NEWSLETTER 3 | JULY 2014

EXCELLENCE ENHANCEMENT CENTRE FOR INDIAN POWER SECTOR

(AN INITIATIVE OF THE INDO-GERMAN ENERGY COOPERATION)

Mrs. Neerja Mathur
President, EEC &
Chairperson, CEA

We welcome Mrs. Neerja Mathur as President, EEC and Chairperson, CEA. Mrs. Neerja Mathur, Member (Grid operation and distribution), CEA has been appointed as the first woman chairperson of the CEA in 2013.

Mrs. Neerja Mathur, 59, has over 34 years of experience in the power sector with B.Tech in Electronics & Communication from IIT, Roorkee, and an M.Tech from IIT, Delhi. Having joined the CEA in 1979 as Assistant Director, she has worked in the area of Power system Planning & Design and Grid operation.

Shri A.K. Jha
Member of the
Governing Body of EEC

Shri A.K. Jha, Director (Technical) of National Thermal Power Corporation (NTPC) since 1st July 2012, is the member of Governing Body of EEC (Excellence Enhancement Centre). He is a graduate in Mechanical Engineering from Ranchi University and LLB from Delhi University. He joined NTPC in 1977 as Executive Trainee (2nd Batch) and was part of erection team which successfully commissioned 5x200 MW capacity at NTPC's 1st project at Singrauli. He has rich and varied experience of 37 years in NTPC in all the areas of power project that is Design & Engineering, Project Planning & Monitoring and Project Construction & Management. He has presented paper on Project Management at IPMA World Congress in Rome in 2008.

From the desk of President, EEC

You may be aware that with the initiative of Ministry of Power, Central Electricity Authority and the Federal Government of Germany, the Excellence Enhancement Centre (EEC) for Indian Power Sector has been established to facilitate performance improvement especially to enhance the efficiency and reliability. EEC is providing a common platform for sharing best practices towards efficiency & reliability.

As a part of EEC activities, in the recent past (August- September, 2013), EEC had organized six Advanced Level Training Programmes on Coal Fired Power Plants.

In future, EEC is planning to organize training/ workshop on "CFBC Boiler" and "Coal Blending" with the technical support of VGB Germany. EEC is also preparing compendium of Best Practices in Coal Based Power Plants (Best Practice data from German utilities, with the support of VGB Power Tech and Indian Power Sector). EEC has also initiated technical study on "Combustion Optimization" in order to improve the performance of combustion systems for 200/210 MW units in co-operation with VGB PowerTech and its member organizations. Other studies are targeted to include Compendium of Best Practices on project construction, Water Optimization and condenser performance monitoring etc.

You may appreciate that EEC is a member driven society and active participation of members will enable EEC in the development of the power sector.

EEC need your support through active participation by way of sharing your experience, identifying various issues in improving performance of thermal plants and also becoming a part of EEC as its member.

With best wishes,

Neerja Mathur
President, EEC

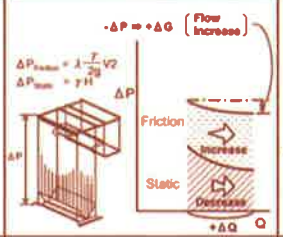
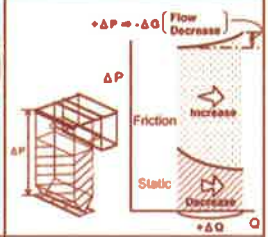
Advanced Ultra Supercritical Steam Generator With Vertical Water

Until now the largest conventional coal fired station operating in the country has unit rating of 500 MW. These units have subcritical operating parameters of 170 ata, 535°C / 538°C at the turbine inlet with conventional drum type natural/ forced circulation boiler.

Increase of the steam parameters, i.e. temperature and pressure, is one of the most effective measures to increase efficiency and economy as well. This method typically in the form of supercritical operation has been followed since decades in many countries; particularly in United States, Europe and Japan. Indian utility power sector has begun its implementation of supercritical boilers from early 2003 onwards. The momentum has picked up in the last three years with many supercritical units coming up, and ultra-supercritical condition such as 600/600°C is about to be introduced in the quite near future even in this country.

Increasing efficiency by raising temperature and steam pressure of thermal electric power plants is an effective means of reducing fuel consumption and CO_2 emission.

L & T and MHI have forged an alliance (L&T-MHI Boilers) to supply indigenously manufactured coal fired supercritical and ultra-supercritical boilers in the range of 600 to 1000 MWe including 600/600°C class boilers. MHI have adopted the vertical water wall configuration, which had been developed and introduced only by MHI.

