

Date of Event	Knowledge Manthan
Name and Type of Event	Knowledge Manthan on “A META-HEURISTIC APPROACH FOR OPTIMIZATION OF SOLAR AIR HEATER PARAMETERS”.
Conducted by	Dr. Anupam Kumari
Number of Participants	32

The Resource person **Dr. Anup Kumar** is Assistant Professor of the School of Engineering and IT, ARKA JAIN University, Jamshedpur.

The speaker gave informative and illuminating lecture with valuable content. The session was very valuable for Faculties, Researcher and Students. Energy is a basic requirement for human being and also influences the economic development. The rapid depletion of fossil fuel resources forced human being for a search for non-conventional energy resources.

Out of alternative energy resources, solar energy is available freely and abundance on earth in the form of radiation. Solar collectors are widely used for utilization of solar energy for various applications. Solar air heaters are simple to design and no complicated tracking mechanism.

The present work showed an attempt to estimate the optimal thermal performance of a smooth flat plate solar air heater (SFPSAH) with various operating parameters and also to determine the most effective parameters through TBLO technique. This work helps to find out that how actual experimental set-up is far away from the optimized set of crucial parameters.

Topic of Knowledge Manthan: - “A Meta-Heuristic Approach For Optimization Of Solar Air Heater Parameters”

Date:-8th January 2022

Convener:- Dr. Anupam Kumari

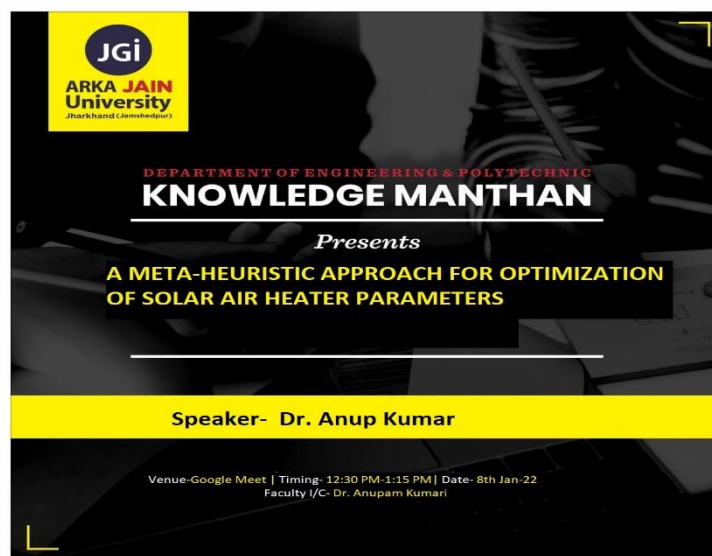
About the Speaker:-

Dr. Anup Kumar is Assistant Professor of the Dept of Engg, School of Engineering and IT, ARKA JAIN University, Jamshedpur..

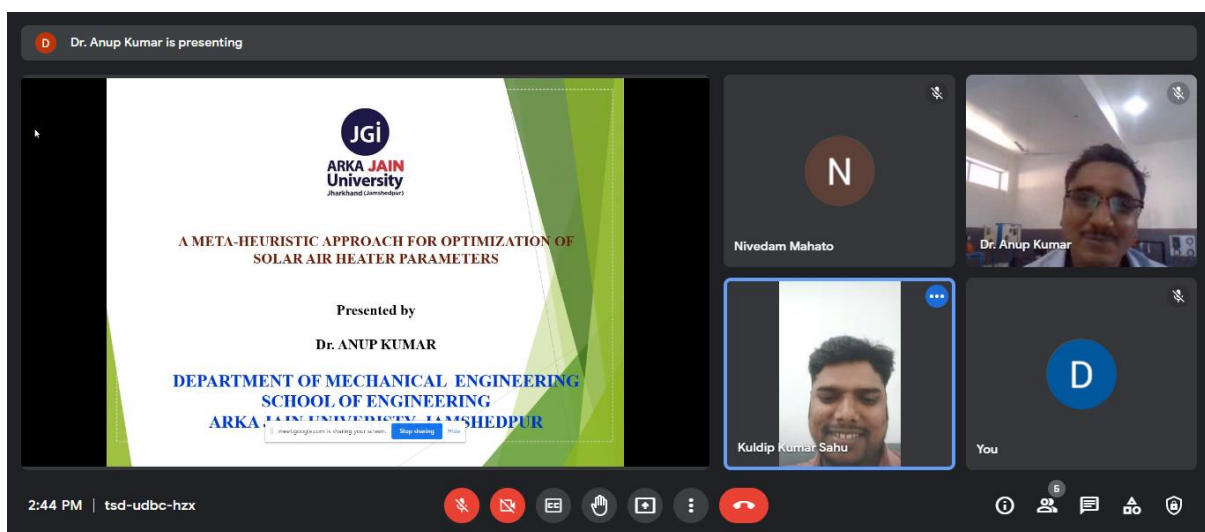
Venue and Participants:-

Knowledge Manthan was conducted online on Google Meet Platform. **Total participants attended were 35**

