Department of Mechanical Engineering
NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

Ref.: 454/NITK/MECH/SERB/AKY/2021-22/ A9 04/11/2024

Advertisement for Student Internship (Corrigendum-1)

Applications are invited for the position of Student Internship in a research and development project **(SERB-CRG**) with following details:

Title of the project: "Design and development of Supercritical carbon dioxide based naturally circulated solar thermal collector"

Principal Investigator:

Dr. Ramesh M.R.
Professor, Department of Mechanical Engineering,
National Institute of Technology Karnataka, Surathkal, Mangalore-575025.
Ph: +91 9480540801, +91 7892517435
E mail: rameshmr@nitk.edu.in

Name of the position: Student Internship

No. of Positions/Vacancies: One

Qualifications:
Essential Qualifications: - Candidate studying in Prefinal year or final year **B.E./B.Tech.** in Mechanical or other allied disciplines with a minimum of 60% aggregate score (6.5/10 CGPA).

Desired Skills:-

- Basic exposure to software such as ANSYS, MATLAB, Lab view and Material characterisation.
- Ability to work in a team, good communication skills and experience in experimental research for fabrication of setup.

Age Limit: 25 years (Preferrable)

Salary:

- **Rs. 5,000/month**

Duration: 02 Months (15 November 2024 to 15 January 2025)

How to apply: Interested candidates must apply with the following documents (1) Cover letter (2) Bio-data with passport-sized photograph, (3) Scanned copies of educational certificates and mark sheets, class X onwards.

The soft copies of all the above documents (pdf format) must be **emailed to the P.I., Dr. Ramesh M.R. (rameshmr@nitk.edu.in) by 11 November 2024**. The email address for correspondence is given above. Only shortlisted candidates will be intimated by email and called for **Offline interview**. The position is available immediately. The appointment will be on a purely temporary basis co-terminus with the project.

About the project:

Funding Agency: Science & Engineering Research Board (SERB)

Project summary:

Solar water heating (SWH) system is one of the main applications of solar energy in domestic as well as industrial sectors. Several investigations are being done to increase the efficiency of SWH using various secondary fluids for different climatic conditions. It is also important to find out a most appropriate fluid which can be used for sub-zero (below 0º C) temperature region, where water based direct system may not be feasible due to chances of freezing of water. Use of conventional solar water heater in winter season is also inefficient due to high viscosity at low temperature. This is one of the severe problems, which encourages researchers to find a suitable solution. Recent studies show that for low temperature heating and cooling applications, CO2 based natural circulation systems are very compact in comparison to other conventional working fluids (~ 8 times compared to water). The proposed research plan is mainly categorized into two parts: CFD analysis and experimental work. CFD simulation for steady-state/transient conditions will be carried out for the pressure range of supercritical regions at different collector inclinations with various solar radiation intensities. The study will also evaluate the effect of different water inlet temperatures at heat exchangers ranging from 5°C to 30°C at various operating pressures. SWH with water as working fluid is not effective in winter mainly at a temperature below 10°C due to high viscosity and low volumetric expansion coefficient. Since the operating pressure of the loop is very high (~120 bar), utmost care is required to be taken while fabricating the setup. Experimental setup consists of a flat plate solar collector to absorb the heat input from the solar radiation, and a water storage tank with a heat exchanger to exchange the heat from NCL to surrounding fluid (water). It is proposed to develop a full-scale (conventional size) of CO2- based naturally circulated solar water heaters for commercialization. Which requires detailed CFD and experimental studies to optimize the parameters like tilt angle, loop fluid pressure, geometrical parameters etc. In addition, electrodeposited selective coating for solar collector is proposed to enhance the absorptivity and lower the emissivity. Bilayer selective coatings of black nickel and black chrome with metallic interlayers is planned to deposit using electro deposition. The coatings will be characterized with respect to microstructure, phase composition, bond strength, hardness, total reflectance, thermal stability and the stability against accelerated weathering.