yantriki 2.0

Volume 2 | 2018–19

Parshvanath Charitable Trust's
A. P. SHAH INSTITUTE OF TECHNOLOGY
(Approved by AICTE New Delhi & Govt. of Maharashtra, Affiliated to University of Mumbai)
(Religious Jain Minority)

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Newsletter from the Dept. of Mechanical Engineering

A. P. Shah Institute of Technology

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From the Principal's Desk

Dear readers,

It gives me immense pleasure to present the second issue of 'Yantriki' that is 'Yantriki 2.0' before you all. Nurturing creativity and inspiring innovation are two key elements of successful education, and the Mechanical Engineering Department at APSIT has been following this motto throughout its journey. This departmental newsletter will be a vital part of this journey as it will serve as a platform for all the students as well as faculties to share their ideas , technical knowledge and opinions on various things happening in APSIT, Mechanical Department.

As practical knowledge is very essential along with the theory knowledge, the department has started various skill development programs for the students. This is going to be very useful for the students to mold themselves according to the industrial requirements. Highly calm and supportive environment of institution develops a spirit of belongingness among staff and students resulting in a community full of innovative ideas for betterment of society. The result of all these things are the success stories of our students which we are going to get through this newsletter from time to time.

I would like to appreciate the Editorial Team and the Designing Team of 'Yantriki 2.0' for putting their valuable efforts for the newsletter and making it reader friendly. Also my heartfelt congratulations to the Head of Mechanical Engineering Department and faculty members for their fruitful efforts.

Dr. Uttam D. Kolekar

PhD .(Electronics and Telecommunication Engineering)

Vision

"To be a nationally renowned Mechanical Engineering Department producing professionals, catering dynamic global industrial needs with sense of responsibility and social sensitivity for contributing towards national growth."

Mission

M1 - To provide an academic foundation in Mechanical Engineering while imbibing professional studies with advance skills to fulfil ever changing global industrial needs.

M2 - To impart graduates with social values and ethics by providing opportunities to solve environmental and social problems.

M3 - To establish an environment that encourages and builds an ambience of learning and practical application of underlying principles at various level.

From the HOD's Desk...

Dear readers...

I am pleased to share with you the second edition of 'Yantriki', the newsletter from Mechanical department of APSIT. The title 'Yantriki' reflects the basis of our department, which is 'Mechanics'! You will be delighted to go through this edition that will connect you to many departmental activities. Also reading the technical articles will definitely enhance your technical knowledge.

Events in Yantriki 2.0 is a look back through all the curricular as well as extra-curricular activities organized by our department in the academic year 2018- 2019. In this period, we've had many informative seminars and good training programmes for our students. All these activities were organised by various student committees of our department like MESA,ISHRAE and SAE. In this edition, we have also covered a success story of our very own 'Modified Auto Club (MAC)' which is truly an inspiration for all our students. Other articles included in this newsletter have covered some amazing technological advancements taking place in the field of science and technology.I hope reading this newsletter will be a delightful experience for all our readers.

My profound thanks to the editorial and designing team of this newsletter for their continuous efforts for this newsletter. I wish may the future issues grow with greater ideas through your appreciation and feedback.

Prof. Venkatesh S. Rao

Head of Department,

Mechanical Engineering

Academic Achievements

1.Students and faculties are encouraged to enroll for NPTEL online IIT certification courses (75+ students certified, 7 faculties certified)

2. Department has started skill next initiative in collaboration with BMW – India.

3. Department is associated with Thane – Belapur Industrial Association.

4. In April'2019 our Modified Auto Club (MAC) students had designed and manufactured solar car from scratch and were Runner ups in Electric Solar Vehicle Championship (ESVC) held at Chandigarh University, Punjab.

Students are encouraged to participate in intra and inter college annual sports and cultural festival 'OJUS'. Last year we won Best Department Award.

Toppers

BE SEMESTER 8

SR NO.	NAME OF THE STUDENTS	GPA
1	DUBEY ABHISHEK RAMESH SAVITREE	9.36
2	UDARE ANAND MANOHAR APARNA	9.08
3	DEOGAONKAR NIMISH MILIND SUCHETA	8.76

TE SEMESTER 6

SR NO.	NAME OF THE STUDENTS	GPA
1	ARYA MANOJ RAJENDRA HANSI	9.84
2	SURANA PRASANNA RAJESH KAVITA	9.68
3	GAIKWAD SHIVKUMAR RAVINDRA LALITA	9.48
4	MISHRA HARIDEV SHAMBUNATH VIMALA	9.48

SE SEMESTER 4

SR NO.	NAME OF THE STUDENTS	GPA
1	RAWAL PRATIK	9.92
2	BARBHAI SAINATH	9.69
3	MANDAL SAGAR	9.54

MAC-AN INSPIRATIONAL STORY...

MAC is an organization of APSIT which finds Eco - friendly solutions to the present global crisis. MAC was established in October 2017 with a motive to propagate the consciousness on world environment issues consisting of inflation, fuel depletion and pollution. After initial failures, the organization built and formed R742 an electric solar car competent enough to convince and attract the community of varied aspects like enthusiasts, special-aided, disabled, learners rental tycoons/dealers. MAC's R742 has set a record in endurance and crosspad rounds at ISIE's ESVC Championship 2019.

MAC took progressive steps towards contentedness in world Environment Expo 2019 held at New Delhi.

