IGSTC
INDO-GERMAN SCIENCE AND TECHNOLOGY CENTRE

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INSIDE

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ABOUT IGSTC

Through its flagship programme 2+2, IGSTC is currently supporting 21 project consortia in the areas of Advanced Manufacturing, Biomedical Technology, Biotechnology/Bioeconomy, Embedded Systems & ICT, Smart Cities, Waste & Wastewater Technologies and Sustainable Energy/Environment. The projects are at various stages of development and expected to complete their objectives as per their stipulated timeframe. IGSTC Call 2020 for 2+2 projects expected shortly on thematic areas of Additive Manufacturing and Electromobility.

There was a change of guard at IGSTC during August 2020. Mr R Varadarajan has taken over the charge of Manager, Accounts & Administration. IGSTC welcomes the Mr R Varadarajan. IGSTC also expresses its gratitude to the outgoing Manager Mr Sunil Kukreja for his services to IGSTC and wish him a healthy, peaceful retirement life.

IGSTC conducted two webconference at National Institutes of Technology (NIT) at Jalandhar and Andhra Pradesh. The webconference focused on bilateral funding opportunities and industrial based future research collaborations. The webinar touched around 500 faculty members, research scholars and master's students. The outreach activity was primarily aimed for young faculty members to look for bilateral funding early in their research career.

IGSTC is currently exploring possibilities to start industrial fellowships for young doctoral and post-doctoral researchers. Considering the current pandemic situation, IGSTC is looking into the possibilities to support web-based/virtual bilateral workshops.

PPAM

METAL POWDER PRODUCTION FOR ADDITIVE MANUFACTURING

PROJECT INVESTIGATORS

Saptarshi Basu
IISc, Bangalore

Suman Chakraborty
IIT Kharagpur

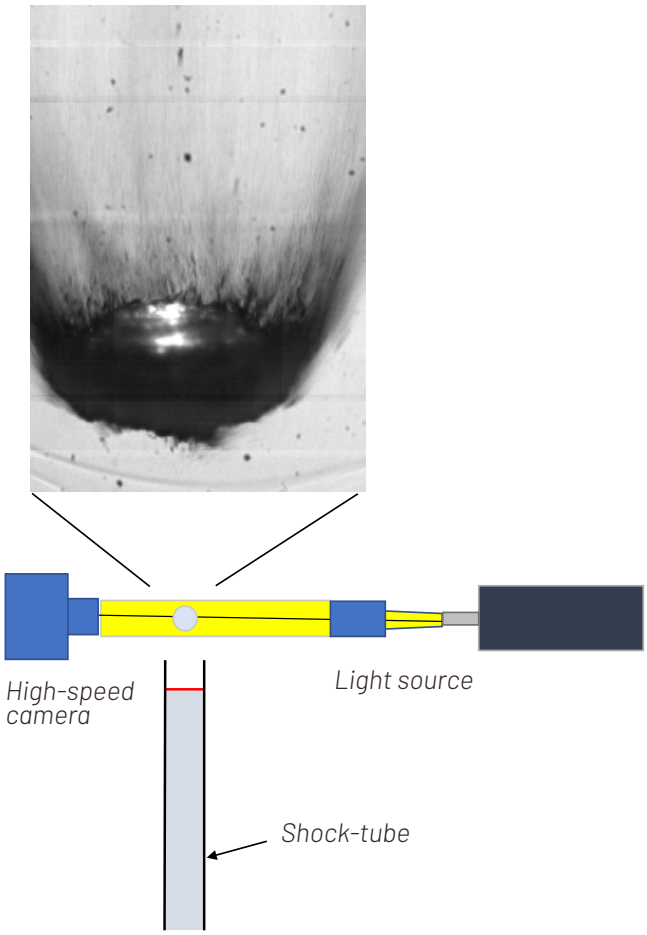
Suvankar Ganguly
Tata Steel Ltd., Jamshedpur

Cameron Tropea
TU Darmstadt

Hans-Jürgen Odenthal
SMS group GmbH

State-of-the art additive manufacturing technologies such as laser powder bed fusion (LBPF) rely strongly on high-quality metal powders. These powders have to meet strict requirements, especially with regards to size uniformity. The PPAM project focuses on the production of such steel powder using close-coupled atomization (CCA) and strives to better understand and model the atomization process. Generic experiments, numerical simulations and pilot plant operation are used in combination to develop validated predictive capabilities as well as design guidelines for full-scale facilities.

