high speed. The total cost of the robot including the motors was around Rs.700/-.This fantastic and efficient design helped us to beg the "Best Design" award in "GRIP" at Techfest'06 at IIT BOMBAY.

Mayur Dixit