	Vertical waterwall (Rifled Tube)	Spiral wound (Smooth Tube)
Tube Velocity	Low	High
Flow Dymanics		
Flow Characteristics	Positive Flow $\left(\frac{\Delta G}{\Delta Q} > 0\right)$	Negative Flow $\left(\frac{\Delta G}{\Delta Q} < 0\right)$
Temperature Unbalance	Small (Advantage)	Large (Disadvantage)

A vertical furnace water wall using rifled tubes was realized by combining it with a circular firing system. This waterwall system increases the levels of safety and realizes the following advantages.

- **Low pressure drop**
  Pressure drop for the main steam is low since mass velocity in the waterwall tubes is low, and the power consumption of the boiler feed pump can be saved while the design pressure of the feed water systems can be reduced.
- **Simple structure**
  Its simple construction makes furnace support easy, so that the number of attachment fittings can be reduced. In addition, because of the reduced number of welding points, the system is superior in terms of reliability, easy erection, and maintainability.
- **Less adhesion of ash**
  Since the tubes are arranged in the vertical direction, slag can fall easily and, hence, the amount of ash that adheres to the waterwall is small.
- **Excellent flow stability**
  Flow stability is usually defined as a characteristics how much the heat absorption deviation affects the water/ steam temperature due to fluid flow deviation brought by its heat absorption deviation, which is classified as "positive flow characteristics" vs. "negative flow characteristics", the former characteristics has less affect and is more preferable.

Design Features

- Achievement of low NOx and low unburnt carbon in fly ash
- Suitability for various kinds of coal and high steam temperature
- Boiler performance
- High Operating Capability

For Detailed article please visit EEC website.

Trainings held in cooperation with STEAG

As a part of EEC's mandate to improve the efficiency and performance of the Indian power sector, the development and execution of technical workshops and trainings plays a crucial role. In cooperation with VGB Powertech, STEAG Energy Services India, CBIP (Central Board of Irrigation and Power) and others, EEC offers a wide range of capacity development.

In last year EEC has organized six Advanced Level Trainings Programmes on coal fired power plants with STEAG Energy Services on following topics:

- Advances in Power Plant Chemistry
- Boiler Operation And Maintenance
- ESP O & M And Performance Enhancement
- Combustion Mechanism & Optimization
- Advance Level Heat Rate Awareness
- Performance Optimisation of Steam Turbine and its Auxiliary Systems

EEC Projects

One of the major pillars of EEC's activities is the solution for common challenges & elaboration of recommendations for power plant operators.

For identification of topics for technical studies, guide lines and technical working groups, EEC had detailed interaction with stakeholders of the power sector. The first few topics, which EEC has picked up, include the following:

Best Practices in Water Usage in Coal Based Thermal Power Plants

Water is increasingly becoming a premium commodity in terms of cost and availability. The study methodology is targeted to include the following:

- Collect data for water usage in few plants located in water scarce areas
- Short list 1-2 projects and carry out measurements and develop water balance
- Develop road map for improvement through operational modifications and technology interventions.

The study works out cost-benefit analysis taking in to account value of water use.

Compendium of Best Practices in Coal Based Thermal Power Plants

The study is intended in identifying the best practices being adopted in Germany Vis-a Vis in India. The areas covered would include:

- Planning and construction of a new super critical power plant
- Operation and maintenance practices (Separately for subcritical and supercritical plants)

The outcome is a compendium of recommendations for planning, construction, operation and maintenance of power plants, considering Indian circumstances.

Technical Study on Combustion Optimization

EEC intends to initiate a technical study on "combustion optimization" to improve the performance of combustion system for 200/210 MW units through use of latest technologies in the field of ignition systems, burners, flame control, thermal flame distribution etc.

These combustion systems represent:

- a good possibility for a significant boiler optimization,
- higher boiler availability and reduced maintenance.

The study and the likely demonstration project would be carried out in association with reputed technology providers and technical support from VGB, Germany and its member organizations.

Suggestions for studies, projects, material, advice, trainings etc. are welcome at: contact@eecpowerindia.com

Improving ESP efficiency

Environmental and efficiency improvement of power plant performance is an essential goal for the years to come. Effective particulate and ash removal in coal fired power plants by Electrostatic Precipitators is a must for environmental compliant and commonly accepted operation. In order to enhance and support this goal a CFD modeling and/or SO_3 flue gas conditioning guided and supported by best practice experiences gained from implemented projects.