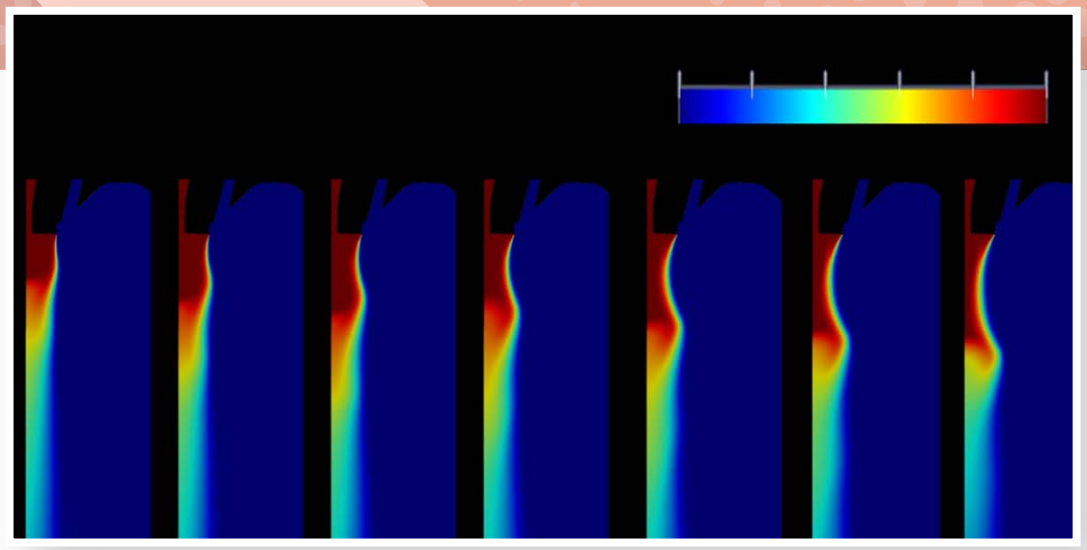
The project partner IISc Bangalore has successfully commissioned a shock-droplet-interaction test rig. Using high-speed shadowgraphy and Schlieren techniques, the interaction of a shockwave with a droplet has been observed in detail. Additionally, the mechanisms responsible for droplet breakup have been identified. Furthermore, a supersonic wind tunnel allowing for the investigation of the interaction of a droplet and an oblique shock has been manufactured. These results will be used to develop appropriate predictive models for drop breakup.



Shock-Drop Interaction

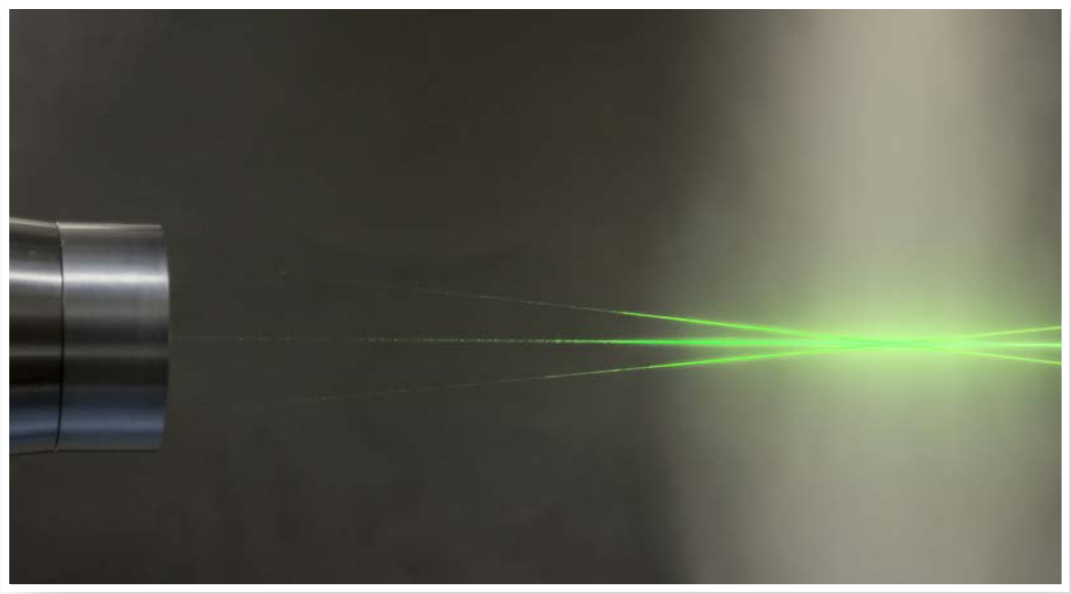
In collaboration with TATA steel, IISc Bangalore has tested its strategies for examining steel powders by first using locally available powders. Scanning Electron Microscopy (SEM) has been used to characterize the powder quality and dog-bone specimens have been manufactured to demonstrate the possibility of mimicking an industrial additive manufacturing process.