~ Shreya Gorule

Reporter of MAC Team

THE TIMES OF INDIA

Thane engg college bags second prize in Asia's electric solar vehicle championship

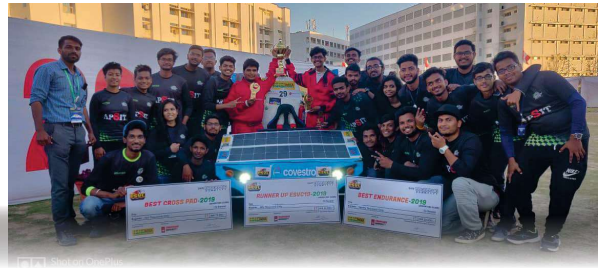
Shrutika.Sukhi
@timesgroup.com

Thane: After working for over seven months designing and manufacturing a solar car, students of an engineering college have helped their college bag the second prize in Asia's electric solar vehicle championship 2019.

A P Shah Institute of Technology (APSIT) was amongst the 58 teams in 28 states that participated in the five-day competition. It was organised by the Imperial Society of Innovative Engineers (ISIE), Chandigarh. The team named Modified Auto Club had around 37 students from mechanical, Information Technology, Electronic & Telecommunication streams. "We took turns everyday to ensure that the vehicle was and we had adequate time to test it. This was the second year of our participation. Last year, we learnt that we had to focus on reducing the weight of the vehicle as it was around 400kg. We used polycarbonate sheets and reduced the weight to around 100kg. The car takes around six hours for solar charging," said Mithilesh Vekhande, vice-captain of the team.

The college bagged the first price in two categories—endurance and cross pad. They even broke the record in the second category. The students said that they will work towards probably having a car running in their campus.

APSIT was amongst the 58 teams in 28 states to participate



APSIT's

MODIFIED AUTO CLUB (MAC)

TEAM MEMBERS (2018-19)

SE MECH

1. Girish Dighe
2. Shreya Gorule
3. Rahul Dusane
4. Akshay Gawade
5. Jaydev Kale
6. Avinash Kamath
7. Paritosh Hattangady
8. Janvi Patel
9. Vrushali Tiwari
10. Hardik Sharda
11. Vidyabhushan Singh
12. Jagdish Vishwakarma
13. Soham Yerandkar
14. Suyash Patil
15. Yash Yadav

TE EXTC

16. Suraj Pandey
17. Dhananjay Yadav
18. Shubhankar Vyavhare

SE EXTC

19. Sudesh Bhar
20. Vedant Shimpi

TE MECH

21. Mithilesh Vekhande
22. Suyash Gandhi
23. Jayesh Jadhav
24. Tanmay Kini
25. Sumeet Vora
26. Anil Yadav
27. Sahil Tare
28. Tejas Sonar
29. Kevin Sangoi
30. Moulik Soni

SE IT

31. Sujoy Dev

BE MECH

32. Vishal Chouthmal
33. Swapnil Gada

ABOUT MESA

MECHANICAL ENGINEERING STUDENTS ASSOCIATION (MESA) at APSIT, aims to play a pivotal role in the development of students as engineers by various out-of-curriculum and extracurricular activities. Also to bring about the technical development of students by organizing seminars, workshops and other activities and also to improve non-technical abilities of students i.e. good communication skills, managerial abilities, presentation skills and team work.

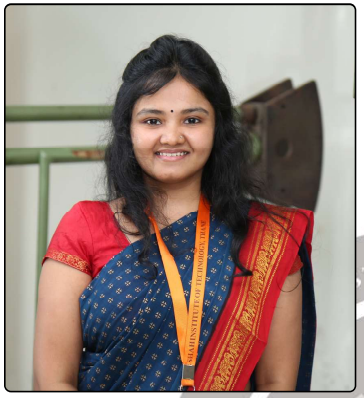
CNC Lab (CNC and VMC Machines)

CNC machining is a manufacturing process in which pre-programmed computer software dictates the movement of factory tools and machinery. The process can be used to control a range of complex machinery, from grinders and lathes to mills and routers. With CNC machining, three-dimensional cutting tasks can be accomplished in a single set of prompts.

Abbreviation for "Computer Numerical Control," the CNC process runs in contrast to — and thereby supersedes — the limitations of manual control, where live operators are needed to prompt and guide the commands of machining tools via levers, buttons and wheels. To the onlooker, a CNC system might resemble a regular set of computer components, but the software programs and consoles employed in CNC machining distinguish it from all other forms of computation.

Department of Mechanical Engineering

Mechanical Engineering Students Association



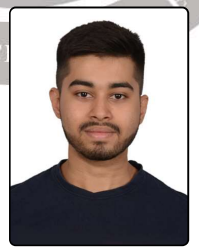
Prof. Arti Vishwanath
MESA Incharge

Hirain Singadia
President

Suyash Patil
Vice President

Tanmay Deshpande
Secretary

Samruddhi Kadam
Treasurer



Yash Keni
Chief Editor - Newsletter

https://www.instagram.com/mesa_apsit/

ABOUT ISHRAE

The Indian Society of Heating, Refrigerating and Air Conditioning Engineers (ISHRAE), was founded in 1981 at New Delhi by a group of eminent HVAC&R professionals. ISHRAE today has more than 28,780 HVAC&R professionals and Student-members. ISHRAE operates from 41 Chapters and sub Chapters spread all over India, with HQ in Delhi. It is led by a team of elected officers, who are members of the Society, working on a voluntary basis, and collectively called the Board of Governors. Mission of ISHRAE is to promote the goals of the Society for the benefit of the general public. Towards this objective, the Chapters of the Society participate in, and organize, activities to protect the Environment, improve Indoor Air Quality, help Energy Conservation, provide continuing education to the Members and others in the HVAC & related user Industries and offer certification programs, career guidance to students at the local colleges and tertiary institutions.

