Energy Efficiency Improvements for Coal-Fired Power Plants

Reduce Power Production Costs and Greenhouse Gas Emissions
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Efficiency is the New Green

The proposed Clean Power Plan requires the U.S. power industry to reduce greenhouse gas emissions by nearly 30% by the year 2030. One compliance strategy outlined by the rule is improving the efficiency of existing coal power plants by an average of 6%. While there are many ways to accomplish this, recovering more energy across the air preheater (APH) is one of the more cost effective.

To address this industry need, AECOM and the Ljungström Division of ARVOS Group are working together to offer a novel approach to improve the energy efficiency of coal-fired power plants by 1 to 3%, with a corresponding reduction in carbon dioxide (CO₂) emissions. As a consequence, power plants can realize significant operational cost savings by burning less coal and generating less air pollution and coal combustion residual (CCR) wastes.

Proven Technology, Proven Results

Our approach combines the successful SBS Injection™ sorbent injection technology for SO₂ control with the successful Ljungström® air preheater technology for heat recovery. Sulfuric acid and other acidic compounds found in combustion flue gas cause fouling and corrosion of the APH equipment. By eliminating these acids, the thermal performance and efficiency of a coal plant can be improved. Long-term testing of the combined technologies at the Ljungström research facilities in Wellsville, NY, has successfully demonstrated stable operation of APH heat transfer surfaces down to temperatures as low as 220°F; an improvement in overall plant efficiency of up to 3%, or a 300 BTU/kW-hr heat rate reduction.
SBS Injection Technology

Critical to the success of this approach is the ability to reduce flue gas SO$_3$ levels to less than 5 ppmv entering the APH. The SBS Injection process is the only technology that can consistently achieve these levels, even on plants burning high-sulfur coal and equipped with SCR NOx control technology, where SO$_3$ levels often exceed 50 ppmv. The proven SBS Injection process has been applied to over 30 boilers, representing nearly 18,000 MW of generating capacity and over 10 years of commercial operating experience.

Ljungström Air Preheater

The Ljungström air preheater is installed on more than 90% of U.S. coal-fired power plants. In recent years, Ljungström research and development has led to advanced heat transfer surface geometries and designs that provide superior thermal heat transfer, without sacrificing cleanability and durability. When implemented in conjunction with the SBS Injection process, these advanced designs have delivered improved plant efficiency and operating reliability, as well as numerous other co-benefits.

Key Technology Benefits

- Improved Plant Energy Efficiency
- Reduced Plant Fuel Operating Costs
- Reduced CO$_2$ Emissions
- Improved Air Preheater Reliability
- Reduced Mercury Emissions
- Reduced Fan Aux Power Usage
- Improved Particulate Collection
- Reduced Wet FGD Water Consumption
- Reduced Plant Derates

Simple Implementation

Using the SBS Injection process to control SO$_3$ entering the APH, significant improvement in heat rate can often be achieved by upgrading heat transfer elements, modifying the APH configuration, and reducing pre-heat of the incoming combustion air. Based on experience, advanced technology, and proprietary design tools, Ljungström can quickly evaluate a variety of options for improving efficiency including:

- Increasing basket depth to fill void space in the rotor
- Utilizing unique basket designs to increase element depth
- Consolidating basket layers
- Switching to a more efficient heat transfer surface
- Modifying the rotor to increase available space

To ensure reliable, efficient long-term operation of the air preheater, Ljungström’s recommendations take into account flue gas composition, rotor design, bearing weight limitations, pressure drop, fan capability, seal design, and thermodynamic limitations.
About AECOM

AECOM is built to deliver a better world. We design, build, finance and operate infrastructure assets for governments, businesses and organizations in more than 150 countries. As a fully integrated firm, we connect knowledge and experience across our global network of experts to help clients solve their most complex challenges. From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, our work is transformative, differentiated and vital. A Fortune 500 firm, AECOM companies have annual revenue of approximately US$19 billion.

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ARVOS Group is a global leading industrial equipment provider, active both in the new equipment and aftermarket service through three global Divisions. The Ljungström Division is the owner of the Ljungström® heat exchanger technology and brand, highly recognized for its outstanding quality and performance, with its pedigree dating back to 1923. Headquartered in Heidelberg, Germany, ARVOS Group employs more than 1,700 employees in eight manufacturing facilities and additional sales and execution offices in Brazil, China, Czech Republic, Germany, India, Japan, Switzerland and the USA.

To learn more about ARVOS and the Ljungström Division, please go to www.arvos-group.com.

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