The SMS group has conducted CFD simulations of the atomization process, covering the entire flow of gas and liquid by implementing a special two-phase flow model. The CFD model allows for the prediction of the final droplet size distribution depending on the prevailing atomization parameters. First results have been computed for the flow of air and water, matching the conditions of the laboratory facility at TU Darmstadt. Furthermore, 100 kg of metal powder have been produced in the SMS pilot plant, a portion of which has been shipped to IISc Bangalore for testing. Additionally, the powder has been analysed and used to print tensile specimens. The latter has been tested, characterized and compared to the conventionally produced components.



Simulations of water mass fraction in atomizer

TU Darmstadt has put into operation an atomization test rig capable of covering a wide range of operating parameters, which closely resemble the actual pilot plant built by the SMS group. The operation of the test rig has been commissioned and shown to produce repeatable results. Additionally, a phase Doppler particle analyser has been used to measure droplet size and velocity distributions in the complex flow of the supersonic atomizer.



Phase Doppler Measurements

The project partners continue to stay in close contact and are looking forward to their next online progress meeting in September 2020.

CO_2BioFeed

CO2 AND BIOMASS AS FEEDSTOCK FOR THE PRODUCTION OF ENERGY CARRIERS AND CHEMICAL INTERMEDIATES

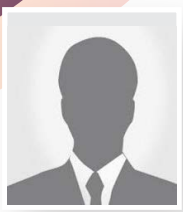
PROJECT INVESTIGATORS

Asim Bhaumik
Indian Association for the Cultivation of Science, Kolkata (IACS)

Biswajit Chowdhury
IIT (ISM) Dhanbad

Praveen K Chinthala
Reliance Industries Ltd. (RIL) Jamnagar

Thomas Ernst Müller
Ruhr-Universität Bochum (RUB), Bochum



Jens Hannes
RWE Power Aktiengesellschaft Essen

Gernot Nell
Parr Instrument GmbH Frankfurt

In this 2+2 project, a consortium of academic and industry partners from India and Germany is working on using CO_2 and biomass as feedstock for the production of energy carriers and high value chemical intermediates like useful olefins. The Key to the new process will be the use of CO_2 as building block and oxidation agent.

The Indian partners from RIL, IIT (ISM) Dhanbad and the IACS synthesize and test the performance of new highly active catalysts on the base of nanomaterials. They will also at a later stage be responsible together with RUB to optimize the catalysts into industrially applicable forms. At RUB the new catalyst materials will be thoroughly tested in reactors that will in parts be newly developed by Parr Instrument GmbH. New process conditions will be identified and scaled to a mini-plant scale. Successful catalyst candidates will be industrialized and tested on pilot plants at RWE Power Aktiengesellschaft (RWE) and RIL, who will together also develop a safety concept. Finally, an ecological balance and a life cycle assessment will be done for all the involved processes and steps in the value chain.

The main goal is to close the anthropogenic carbon cycle for large volume value added chemical intermediates, in which all the carbon stems from renewable sources.

Due to COVID-19 restrictions, the Kick-off meeting of the CO_2BioFeed project partner meeting was held online on 17th April, 2020. The meeting started with self introductions of the partners emphasizing their bios, institutions, research capabilities and specialities. A lively discussion and brainstorming activities resulted in definitive plans for joint research, catalyst development and new reactor setups.

Planned direct visits and joint workshops among consortium partners that were agreed upon before could not yet be realized due to the on-going restrictions and lockdowns in Germany and India. It will be resumed as soon as possible.

Several bilateral meetings between RUB-RWE have taken place (offline and online) to coordinate the mutual progress.

Catalyst development has been started by the Indian partners but on-going lockdowns hampered completion and delivery to Germany.

