



## 2<sup>nd</sup> INTERNATIONAL WORKSHOP ADVANCES IN CLEANER PRODUCTION

"KEY ELEMENTS FOR A SUSTAINABLE WORLD: ENERGY, WATER AND CLIMATE CHANGE"

### **Solutions for Energy Savings and Environmental Compliance Leading to Cleaner & Lower Cost Production**

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#### **Abstract**

Present dilemma is with 'how to manage the global warming resulting from energy guzzling manufacturing sectors like power, petrochemical, steel, mining, and minerals industries'? Although these operations are essential to sustain the global economy, their impact on climate change can't be ignored. This paper addresses scientific and engineering approach to transform these operations and minimize their impact in our eco-friendly world. The primary objective is in providing total solution for energy savings in vibration and noise reduction for achieving safe, energy-efficient, and cleaner production. The methodology has been substantiated with several practical examples that have been implemented in North America, Europe and other parts of the world, where 15% ~ 25% energy savings have been achieved.

"Noise and Vibration" are integral part of critical equipments and processes in the heavy industry sector. These symptoms are indication of turbulent airflow and wasted energy. This paper focuses on "optimization of airflow in plant draft systems" and therefore minimizing the use of energy to generate same amount of work. A number of design innovations for reducing turbulence and flow separation ensuring streamlining of airflow in the draft system and uniform loading on fans in the draft (forced or induced) system have been discussed. The present work elaborates on design optimization for achieving energy efficiency and environmental compliance leading to cleaner production – realized by modifying plant draft systems and fan systems using CFD simulation tool, including mathematical modeling and numerical simulation.

Implementation of this technology has improved the health & safety constraints in the industry. The outcomes of selected case studies are included for demonstrating the energy savings and the corresponding financial return through the proposed design innovations. In addition, improved inlet and outlet conditions of any pollution prevention equipment (*e.g.*, SCR, ESP, FGD) facilitate enhancement of environmental compliance of these equipments. Further, stream lining the plant draft system has also demonstrated improvement in process yields, improvement in fan and related equipment life as well as flexibility to use lower grade raw materials (*e.g.*, high ash content coal in boilers).

The major design innovation is the aerodynamic diffusion system. In the mining industry, such solutions when integrated with CFD modeling would enhance the total systems approach. This is a growing area and gradually receiving corporate attention for conducting studies in improved ventilation system management. Finally, various solutions and technical approach recommended by the authors integrate the three pillars (Economics, Environment, and Society) of sustainable development and helps the operating companies to meet their Corporate Social Responsibility.

*Keywords: Aero-acoustics, Energy-efficiency, Computational Fluid Dynamics (CFD), Cleaner Production*

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