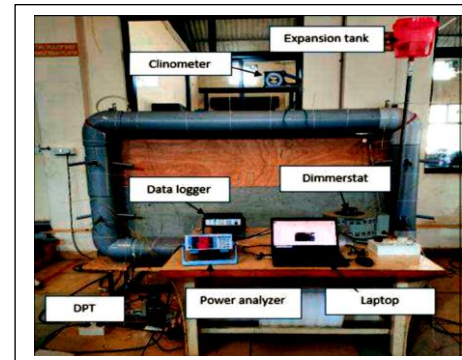




One-day workshop on
Natural circulation loops - Theory and Applications (NCL-2023)
in Offline Mode
Sponsored by DST, SERB under SSR Scheme
Date: April 26, 2023



About the workshop

The workshop aims to discuss the scope and avenues of natural circulation loop (NCL) application in the present-day scenario. The scope has been ever-expanding due to advancements in computational science and experimental techniques as well as inherent reliability posed by NCL. A comprehensive understanding of the flow physics calls for a combined exercise of experimental, theoretical, and numerical studies. The workshop is designed to offer insights into emerging areas of NCL applications through experimental techniques and numerical simulation.

About MIT Manipal



Manipal Institute of Technology (MIT), Manipal was established in the year 1957 as one of the first pioneering self-financing engineering colleges in the country. In the year 2000, it became a constituent institute of the Deemed University - Manipal Academy of Higher Education (MAHE). With a total student intake of about 2500 per year, and around 10,000 students, over 650 faculties, over 1000 support staff, over 30,000 alumni, the Institute provides the right ambiance and platform for the students' all round development. It has the requisite student to teacher ratio. MIT has 18 undergraduate programs, 30 Masters Programs and Doctoral programs in all streams of Engineering and Science under 18 different departments. The institute undertakes sponsored research programmes supported by funding agencies such as DST, CSIR, AICTE and the Ministry of Environmental Sciences. It has collaborative research programs in association with premier research laboratories and institutes in India and abroad.

- **Eligibility:** Faculty/Working professionals/Research scholars/M Tech students
- **Free Registration for all**
- **Application:** Google form - <https://forms.gle/Qjn6xZP5PZ7R2aWSA>
- **Last date:** 23rd April 2023
- **Venue:** Seminar Hall, Department of Mechanical & Industrial Engg. Academic Block 1, MIT Manipal
- Participants need to bear their travel and accommodation expenses
- **For queries:**
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Objective

Holistic approach to research on natural circulation loop through experiments and simulation.

Overview

➤ **Forenoon session** - Comprises lectures (tentative schedule detailed below) on fundamentals of NCL and potential applications.

While the first lecture offers a bird's eye view of the functioning of NCL, the subsequent talks will be focused on specific applications namely,

- Heat transfer augmentation in NCL using supercritical carbon dioxide as the loop fluid. Although such fluids are capable of generating high flow rates, interesting behavior of heat transfer enhancement and deterioration with applied heat flux is observed.
- Air injection in NCL has dual functions i.e. improves stability and enhances loop flow rate. The dominance of void buoyancy over the thermal effect is responsible for such an interesting observation.
- Coupling of NCL could be single phase and two phase loops or loops with different fluids. Influence of stability behavior of primary loop over subsequent loops is the crux of the analysis.
- Reliable and power-free operation of NCL even suits in the thermal management of photovoltaic module

➤ **Afternoon session** – Apart from the laboratory visit, to know how the in-house construction of experimental set ups and instrumentation facilities, lectures on NCL in solar thermal energy conversion includes,

- Application of NCL in solar parabolic collector is an interesting field as it combines renewable energy technology and sustainable energy transportation mechanism.
- Compact version of NCL i.e. thermosiphon heat transport device is gaining importance in the field of nuclear power plant and solar thermal energy conversion systems.

Each talk will be followed by an interactive session to discuss the queries of participants.

➤ **Valedictory session** - Summary of the salient features and the take-home messages from the workshop.