CFD modeling is a branch of fluid mechanics that uses numerical methods and algorithms to solve and analyze problems that involve fluid flows. Computers are used to perform the calculations required to simulate the interaction of liquids and gases with surfaces defined by boundary conditions.

SO_3 conditioning of the flue gas is an appliance in which the surface conductivity of the particles in the flue gas are improved in order to reach a better dust removal in the ESP. Technologically, SO_3 flue gas conditioning plant consists of a container, in which sulphur will be burned to SO_2 and converted to SO_3 in a catalyst.

SO_3 together with air will be injected through injection lances into the flue gas duct. SO_3 will be condensed at the outlet of the lances so that the dust particles will be thoroughly charged. This increases the conductivity of the dust for a better separation in the ESP.

Through the improvement of the ESP performance the particulate emissions in general will decrease and in this way also the dust concentration entering the flue gas path and being emitted through the stack will substantially be reduced to the immediate benefit of the environment.

Benefits of this project:

- Great Flexibility for Coal Quality
- Whiteness Gypsum > 85 %
- Dust input to FGD very low
- Keeping the future Emission-Limit of 10 mg/Nm³ without expensive ESP Extension
- Investment costs relatively low (app. 1/3 lower)
- Operation and maintenance costs relatively low (app. 1/4 lower)
- SO_3-Conditioning Plant fully integrated in the DCS.

Upcoming Trainings & Events

As a part of EEC's mandate to improve the efficiency and performance of the Indian power sector, the development and execution of technical workshops and trainings play a crucial role. In cooperation with VGB Powertech, STEAG Energy Services India, CBIP (Central Board of Irrigation and Power) and others, EEC offers a wide range of capacity development.

Events planned in coming months:

Training Program on Circulating Fluidised Bed Combustion (CFBC) Boilers

Circulating Fluidized Bed (CFB) boiler technology meets today's market demand for utility size boilers with flexibility to fire with wide range of fuels. The CFBC boilers are designed for firm emission performance and high reliability.

Features of CFBC Boilers

1. Compatibility with wide range of fuels
2. Low polluting
3. Space-saving, ease of maintenance

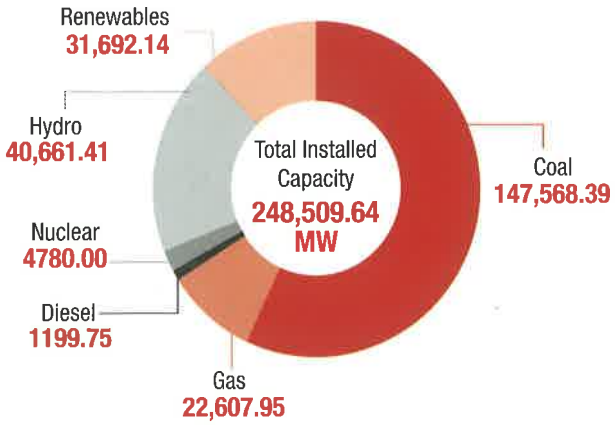
Training Program on Coal Blending

Coal Blending is the process of combining various types of coal to take advantage of their different combustion and emission properties. Coal blending in power station is mainly adopted to reduce the cost of generation and increase availability of coal. The low-grade coals can be mixed with better grade coal without deterioration in thermal performance of the boiler thus reducing the cost of generation.

The benefits of blending coal are:

- Consistent Coal Quality
- Improved power plant output
- Cost savings
- Environmentally friendly

All India Generating Installed Capacity (In MW) (As on 31-05-2014)



EEC Membership

EEC provides a platform for the experts and for all stakeholders of the Indian and international power sector to share their concerns, issues and experiences. Organisations such as Siemens, BHEL, NPTI, CESC, GSECL, Durag, CPRI, STEAG, NTPC, CBIP, ACB, GIZ, VGB, CEA, CSPGCL, and IPPGCL are already members of EEC.

EEC is preparing technical guidelines for various aspects of Indian power plant and power plant auxiliaries, with the support of VGB Power Tech by providing nearly 100 VGB guidelines which reflect the state of the art process and procedures that are applied in Germany and Europe. EEC members can have access to VGB guidelines through EEC.

For more information on membership, membership benefits and how to apply, please visit www.eecpowerindia.com and proceed to the "Membership"

Visit www.eecpowerindia.com for more information and online registration for all EEC trainings and workshops

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