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AMEN

The Association of Mechanical Engineers

NEWSLETTER

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Success is doing ordinary things extraordinarily well

GIVE ME A BRAKE!

A brake is used to apply frictional resistance to a moving machine member to retard its motion. Early automotive brake systems used drum design on all four wheels. They were 'drum brakes' because the components were housed in a round drum that rotated along with the wheel. When the brake pedal was pressed, a set of shoes, present inside, would be forced against the drum and the wheel would be slowed. Fluid was used to transfer the movement of the brake pedal into the movement of the brake shoes, while the shoes themselves were made of a heat- resistant frictional material similar to that used on clutch plates. This design had a flaw. Under high braking conditions, like descending a steep hill with a heavy load or repeated high-speed slowdowns, they would often lose effectiveness, due to too much of heat build up within the drum. Hence drum brakes can only operate as long as they can absorb the heat generated by slowing a vehicles wheel.

The 'disc brakes', though working on the same basic principle, have a far superior design to that of drum brakes. They use a slim rotor and small caliper to halt wheel movement. Within the caliper are two breaking pads, one on each side of the rotor, that clamp together when the brake pedal is pressed. Once again, fluid is used to transfer the movement of the brake pedal into the movement of the brake pedal into the movement of the brake pads. However unlike drum brakes which allow heat to build up inside the drum during heavy loading (or breaking), the rotor used in disc brakes is fully exposed. This exposure works to constantly cool the rotor, greatly reducing its tendency to overheat or cause fading. Hence, we find a lot of vehicles with disc brakes now a day.

Sameer Behre (Y4374)

FROM THE DEPARTMENT

- Along with increasing speed and other parameters, vehicle research, in the past two decades, has been driven by safety considerations. To understand and appreciate the developments in this field, AME organized a **seminar on crash worthiness** on 10th November at 6 p.m. in L9. The speaker Dr. Sudipto Mukherjee , an IITK alumnus, is an Associate Professor at IITD and is presently a visiting faculty at IITK. The topic of the talk was "Towards safer vehicle design".

Dr. Mukherjee said that now-a-days traffic accidents and injuries have emerged like an epidemic. Although it has a lot of energy associated with it, yet it is handled by inexperienced persons. He also added that safety cannot be cognitive. He spoke about the working of some of the safety devices that are commonly used: air bags and seat belts.

Light was thrown on the research work being carried out in IITD in the field of Vehicle Crash Simulations, Human Body FE simulations, Tissue characterization and Crash reconstruction and the use of dummies for experimental purposes. Concluding the talk, he said that transportation is an economic enabler but also a health risk. Technology alone can help in mitigating the risks associated.

- The AME organised **a trip to the Panki thermal power plant** on the 12th of November for the first and second yearites.

It started with the description of the process of unloading of coal that comes from the mines and its subsequent transportation to the appropriate places. The students were then shown the process of removal of big rocks and its conversion to fine particles using the crushers and pulverisers. This was followed by the description of the electricity production cycle: Heat generation from combustion, production of superheated steam using this energy (Rankine Cycle) that moves the turbine producing mechanical energy, its conversion into electrical energy by generators and finally condensation and reuse of the steam after passing through deareator and the economizer.

The group was also shown the Electrostatic Separator where ash particles and flue gases are separated from the ash produced. Ash is then mixed with water to form slurry & stored in ash storage. The stepping up of voltage using transformers and the transportation of electricity was also described

SCOPE OF FLUID FLOW STUDY AT SMALL SCALES:
(A Multidisciplinary outlook)