Objectives:

- Advancement of the Arts and Sciences of Heating, Ventilation, Air Conditioning and Refrigeration Engineering and Related Services.
- Continuing education of Members and other interested persons in the said sciences through Lectures, Workshops, Product Presentations, Publications and Expositions.
- Rendition of career guidance and financial assistance to students of the said sciences.
- Encouragement of scientific research.

The Indian Society of Heating, Refrigerating and Air Conditioning Engineers (ISHRAE)

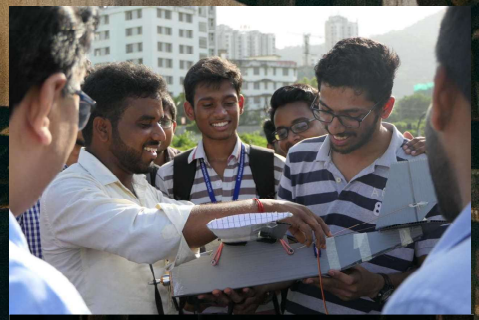
https://www.instagram.com/apsitishrae/

APSIT-ISHRAE had organized a visit to ACREX-2019

Mini project exhibitions held for students to enhance their technical skills

SAE Technical Quiz

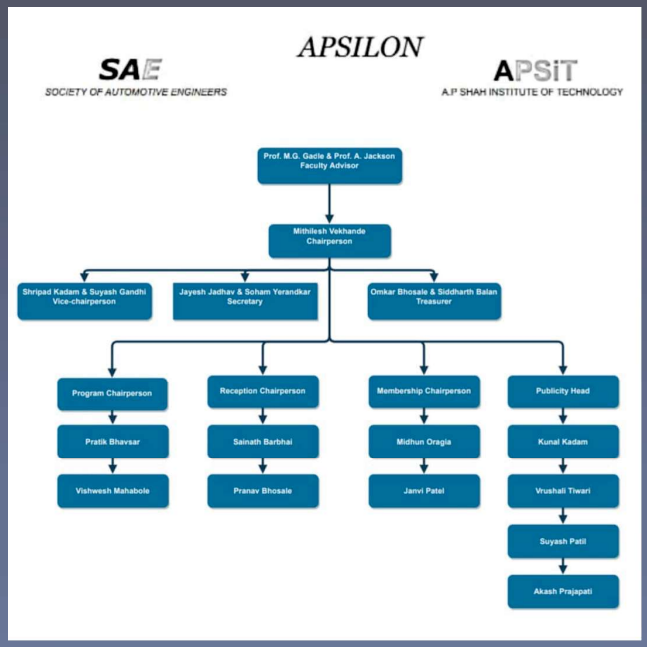
Two day RC- Aircraft workshop – Students after flying their own planes



Technical Inspection of the RC Aircraft

14-15

Society of Automotive Engineers (SAE)



About SAE

SAE INDIA is India's leading resource for mobility technology. As an individual member-driven society of mobility practitioners the ownership of SAEINDIA wrests with its members who are Individuals from the mobility community, which includes Engineers Executives from Industry, Government Officials, Academics and Students. SAE INDIA is a strategic alliance partner of SAE International registered in India as an Indian non profit engineering and scientific society dedicated to the advancement of mobility industry in India.

SAE is the most preferred technical body for knowledge dissemination & skill development of mobility professionals, students, and faculty. They are a trusted think-tank advising policymakers on Mobility-Related Matters. They are also a self-sustaining Society with more than 10% of Mobility Professionals as Members. Finally they are a nimble and Professional Organization Creating Value for Mobility Engineering Community.

The Objective of starting an SAE college club at APSIT is to provide opportunities to engineering students to showcase their talents in design, manufacture and testing of all terrain vehicle, simulating the real world product development process.

https://www.instagram.com/apsilon_apsit/

List of events/workshops held in Academic Year 2018-19

Sr.No	Name of Event	Date	Experts	Organizing Committee
1	Expert talk on "World Class Maintenance" for TE (Batch 3)	04/08/18	Mr. Vartak Prasad, Mahindra and Mahindra	MESA (2018-19)
2	Expert talk on "Role of Mechanical Engineers in Sales and Marketing" for BE (Batch 2)	14/08/18	Mr. Sunil Joshi, Sales Director, Praxiar Ltd.	MESA (2018-19)
3	Seminar on "Zero Liquid Discharge and Mechanical Utilities in Process plants" For SE (Batch 4)	24/08/18	Ms. Pallavi Phoujdar, Mr. B. T. Sapate, CETP	MESA (2018-19)
4	Workshop on "RC – Aircraft" for 40 students of SE, TE and BE (Batch 4,3,2)	07/09/18 to 08/09/18	Aerotrix Labs	MESA (2018-19)
5	Session lecture on " Study smarter not Harder" for SE (Batch 4)	13/08/18	Student President – Manoj Arya	MESA (2018-19)
6	Session lecture on " Project Planning and Development" for SE (Batch 4)	04/09/18	Student Secretary – Suyash Gandhi	MESA (2018-19)
7	Expert talk on "Product Development and Engineering" for FE and SE (Batch 5,4)	15/03/19	Mr. Jitendra Bhambure (VP – Bluestar)	MESA (2018-19)
8	Expert talk on "Understanding Environmental issues through Engineering principles" for TE (Batch 3)	22/03/19	Mr. Chandan Mulherkar (Senior Researcher at CERE)	MESA (2018-19)
9	Introductory course on "Piping Engineering" for TE (Batch 3)		Mr. Gaurav Patil, TOYO Engineering	Value Added Program
10	Introduction to Open Foam Software for SE, TE (Batch 4,3)		IITB	Spoken Tutorial
11	Industrial Visit For ISHRAE for SE, TE, BE (Batch 4,3,2)	05/01/19	Bluestar Ltd	ISHRAE (2018-19)
12	Expert talk on "INTRODUCTION TO RADIANT COOLING, CHILLBEAMS AND HEAT PUMPS" for TE & BE Students (Batch 3,2)	17/01/19	Mr. Rahul Soni	ISHRAE (2018-19)
13	Filtration for Diesel Engines for SE,TE,BE (Batch 4,3,2)	25/01/2019	Mr. Sudhir Vaidya, SAE Wertern Region	SAE (2018
14	Current Challenges in Automobile Industry for SE,TE,BE (Batch 4,3,2)	25/01/2019	Mr Prakash Banait	SAE (2018
15	SAE – Technical Quiz competition for SE,TE,BE (Batch 4,3,2)	05/01/2019	-	SAE (2018-19)