RUB is currently focusing its effort on testing new or adapted reactor types received from Parr (Continuous Reactor, Batch reactors and Berty reactors), identifying the process parameters and testing commercially available catalysts.

STEEL4LTC

HIGH STRENGTH SPRING STEELS WITH REDUCED LOW TEMPERATURE CREEP FOR LIGHT WEIGHT DESIGNS

PROJECT INVESTIGATORS

Koteswararao V. Rajulapati
University of Hyderabad (UoH)

Manjini Sambandam
JSW Steels Salem Works (JSW)

Robert Brandt
Universität Siegen (USI)

Steffen Klapprott
Muhr und Bender KG (MUB)

Downsizing and light weight design of all automotive components especially in chassis area is underway. Higher stress acts on spring material due to its lightweight design. The springs being used currently may not withstand very high stresses. Hence, there is a pressing need for the development of advanced spring steels. The main focus of this Indo-German consortium is to develop a new steel grade with enhanced Ultimate Tensile Strength (UTS) with adequate ductility and improved low temperature creep (LTC) resistance and high cycle fatigue (HCF) resistance. The ultimate target of the project is developing and commercializing the high strength spring steel components.

The industrial partners, JSW and MUB have been putting their efforts in delivering of steel grade in time to both Indian and German academic partners during the unforeseen lockdown period caused by COVID-19. Besides, JSW has offered its support to perform the preliminary Charpy impact tests in their lab. MUB has performed inductive heat treatments (IT) on a small quantity of the steel grade provided by JSW. These IT wires were shipped to USI to investigate the influence of heat treatment technology on material's microstructure and mechanical properties. The work from home during April-May 2020 lockdown duration were fully utilized to work with scientific manuscript on low temperature creep mechanism, as well as to do the groundwork on designing of experiments. USI has resumed their experiments in the laboratory, such as furnace heat treatment and material characterization from June 2020 onwards. A quotation from the service provider, Zwick Roell has been received to perform planned mechanical testings. As an alternative option to perform mechanical tests, USI team is setting up collaboration with a team in "Werkstoffprüftechnik" chair, TU Dortmund. Despite the hurdles caused by COVID-19 and the associated complete closure of UoH during March-July 2020, UoH was successful in procuring a resonance-based high cycle fatigue (HCF) testing equipment in time with IGSTC grants. The equipment was delivered to the UoH on 18 August 2020. Currently, the site preparation for the installation of equipment is under process. Figure 1 shows the

photograph captured during transportation of the crates into the laboratory. On the other hand, while working from home during the lockdown due to COVID-19, UoH team has put efforts to compile all the relevant literature available on spring steels, and the team intended to submit this compilation as a scientific review article to an international journal in collaboration with other consortium partners.

Figure 1: Transportation of crates of resonance based HCF testing equipment to UoH laboratory

Consortium is organizing virtual joint project meetings on bi-weekly basis with all the partners to discuss the project performance and chalked out the plans for the future. In addition to that, academic partners are having one-to-one scientific meetings on bi-weekly basis via video conference for an in-depth scientific discussions. Figure 2 shows the snapshot captured during the recent scientific meeting.

Figure 2: One-to-one scientific meeting between UoH and USI. Participants (in clock-wise): Prof. Rajulapati, Mr. Karnam, Prof Brandt, Mr. Remalli.