Continued…

MECHANICAL/AEROSPACE ENGINEERING

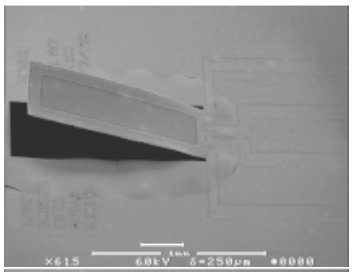
Some applications related to Mechanical, Aerospace and Food Engineering are: (a) Sensors and actuators for food industry process control, (b) Pressure, flow rate and shear stress sensor for engines and aerospace applications, (c) Sensors for identification of explosives and forensics (d) Micro-actuators for flow control related to mixing and combustion efficiency enhancement, and (e) Micro-cantilever. The potential for small scale sensors is related to greater applications of small scale devices in many practical situations. Similarly, the small scale actuators are highly attractive due to their low electrical power consumption. Small expenditure of energy in achieving control of large scale devices can lead to far reaching consequence in many energy devices. The availability of small scale sensors and actuators can open up the possibility of dynamic and distributed mode of control. The mass flow and shear stress sensors are very useful for the flow control applications related to Mechanical, and Aerospace Engineering. The micro cantilever used in atomic force microscope (AFM) and hearing aids has been shown in the figure alongside. The AFM measures the deflection of an atomically sharp probe tip mounted on the end of a cantilever as the tip is scanned over a surface being imaged.

The behavior of the micro cantilever under the influence of fluid particle is of crucial importance. This necessitates the flow characterization at small scales.

PETROLEUM ENGINEERING

Petroleum engineering is another application, which can benefit from the flow measurement of small scales. There is considerable research for enhanced oil recovery of oil trapped in dead ends of the soil. However, these types of complex capillary flows are further complicated by the complex nature of the fluid. The fluid is non-Newtonian and the viscosity is affected by the flow rate. The polymer chain breaks under shear and viscous heating. Therefore, the researchers are struggling to develop proper model for these flows. The proper characterization of flow in these micro pores is expected to contribute significantly towards enhanced oil recovery mechanism.

(To be continued….)



Photograph of a micro-cantilever used in atomic force microscope and hearing aids.

DID YOU KNOW?

The first elevator designed for passengers was built in 1743 for King Louis XV at his palace in France. The one-person contraption went up only one floor, from the first to the second. Known as the "Flying Chair," the mechanism consisted of a carefully balanced arrangement of weights and pulleys hanging inside a chimney. Men stationed inside the chimney then raised or lowered the Flying Chair at the king's command!

THE FUTURE……

Widely fluctuating global oil prices and the depleting resources of fossil fuel has led to greater emphasis on alternative sources of energy and bio-diesel is hogging the limelight. The concept of biodiesel dates back to 1885 when Dr. Rudolf Diesel built the first diesel engine with the full intention of running it on vegetable source.

He first displayed his engine at the Paris show of 1900 and astounded everyone when he ran patented engine on a hydrocarbon fuel - which included gasoline and peanut oil. In 1912 he stated "… *the use of vegetable oils for engine fuels may seem insignificant today. But such oils may in the course of time become as important as petroleum and the coal tar products of our present time".*

In 1970, scientists discovered that the viscosity of vegetable oils could be reduced in a simple chemical process and that it could work well as diesel fuel in modern engine. This fuel is called biodiesel. It is a substitute for, or an additive to, diesel fuel that is derived from the oils` and fats of plants, like Sunflower, Canola or the wonder plant - **Jatropha**.

With its potential to grow in any type of soil and weather conditions, Jatropha is gaining universally accepted as an energy crop. Jatropha curcus is a drought-resistant perennial, growing well in marginal/poor soil. It is easy to establish, grows relatively quickly and lives, producing seeds for 50 years. Among the positive strengths of Jatropha is its promotion as better use of land. A yield of 1.6 t of bio-diesel and 5 t of fertilizer from 6.5 t of seed is expected per ha land after two to three years. One ton of nuts yielding 70 kg refined petroleum, 40 kg light fuel oil, 40 kg regular fuel oil, 34 kg dry tar/pitch/rosin, 270 kg coke-like char , and 200 kg ammoniacal water and natural gas.

Biodiesel is environment friendly. It is as biodegradable as salt .Bio Diesel produces 80% less carbon dioxide and 100% less sulfur dioxide emissions. It can be used alone or mixed in any ratio with mineral oil diesel fuel. It extends the life of diesel engines and is cheaper than mineral oil diesel.

SEPT-O-PROBLEME

	26		35		37	
	31		36		39	
	38		26		24	

Here is a very special grid; around each shaded number are 8 white squares. Each white square should have a number from 1 to 7. Once filled in, these 8 numbers will sum to the shaded number. In addition, once completed correctly, no row or column will contain a duplicate number within a white square. For example, the top row may be 5 6 4 2 3 1 7, etc.

ASME