Industry Collaborations and College Initiatives

"Dassault Systems" CLIC Program

This Collaborative Learning and Innovation Center (CLIC) offers various trainings on 3D designing and simulations for Mechanical Engineering students.

Autodesk Hub

APSIT is Autodesk Authorized Training Center(ATC) and Learning Partner. The courses cater to 3D Modeling and Animation, CAD/CAM, CAE, Prototyping and Simulation, Building Information Modeling(BIM)

e-Yantra Robotics Lab

To address futuristic needs of industrial automation, eYantra Robotics Lab (eYRL@APSIT) is setup in collaboration with IIT Bombay. eYRL facilitates Design and Development of Industrial Robotic Automation.

ANSYS Authorized Training Center

Students ANSYS provides outstanding value, laying the foundation for educational and other opportunities that arise from using best-in-class engineering simulation tools. The high-performance bundles of ANSYS simulation technology include structural, thermal, fluid dynamics, explicit dynamics, electronics and multiphysics solvers, ANSYS Workbench, CAD import tools, solid modeling, advanced meshing, and post-processing features.

18-19

Siemens Excellence Centre*

APSIT is Center of Excellence in CAD/CAM/CAE involved in Engineering Design and training.

BMW Skill Next

Students will have handson experience on BMW Twin Power Turbo, Inline 4 cylinder diesel engine, eight-speed Steptronic, automatic transmission units will be installed.

ICT Academy

The aim of India's higher education system is attaining sustainable development and achieving higher growth rates which could be enabled through creation, transmission and dissemination of knowledge. Higher education at all levels in the country is witnessing a consistent growth pattern marked by the setting up of new institutions and the improvement of the existing ones.

Free GATE/GRE*/CAT* Coaching

An initiative to prepare students for post graduation studies in India and abroad.

Attendance Rewards!!

Regularity of student meets values here !!! Now Student gets AMAZING PERKS for JUST being :

REGULARLY PRESENT IN COLLEGE . . . include a Rs.1000 Coupon . . .

Digital Marketing Academy

Students The marketing paradigm has transformed with the rise of digital technologies. To succeed, marketers must be able to plan, implement, and measure the impact of digital strategies that are suited to today's customers and integrated with their traditional marketing and business goals.

https://www.apsit.edu.in/mechanical-engineering-1

Engineers develop first method for controlling Nanomotors

By Tejas Sonar (BE B)

In a breakthrough for nanotechnology, engineers at The University of Texas at Austin have developed the first method for selecting and switching the mechanical motion of nanomotors among multiple modes with simple visible light as the stimulus.

The capability of mechanical reconfiguration could lead to a new class of controllable nanoelectromechanical and nanorobotic devices for a variety of fields including drug delivery, optical sensing, communication, molecule release, detection, nanoparticle separation and microfluidic automation.

The finding, made by Donglei (Emma) Fan, associate professor at the Cockrell School of Engineering's Department of Mechanical Engineering, and Ph.D. candidate Zexi Liang, demonstrates how, depending on the intensity, light can instantly increase, stop and even reverse the rotation orientation of silicon nanomotors in an electric field. This effect and the underlying physical principles have been unveiled for the first time. It switches mechanical motion of rotary nanomotors among various modes instantaneously and effectively.

The researchers published their findings in the Sept. 14 issue of Science Advances.

Nanomotors, which are nanoscale devices capable of converting energy into movement at the cellular and molecular levels, have the potential to be used in everything from drug delivery to nanoparticle separation.

Using light from a laser or light projector at strengths varying from visible to infrared, the UT researchers' novel technique for reconfiguring the motion of nanomotors is efficient and simple in its function. Nanomotors with tunable speed have already been researched as drug delivery vessels, but using light to adjust the mechanical motions has far wider implications for nanomotors and nanotechnology research more generally.

"The ability to alter the behavior of nanodevices in this way -- from passive to active -- opens the door to the design of autonomous and intelligent machines at the nanoscale," Fan said.

Fan describes the working principle of reconfigurable electric nanomotors as a mechanical analogy of electric transistors, the basic building blocks of microchips in cellphones, computers, laptops and other electronic devices that switch on demand to external stimuli.

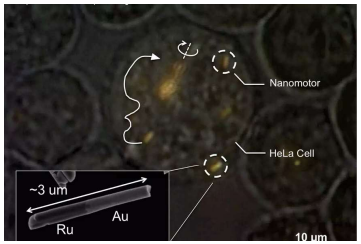
"We successfully tested our hypothesis based on the newly discovered effect through a practical application," Fan added.

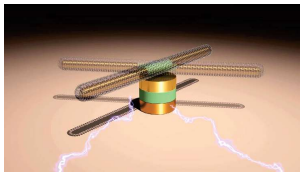
"We were able to distinguish semiconductor and metal nanomaterials just by observing their different mechanical motions in response to light with a conventional optical microscope. This distinction was made in a noncontact and nondestructive manner compared to the prevailing destructive contact-based electric measurements."