Program schedule (Tentative)

| Time | Topic | Speaker |
|---|---|---------------------|
| 9:15-10:15 | Insights on NCLs | Dr P K Vijayan |
| 10:15-11:00 | Enhancement of heat transfer rate using supercritical CO ₂ in a NCL | Dr Ajay Kumar Yadav |
| Tea break (11:00-11:15) | | |
| 11:15-12:00 | Flow and stability characteristics of NCL equipped with air injection | Dr Arunachala U C |
| 12:00-12:45 | Stability analysis of coupled NCL | Dr Elton D N |
| 12:45 -13:15 | NCL based thermal management system for PV module | Mr Kiran |
| Lunch break (13:15-14:00) | | |
| 14:00-14:45 | Experimental and numerical investigation on the thermal performance of natural circulation based parabolic trough collector | Mr Nakul S |
| Lab visit (14.45-15.30) & Tea break (15:30-15:45) | | |
| 15:45-16:30 | Thermosiphon Heat Transport Device: A new class of single phase natural circulation loop | Mr Varun K |
| 16:30-17:00 | Interaction/Valedictory Session | Dr P K Vijayan |

For more information on above mentioned topics:

<https://www.sciencedirect.com/search?authors=Arunachala%20U%20C>

Outcome

Disseminating the importance of NCL to the stakeholders, list down the scope for future research and possible collaborative research.

About the Department:

Established in the year 1960, the Department of Mechanical and Industrial Engineering has become one of the most sought after departments for admission at both UG and PG levels. The department offers two Under Graduate programs (Mechanical Engg. & Industrial Engg.), three Post Graduate programs (Thermal sciences & energy systems, Computer aided design & analysis, Manufacturing engineering) and also PhD programs. The department is recognized as a QIP center for post graduate and PhD programs. The department consists of experienced faculty members who are constantly engaged in undertaking research work of original nature and have subsequent publications in various reputed national and international journals and conferences. The department has very good industry – institute interaction and faculty members are involved in consultancy in addition to regular academic work.

About Renewable energy lab:

To cater to the needs of M Tech (Thermal Sciences & Energy Systems) program, a Renewable Energy laboratory was established in the year 2014. Apart from meeting the curriculum requirements of the M Tech program, the lab has several high end instruments and set ups to carry out advanced research in the areas of conventional thermal and solar thermal power systems. The salient feature of this lab is most of the research related set ups are being designed and fabricated in-house, which has led to publications in high impact factor journals. The prominent set ups available in the laboratory are as under:

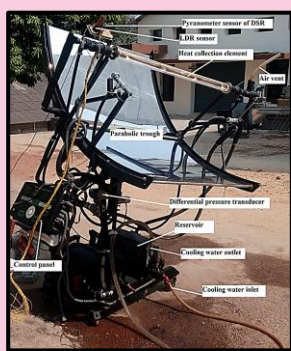
Experimental set ups



Wind turbine training system



Thermal energy storage system



Two axes parabolic concentrator



Solar water heater-Radiation simulator



PV grid tied system

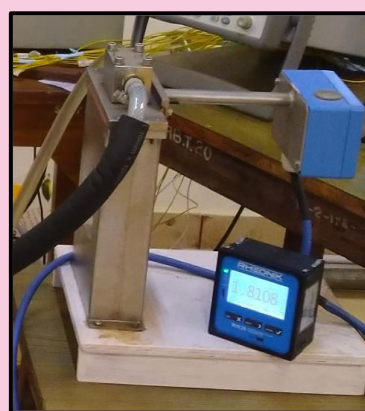
Equipments/instruments



Power analyzer



Data logger



Mass flow meter



Ultrasonic flow meter



PV analyzer



DPT calibrator



Hot wire anemometer



Thermal imager



Thermostatic bath

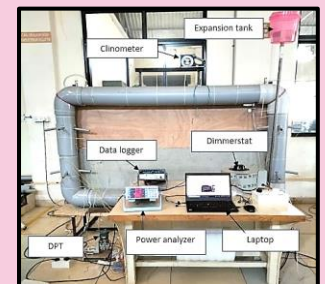


DPT

Research set ups



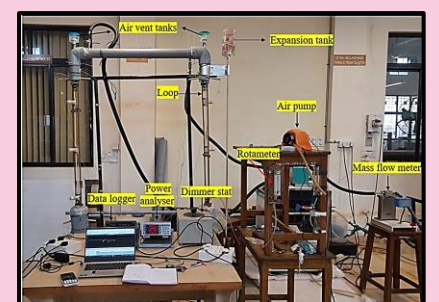
Coupled natural circulation loop



NCL based parabolic trough collector



Thermosiphon heat transport device



NCL equipped with air injection



NCL based PV thermal management