ECO-WET

EFFICIENT COUPLING OF WATER AND ENERGY TECHNOLOGIES FOR SMART SUSTAINABLE CITIES

PROJECT INVESTIGATORS

Naran Pindoriya
IIT Gandhinagar

Sriniwas Singh
MMM University of Technology (MMMUT), Gorakhpur

Arvind Rajput
GIFTCL, Gandhinagar

Janki Jethi
GIFTCL, Gandhinagar

Markus Duchon
Fortiss GmbH, Munich

Julia Singer
Sonnen GmbH Wildpoldsried

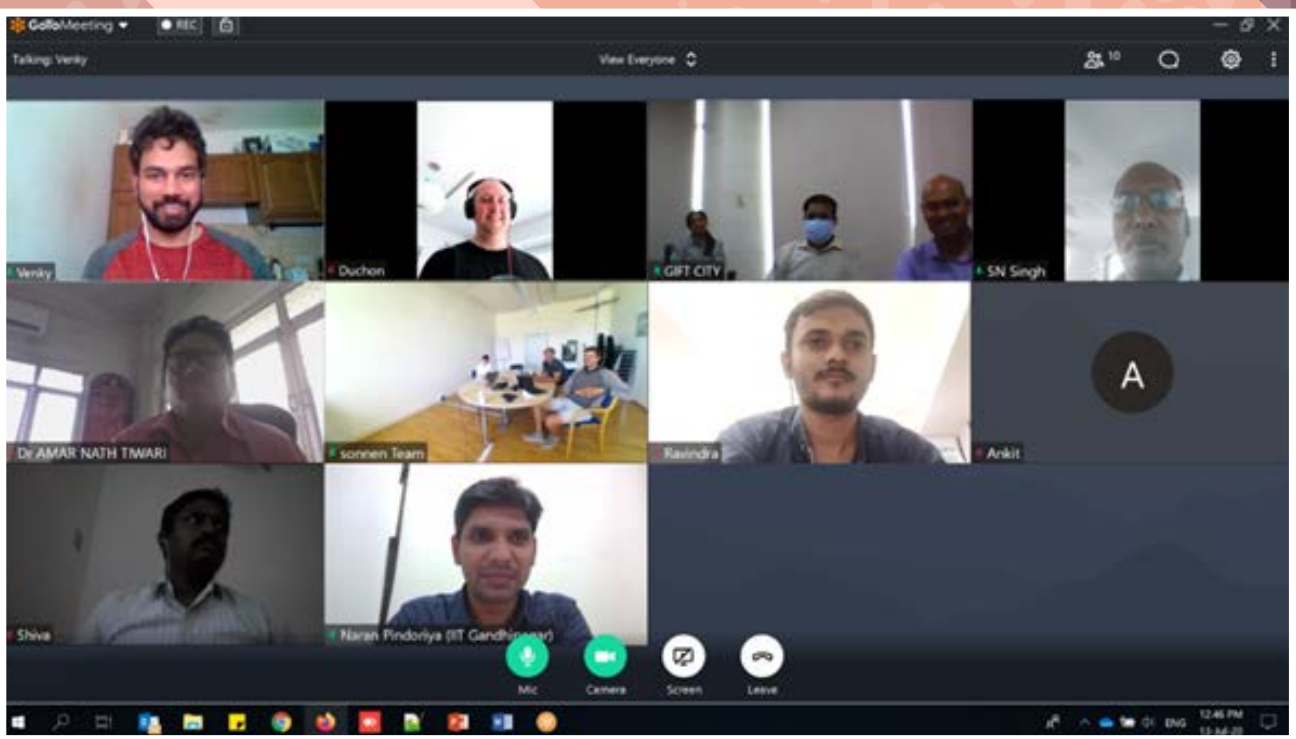
The consortium meeting for ECO-WET project was held virtually on 13th & 14th July 2020. Smart cities are envisioned to efficiently use the two most critical resources: water and energy. Advanced techniques are being developed to conserve water. Similarly, renewable energy resources and smart devices are being implemented to meet the increasing electricity demand for the large population. The coupling of cross -commodity infrastructure and integration of energy storage is a challenge for smart cities. With respect to ICT this project addresses the challenge to bring intelligence closer to the device, which leads to distributed design. In such a system, highly integrated components from different sectors interact with each other to use available resources more efficiently and increase the overall performance.

The outcome of this project will be a system focusing the energy-water nexus comprising:

- *The integration of advanced energy storage technology and renewable energy sources to enable the coupling and modularization of electricity and water infrastructures;*
- *A software platform that allows real-time monitoring, analysis and controlling based on the IEC 61499 industrial standard with the grounding of systems engineering techniques;*
- *Optimization techniques for energy-efficient management of both water and electricity in the purview of the infrastructural constraints in the smart sustainable cities.*

The meeting was attended by the project partners i.e., IIT Gandhinagar, GIFT City, and MMMUT Gorakhpur from the Indian side, and fortiss GmbH & Sonnen GmbH from the German side. The meeting was hosted virtually by fortiss GmbH. The two-day meeting was kicked-off with the current status of use-cases and detailed updates on those. The update of hardware installation at testbed was discussed, and their timelines were revisited. Each project partner showcased their contribution to the consortium in the form of a demonstration. At the end of day 2, a plan on phase 2 proposal focused on water management on implementation of energy management as a viable business model was put forth by GIFT City and discussed among the consortium partners. Moreover, the project timeline was reviewed in respect to the outcomes of each partner's contribution and milestones.