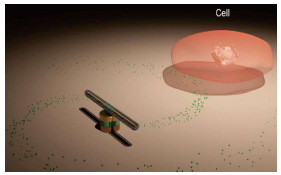
The discovery of light acting as a switch for adjusting the mechanical behaviors of nanomotors was based on examinations of the interactions of light, an electric field and semiconductor nanoparticles at play in a water-based solution.

This is Fan and her team's latest breakthrough in this area. In 2014, they developed the smallest, fastest and longest-running rotary nanomotors ever designed.

The research was funded by Fan's National Science Foundation Faculty Early Career Development Award and the Welch Foundation.







SpaceX Raptor Engine

By Yash Keni (TE A)

SpaceX Raptor engine is a Full Flow Staged Combustion cycle engine which is a closed cycle engine unlike Merlin or F-1 engines which used Gas generator cycle and better than the RS25/68 or RD-180 which used Staged Combustion Cycle. This type of engine has 2 preburner. One for oxygen rich side and other for fuel rich side. Exhausts of these preburners run their respective turbopumps which pumps fuel rich gas and oxydizer rich gas into the Combustion Chamber to unleash the Awesomeness. If SpaceX can make Raptor engine fly with the awaited Starship then SpaceX would be the first to fly these engines.

Cycle	Full-flow staged combustion
Oxidizer	Subcooled liquid oxygen
Fuel	Subcooled liquid methane
Chamber Pressure	300 bar
Throttle Capability	20% to 100% thrust

Sea-Level Nozzle
Expansion Ratio: 40
Thrust (SL): 3,050 kN
Isp (SL): 334 s

Vacuum Nozzle
Expansion Ratio: 200
Thrust: 3,500 kN
Isp: 382 s

Teaching computers to intelligently design 'billions' of possible materials

By Shreyas Vyas (BE B)

Discovering how atoms -- such as a single layer of carbon atoms found in graphene, one of the world's strongest materials -- work to create a solid material is currently a major research topic in the field of materials science, or the design and discovery of new materials. At the University of Missouri, researchers in the College of Engineering are applying one of the first uses of deep learning -- the technology computers use to intelligently perform tasks such as recognizing language and driving autonomous vehicles -- to the field of materials science.

"You can train a computer to do what it would take many years for people to otherwise do," said Yuan Dong, a research assistant professor of mechanical and aerospace engineering and lead researcher on the study. "This is a good starting point."

Dong worked with Jian Lin, an assistant professor of mechanical and aerospace engineering, to determine if there was a way to predict the billions of possibilities of material structures created when certain carbon atoms in graphene are replaced with non-carbon atoms.

"If you put atoms in certain configurations, the material will behave differently," Lin said. "Structures determine the properties. How can you predict these properties without doing experiments? That's where computational principles come in."

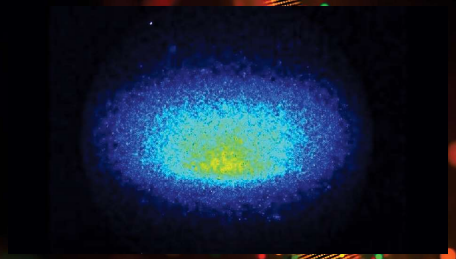
Lin and Dong partnered with Jianlin Cheng, a William and Nancy Thompson Professor of Electrical Engineering and Computer Science at MU, to input a few thousand known combinations of graphene structures and their properties into deep learning models. From there, it took about two days for the high-performance computer to learn and predict the properties of the billions of other possible structures of graphene without having to test each one separately.

Researchers envision future uses of this artificial intelligence assistive technology in designing many different graphene related or other two-dimensional materials. These materials could be applied to the construction of LED televisions, touch screens, smartphones, solar cells, missiles and explosive devices.

"Give an intelligent computer system any design, and it can predict the properties," Cheng said. "This trend is emerging in the material science field. It's a great example of applying artificial intelligence to change the standard process of material design in this field."

Using lasers to visualize molecular mysteries in our atmosphere

A new technique offers a direct way for scientists from varied fields to study fundamental molecular interactions **By Murtaja Khan (TE A)**



Invisible to the human eye, molecular interactions between gases and liquids underpin much of our lives, including the absorption of oxygen molecules into our lungs, many industrial processes and the conversion of organic compounds within our atmosphere. But difficulties in measuring gas-liquid collisions have so far prevented the fundamental exploration of these processes.

Kenneth McKendrick and Matthew Costen, both at Heriot-Watt University, in Edinburgh, U.K., hope their new technique of enabling the visualization of gas molecules bouncing off a liquid surface will help climate scientists improve their predictive atmospheric models. The technique is described in The Journal of Chemical Physics, from AIP Publishing.

"The molecule of interest in our study, the hydroxyl radical, is an unstable fragment of a molecule that affects the whole of the understanding of atmospheric chemistry and things that genuinely affect climate," said McKendrick. "Some of these important OH reactions take place at the surface of liquid droplets, but we can't see surface interactions directly, so we measure the characteristics of the scattered molecules from real-time movies to infer what happened during their encounter with the liquid."

Laser sheets are the key to the technique, inducing a short-lived fluorescent signal from each molecule as it passes through 10 nanosecond pulses. Laser-induced fluorescence isn't new in itself, but this was the first time laser sheets have been applied to scattering from a surface in a vacuum with no other molecules present to interfere with the scattering from the molecular beam. This enabled the McKendrick team to capture individual frames of molecular movement, from molecular beam to liquid surface and scattering, which were compiled into movies.