Event Poster



Glimpse of the event



Dr. Anup Kumar is presenting

Introduction

- Energy is a basic requirement for human being and also influences the economic development. The rapid depletion of fossil fuel resources forced human being for a search for non-conventional energy resources.
- Out of alternative energy resources, solar energy is available freely and abundance on earth in the form of radiation. Solar collectors are widely used for utilization of solar energy for various applications. Solar air heaters are simple to design and no complicated tracking mechanism.
- Various researchers attempted using different optimization techniques such as genetic algorithm (GA), particle swarm optimization (PSO), etc. Kalogirou, S.A(2004) has applied a combination of artificial neural-networks (ANNs) and genetic algorithms (GAs) to optimize a solar-energy system. Varun and Siddhartha (2010) used GA and Varun et al. (2011) applied stochastic iterative perturbation technique to evaluate the optimal thermal performance of flat plate solar air heater.
- The present work showed an attempt to estimate the optimal thermal performance of a smooth flat plate solar air heater (SFPSAH) with various operating parameters and also to determine the most effective parameters through TBL0 technique.
- This work helps to find \dots is far away from the optimized set of crucial parameters.

2:45 PM | tsd-udbc-hzx

Participants: Nivedam Mahato, Dr. Anup Kumar, Kuldip Kumar Sahu, You

Dr. Anup Kumar is presenting

Effect of geometrical parameters on heat transfer and friction factor

Effect of rib height (e) and pitch (P)

- The turbulence must be created only in the region very close to the heat transferring surface i.e. laminar sub-layer only. Prasad and Saini [37] had explained the effect of the roughness height (e) in Fig.2 as follows:
 - if $e \ll \delta$, roughness has no effect.
 - if $e \geq \delta$, the intended purpose of noticeable increase in heat transfer and moderate fluid pressure could be served.
 - if $e \gg \delta$, roughness has more effect on fluid pressure as compared to heat transfer, owing to probable interference of turbulence induced in the already turbulent core.

Fig.2. Effect of rib height on laminar sub layer

2:48 PM | tsd-udbc-hzx

Participants: Nivedam Mahato, Dr. Anup Kumar, Kuldip Kumar Sahu, Ravideep Singh, You

Dr. Anup Kumar is presenting

Fig. 23: Perceived flow patterns for rib inclination angle accounted for twisted rib roughness.

- The rib was placed inclined at different angles to the direction of main flow, generates secondary flow, induced through rotating vortices of rib to carry the cooler fluid from edging end to central core region.
- At 30° , the interaction of secondary flow with core flow boundary region of upstream side of rib is very weak as low appearance of secondary flow region and attains maxima at 60° and then starts decreasing.

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Participants: Kuldip Kumar Sahu, Nivedam Mahato, Dr. Anup Kumar, Ravideep Singh, You

THERMO-HYDRAULIC PERFORMANCE,

- ❖ The optimum geometric roughness parameter needs to optimize to maximize heat transfer augmentation along with minimum fluid friction.
- ❖ The thermo-hydraulic performance parameter (THP) parameter of values greater than unity shows advantageous for a roughened surface.
- ❖ Thermo hydraulic performance is given as
$$\zeta = \frac{Nu_r / Nu_s}{(f_r / f_s)^{0.25}}$$
- ❖ It is observed that the THP attains its maxima at optimal geometric parameters of $P/e = 8, \alpha = 60^\circ, y/e = 3$.
- ❖ The significance test for thermo-hydraulic performance model is obtained with confidence level of 95 % is shown in (ANOVA table).

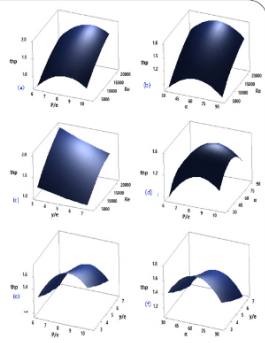


Fig 31: Surface plot for thp at various geometrical roughness pa