The progress of hardware installation was affected by lockdowns imposed due to the spread of the novel coronavirus. However, the hardware installation was resumed later at a slow pace. Current installation progress of roof-top solar PV and capacitive deionization systems at the GIFT City's testbed is shown in the photographs. Additionally, the work of Atmospheric Water Generation (AWG) that was ongoing has been completed and is currently installed at the WTP testbed, GIFT City.


GoToMeeting
Talking: Venky
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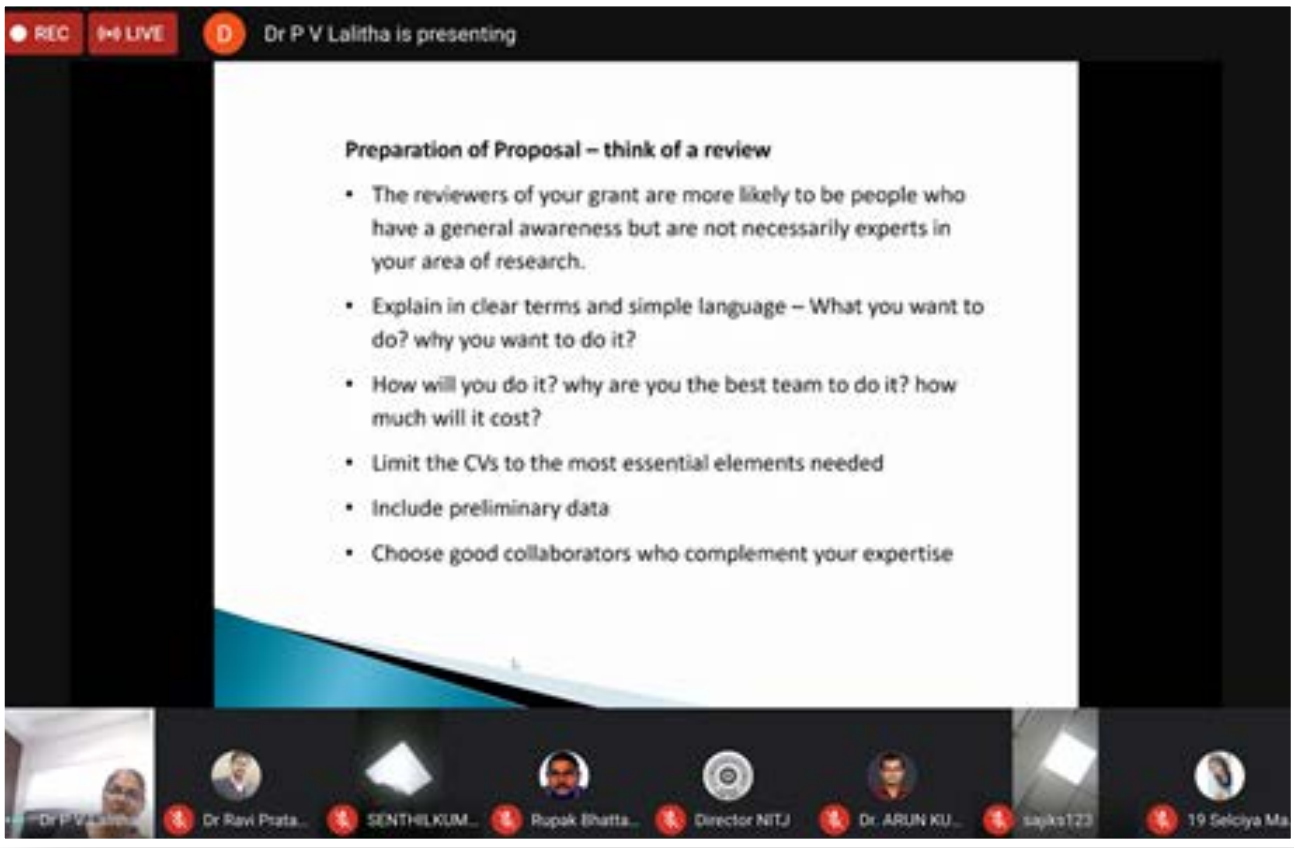
GIFT CITY
SN Singh
Dr AMAR NATH TIWARI
sonnen Team
Ravindra
A
Ankit
Shiva
Naran Pindoriya (IIT Gandhinagar)
Mic
Camera
Screen
Leave