Unlike previous methods of capturing gas-liquid interactions, all the characteristics needed to understand the interaction -- speed, scatter angle, rotation, etc. -- are captured within the simple movies that McKendrick describes as "intuitive." By observing the molecular film strips, McKendrick's team noted molecules scattered at a broad range of angles, similar to a ball bouncing off in all directions when thrown onto an uneven surface. This simple observation directly proved the surface of liquids is not flat.

"When you get down to the molecular level, the surface of these liquids is very rough, so much so that you can barely tell the difference between the distribution of molecules when directed down vertically onto the surface or when at an angle of 45 degrees. This finding is important for understanding the chances of different molecular processes happening at the liquid surface," said McKendrick.

As they improve their technique, McKendrick's team hopes to collect more refined information from atmospheric relevant liquids. But McKendrick points out the technique is not limited to the field of atmospheric science and is likely to soon be applied to understanding the gas-solid interactions that occur in processes such as the catalytic conversion of gases in car engines.

By Siddhesh Chaubal (BE A)

On 1st March 2019, ISHRAE Committee of our college had organized a visit for TE & BE students to Acrex 2019, South Asia's largest HVAC & R exhibition that was held in Mumbai. Many Indian as well as foreign MNC's had participated as exhibitors. Not only we got to see so many inventions in HVAC & Fire Security, but also got an opportunity to interact with industrial people from engineering & sales backgrounds.

Writing about some of the many new inventions, that I found most amusing.

1. **Green Dehumidifier**: The basic working principle of a regular dehumidifier is to dry the moist room air by a blower such that it passes first through the cooling coil, where the moisture of the air condenses to water & then through a warmer coil to reheat the air. The working cycle of a dehumidifier is same as that of a refrigerator (Viz. VCC), & the refrigerant used is also same or similar to that of a refrigerator, making it less of an eco-friendly device.

Green Dehumidifiers seem to make a revolutionary change in the basic concept/principle of dehumidification. Green Dehumidifiers use a solid desiccant rotor, consisting of stabilized silica gel bonded to a high resistant substrate that is slowly rotated. As the air passes through the fluted rotor, it absorbs moisture from the process air that is dictated to the unit & is blown through & approximate 70% of the rotor surface. This produces very dry discharge air with extremely low relative humidity, which is ducted to the AHU or area being treated to facilitate drying of other moisture control applications. Heat is applied to the remaining 30% of the rotor surface to reactivate the desiccant material. The resulting wet air discharge is vented outside. Other advanced features like microprocessor controllers are also incorporated for precision control and maximum operating efficiency

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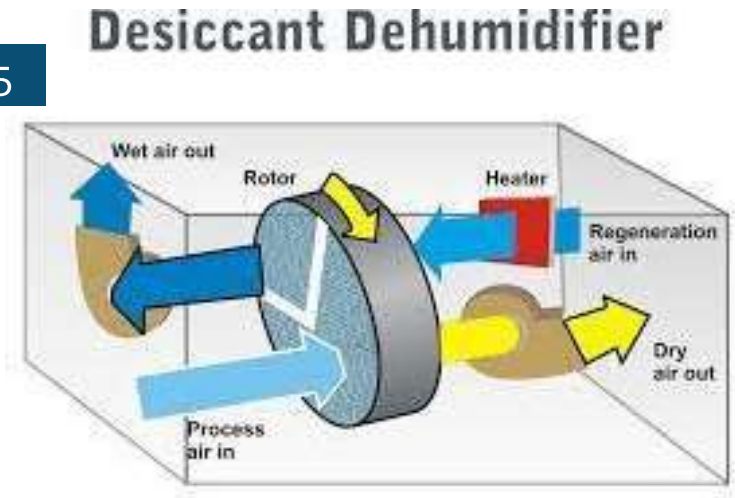


Underfloor Air Distribution (UFAD)

1. **Underfloor Air Distribution (UFAD):** Underfloor air distribution (UFAD) is an air distribution strategy for providing ventilation and space conditioning in buildings as part of the design of a HVAC system. UFAD systems use an underfloor supply plenum located between the structural concrete slab and a raised floor system to supply conditioned air through floor diffusers directly into the occupied zone of the building. UFAD systems are similar to conventional overhead systems (OH) in terms of the types of equipment used at the cooling and heating plants and primary air-handling units (AHU). Key differences include the use of an underfloor air supply plenum, warmer supply air temperatures, localized air distribution (with or without individual control) and thermal stratification. Thermal stratification is one of the featured characteristics of UFAD systems, which allows higher thermostat set points compared to the traditional overhead systems (OH). UFAD cooling load profile is different from a traditional OH system due to the impact of raised floor, particularly UFAD may have a higher peak cooling load than that of OH systems. This is because heat is gained from building penetrations and gaps within the structure itself.

Benefits of UFAD Systems:

- Reduced energy usage
- Flexibility for re-locating wiring, piping, and other building services
- Improved Ventilation Efficiency and Indoor Air Quality (IAQ)
- Documented improvements in occupant comfort, productivity, and health
- Reduced slab-to-slab height and facade costs

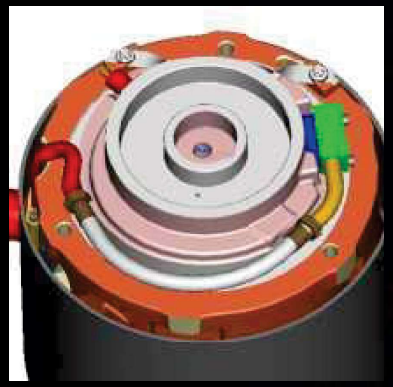
UFAD is often used in office buildings, particularly highly-reconfigurable and open plan offices where raised floors are desirable for cable management. UFAD is appropriate for a number of different building types including commercials, schools, churches, airports, museums, libraries etc.

Notable buildings using UFAD system in North America include The New York Times Building, Bank of America Tower and San Francisco Federal Building. Careful considerations need to be made in the construction phase of UFAD systems to ensure a well-sealed plenum to avoid air leakage in UFAD supply plenums.

EVI Heat Pump

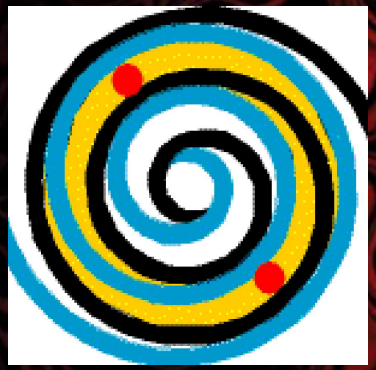
EVI Heat Pump: EVI (Enhanced Vapour Injection) compressor technology makes use of an economizer with the vapour compression cycle. This cycle offers the advantages of more heating capacity and a better COP than with a conventional cycle. Both the capacity and the COP improvement are proportional to the temperature lift and this technology offers best results at low evaporating temperatures where capacity and efficiency are most needed. It is usually possible to specify a smaller displacement compressor for a given cooling load. Additionally the heating provided by the interstage injection allows the compressor to operate over a similar envelope to a conventional liquid injected model, and so the vapour-injected scroll can operate at all the normal low temperature application conditions.

Position of the injection ports in the scroll



set and the internal tubing connecting the injection inlet with the scroll set

The vapor is injected into the scroll set at an intermediate point in the compression process via two symmetrically positioned ports as shown on the left. The size and



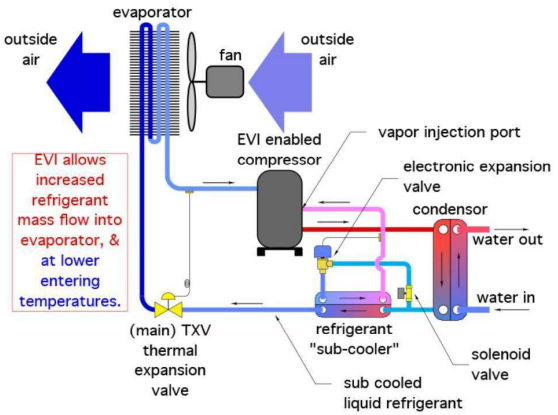
position of these ports have been optimized to ensure maximum COP and capacity benefit at typical operating conditions. A single inlet connection on the shell communicates with the injection ports via a flexible tube as shown on the right, and drillings in the fixed scroll. The flexibility ensures that axial compliance is maintained.

The most advanced low-temperature Enhanced Vapors Injection compressor technology (EVI) heat pump delivers higher heating capacity at low evaporation temperature thereby better responding to heating requirements than normal air source heat pump, it also results in less supplementary heating to cover the full heating demand on the coldest days. It has been further optimized to enable heat pumps to efficiently produce water temperature up to 60 DC during cold winter time.

Advantages of EVI Heat Pump:

- Capacity Improvement: The capacity is improved by increasing the enthalpy difference in the system rather than increasing mass flow. This is accomplished without increasing displacements.
- Increased COP: The efficiency improves due to the fact that the gain in capacity is greater than the increase in power that the compressor consumes.
- Cost and Energy Advantage: Because a smaller size compressor can be used to achieve the same capacity as a larger conventional model, there is an inherent cost advantage

The EVI heat pump cycle is as shown below:



Acknowledgement

Visiting Acrex 2019 has opened new doors to HVAC industry, which I'm finding very intriguing. The industrial exposure to recent inventions & trends in HVAC & the knowledge we had acquired that day is of high importance to me. It has truly been an unforgettable experience. I'm thankful to ISHRAE Student Chapter & Prof. Umais Momin for organizing the visit.

Wireless Battery Charging

By Vinayak Rachha (BE B)

1.Introduction to Wireless Battery Charging

Wireless charging eliminates the cable typically required to charge mobile phones, cordless appliances and so on. With a wireless charger, the battery inside any battery-powered appliance can be charged by simply placing the appliance close to a wireless power transmitter or a designated charging station. As a result, the appliance casing can be made completely sealed, even waterproof. Besides the inherent convenience it offers, wireless charging can also greatly enhance reliability, since the charging plug on the side of an appliance can suffer mechanical damage easily, or simply by someone inadvertently plugging in the wrong adapter. The underlying principle behind wireless charging is the well-known Faraday's law of induced voltage, commonly used in motors and transformers.

2.Basics

Wireless battery charging uses an inductive or magnetic field between two objects which are typically coils to transfer the energy from one to another. The energy is transferred from the energy source to the receiver where it is typically used to charge the battery in the device.

This makes wireless charging or inductive charging ideal for use with many portable devices such as mobile phones and other wireless applications. However they have also found widespread use in products such as electric toothbrushes where cordless operation is needed and where connections would be very unwise and short-lived.

The system is essentially a flat form of transformer - flat because this makes it easier to fit into the equipment in which it is to be used. Many wireless battery charging systems are used in consumer items where small form factors are essential.

The primary side of the transformer is connected to the energy supply that will typically be a mains power source, and the secondary side will be within the equipment where the charge is required.

In many applications the wireless battery charging system will consist of two flat coils. The power source is often contained within a pad or mat on which the appliance to be charged is placed.

There are several key concepts associated with the transmission of power wire-lessly. Aspects like efficiency, diameter of the coils, frequencies used and the like all have a bearing on the way the wireless charging works.