ATMOSPHERIC WATER GENERATOR
(AIR TO WATER)
CAPACITIVE
DEIONISATION
SYSTEM

WEBCONFERENCE

INDO-GERMAN BILATERAL FUNDING PROGRAMMES FOR ADVANCED INDUSTRIAL RESEARCH

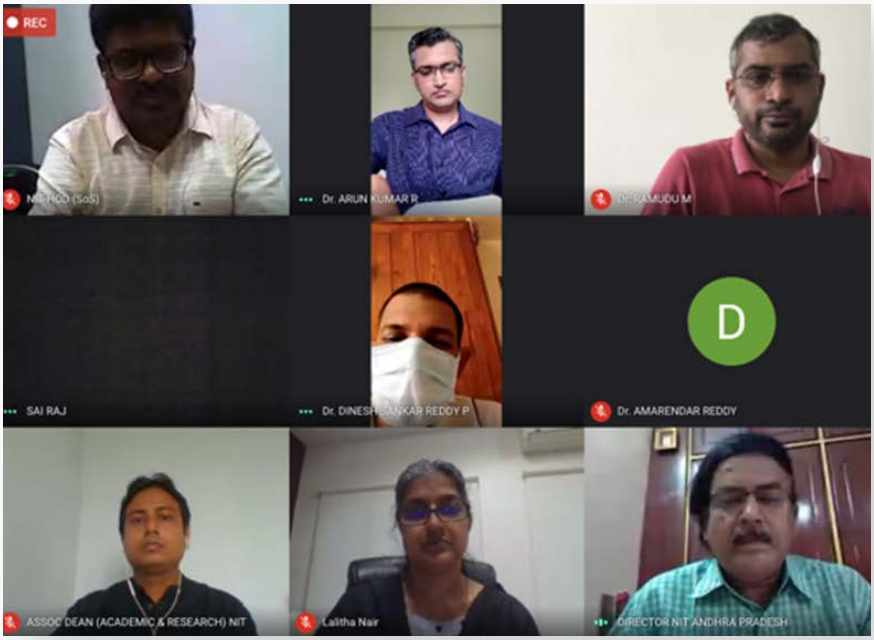
IGSTC in association with Department of Industrial & Production Engineering, National Institute of Technology, Jalandhar (NIT Jalandhar) organized a webconference on "Indo-German bilateral funding programmes for advanced industrial research" on 26th June 2020. The Coordinators from NIT Jalandhar were Dr Narendra Kumar and Dr Ravi Pratap Singh. Prof Lalit Kumar Awasthi, Director NIT Jalandhar opened the webconference with his welcome remarks. He stressed on applying for more international programmes alongwith the national funding programmes. He also briefed about the research activities happening in NIT Jalandhar. Dr P V Lalitha, Senior Scientific Officer was the webconference speaker. She presented the different perspectives of integrating academic research and aligning it with industry for better research outcomes in terms of patents, technology transfer, etc. An overview of different IGSTC programmes was presented. The most striking aspect of the presentation was the nitty-gritties of writing a good research proposal and what exactly funding agencies want in the proposal. Around 400 participants were part of the webconference which included faculties, research scholars and master's students of various departments of NIT Jalandhar.



A screengrab of the webinar

OPPORTUNITIES IN INDO-GERMAN BILATERAL FUNDING PROGRAMMES

A webconference on "Opportunities in Indo-German bilateral funding programmes" was conducted in association with National Institute of Technology, Andhra Pradesh (NIT-AP) on 22nd July. Dr R. Arun Kumar, Dr Tapas Paramanik, Dr J. Krishnamurthy, Dr M Ramudu from the Department of Physics were the coordinators of the webconference. Prof C.S.P. Rao, Director, NIT Andhra Pradesh gave the opening address. He spoke about the various activities being conducted in NIT-AP and how bilateral funding helps the young faculty get good exposure to international research. Being a young NIT, he emphasized on the need for young faculty members to research and innovation driven from its foundational years. He urged the faculty members to get the most out of webconference for bilateral funding programmes. Dr P V Lalitha, Senior Scientific Officer was the speaker for the session. Dr Lalitha delved deep into the programmes of IGSTC especially the flagship program of 2+2 projects. She also explained the significance of working in bilateral projects, getting a good hold of international research ethics. She ended the webconference with a short brief of writing a good proposal to different funding agencies. Around 100 faculty members and research scholars participated in the session.



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