3.Applications

Smart Phones, Portable Media Players, Digital Cameras, Tablets and Wearables:

Multi-standard interoperability is preferred. Wireless charging can coexist with NFC (Near Field Communication) and Bluetooth, allowing for very creative solutions

Accessories:

Headsets, wireless speakers, mice, keyboards and many other applications can benefit from wireless power transmission. Plugging charging cables into the tiny connectors of ever-shrinking devices is an impediment to robust design. For example, Bluetooth headsets need to be sweat-proof to survive in a gym environment. Only wireless charging can enable that possibility.

Public Access Charging Terminal:

Deployment of charging pads (transmitters) in the public domain requires systems to be safe and secure. But smart charging systems can go well beyond stand-alone charging solutions. They can enable quick network-connectivity and create billable charging stations if desired. Many coffee shops, airport kiosks and hotels support these scenarios. Furniture manufacturers also design-in discreet wireless power transmitters into their end and side tables

Computer Systems:

Laptops, notebooks, ultra books and tablet PCs are all candidates for wireless charging as either hosts or clients. The possibilities are endless.

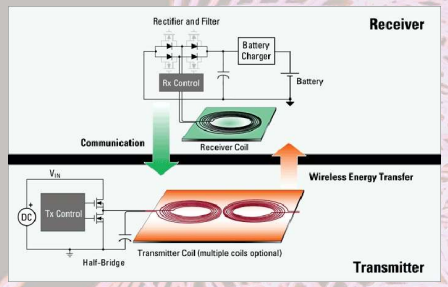
Electric Vehicles:

Smart charging stations for EVs (electric vehicles) are also coming up, but require much higher powers. Standards are under development.

4.Wireless Charging Standards for Compliant Wireless Power Transmission

There are three major competing wireless charging standards that have emerged in the last few years, including Qi, PMA, and Air fuel, as explained further below. All three are essentially based on Faraday's law of induced voltage, and utilize inductive coils for wireless power transmission, but are defined to function at different frequencies with different control schemes. As such, each wireless power standard offers unique benefits in technology, with different levels of industry support and market share.

In traditional Chinese culture, Qi (pronounced "Chee") is frequently translated as "natural energy", "life force" or "energy flow". It is also the name of the industry standard created by the Wireless Power Consortium (WPC). Qi currently supports wireless power transfer of up to 5 W over distances up to 5 mm, but is being quickly extended to deliver up to 15 W, and thereafter to 120 W over much larger distances.



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5.Major Components of Wireless Battery Charging System

The wireless charging transmitter is powered by an input DC rail of 5 V to 19 V, typically derived from a USB port or an AC/DC power adapter.

A switched transistor bridge using two or four FETs drives a coil and series capacitor. A resonant frequency is set internally, by means of the series capacitor.

The transmitter has a coil to transfer power by electromagnetic induction. Some transmitters support multi-coil arrays, driven by separate bridges which are automatically selected to deliver the highest coupled power into the wireless power receiver.

The induced power is coupled to the wireless power receiver, which has a similar coil to collect the incoming power.

The receiver rectifies the power by means of diode rectifiers, usually made of FETs for improving the efficiency. It also filters the power using ceramic output capacitors, and then applies it to the battery that needs to be charged, either through a linear stage or a switching regulator.

The battery inside the portable device receives the power and charges up. The receiver can command the transmitter to adjust the charging current or voltage, and also to stop transmitting power completely when end of charge is indicated.

6.Primary Design Considerations

Wireless electricity is certainly a complex area. When integrating a wireless charging system into a device, one must first decide which wireless power standard is most appropriate for the application. In some industries, offers dual-mode solutions to maximize interoperability and convenience.

Coil selection is defined by the standards. All major magnetic vendors provide the same standard coils (as defined). An engineer then typically picks coils based on the application, depending on input DC voltage and output requirements. However, the appropriate coil geometry and coil type is usually the exact one used in the evaluation kit of the particular receiver or transmitter IC solution.

Typically, only a few millimetres of space is required inside the receiver to accommodate the coil and associated electronics. Some shielding may be necessary to prevent noise and EMI pickup occurring inside the device. Fuel gauging is usually not integrated in wireless chargers, so this feature may need to be supported separately

Another consideration during integration is that power cannot be transferred across a metal enclosure, since metal effectively shields the receiver from the transmitter. Therefore the systems designer needs to have a relatively flat plastic interface available on the receiver casing, for the wireless charging coils to face each other. Furthermore, the plastic wall cannot be more than a couple millimetres thick, as that can affect the transfer of power too.

Lastly, some engineers realize the need to accurately detect a foreign metallic object if present in the power transfer path to avoid an overheating condition. To address this need, all of feature robust foreign object detection and control circuitry making the solutions compatible with all major safety regulations.

7.Conclusion

Wireless charging is convenient and fairly efficient, but there has not been enough research done to increase efficiency and distance necessary between the device and charger. Currently, electric toothbrushes and cellular phones need to be in contact with the charger's surface. This makes it easier to charge and saves a few seconds fiddling with cords, but the device is still essentially plugged in and immobile where as having a longer cord would allow use and charging at the same time. The future for wireless charging will include longer ranges between the device and charging mechanism as well as a higher efficiency over a longer distance. At some point, it could be possible to charge multiple devices efficiently and safely from another room of a building solving the issue of battery life.

"Chandrayaan 2 is an Indian lunar mission that will boldly go where no country has ever gone before — the Moon's south polar region. Through this effort, the aim is to improve our understanding of the Moon — discoveries that will benefit India and humanity as a whole."
22nd July 2019

Cover by Shreyas Vyas,