PROJECT facts

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Environmental and Water Resources

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THE INTEGRATED ENVIRONMENTAL CONTROL MODEL

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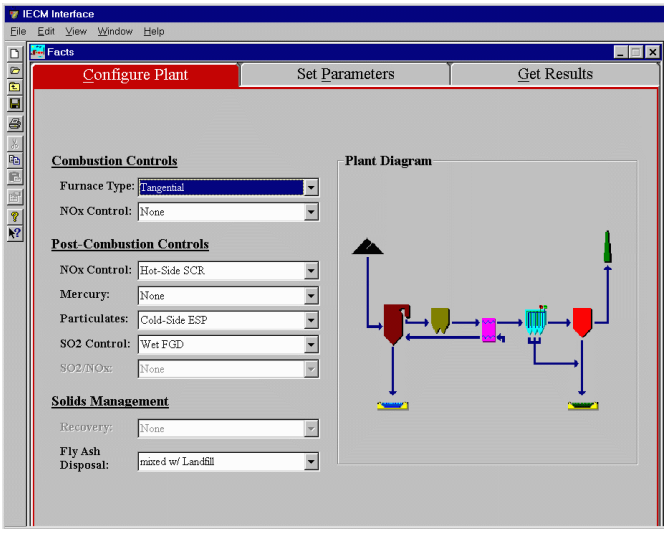
The Integrated Environmental Control Model (IECM) is a computer-modeling program that performs a systematic cost and performance analyses of emission control equipment at coal-fired power plants. Power plant owners, operators, state and federal regulators, environmental groups, and academic researchers can download the IECM from www.iecm-online.com for no charge.



The IECM presents a simple block diagram screen to the user to configure an existing power plant. The user then adds a variety of pre-combustion, combustion, and post-combustion emission control methods. The plant areas and processes currently included in the IECM are nitrogen oxides (NO_X), sulfur oxides (SO_X), particulate matter (PM), and mercury control technologies.

The IECM includes modules for a number of advanced environmental control technologies being developed with support from U.S. Department of Energy. For comparative purposes, a set of “baseline” technologies representing current commercial emission control systems is also part of the IECM framework. A unique capability of the IECM model is that it allows uncertainty of performance and costs to be characterized for key design criteria. The uncertainties can be iterated across the entire emission control system.

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POLLUTANT CONTROL TECHNOLOGIES

NO_X control:
- Tangential, Wall and Cyclone Firing
- Low NO_X Burner
- Selective Catalytic Reduction
- Selective Non-Catalytic Reduction
- Natural Gas Reburn

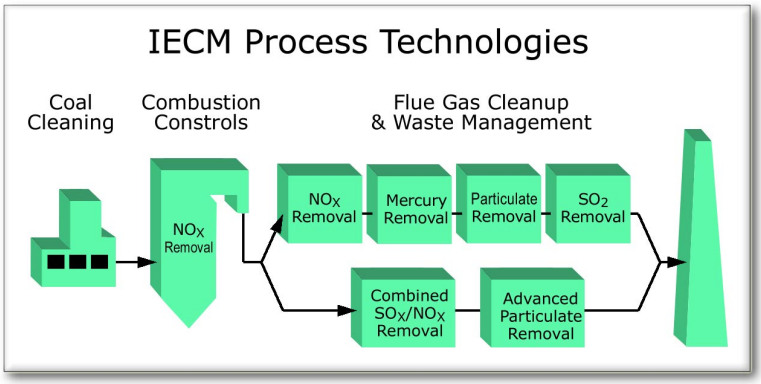
SO_2 control:
- Wet Limestone w/ Forced Oxidation
- Wet Limestone with Dibasic Acid Additives
- Lime Spray Dryer
- Mg-Lime process

Particulate matter control:
- Electrostatic Precipitator
- Reverse Gas Fabric Filter
- Reverse Gas Sonic Fabric Filter
- Shake and Deflate Fabric Filter
- Pulse-jet Fabric Filter

Mercury control:
- Activated Carbon Injection (with and without spray cooling)
- Intrinsic capture of mercury by other control technologies

Tech Talk

Carnegie Mellon University developed the IECM for the National Energy Technology Laboratory. The model runs on an Intel-based PC under Windows 95/98/NT. The IECM website is *www.iecm-online.com* The executable file for the model, the documentation for the model, some papers describing the model and some applications are all posted on this site. Technical support is available by e-mail at *modelling@netl.doe.gov*



For each technology, a process performance sub-model accounts for all energy and mass flows, including air pollutants, reagent requirements, and solid wastes associated with that process. The performance sub-models use key process design parameters, such as the specific collection area of an electrostatic precipitator, or the reagent stoichiometry of a flue gas desulfurization system. Coupled to each performance model, an economic sub-model estimates the capital cost, annual operating and maintenance costs, and total levelized cost of each technology based on plant and performance model parameters, including all emission constraints. The model reflects the EPRI cost methodology. (TAG™, Technical Assessment Guide, Volume 1: Electricity Supply. Palo Alto, CA, Electric Power Research Institute (EPRI), TR-102276-V1R7, 1993.)

Background

Clean, affordable energy is essential for future U.S. prosperity and security. Over half of the electricity used in the U.S. currently comes from coal-fired power plants, with coal projected to be the primary source of electricity through 2020 and beyond. Regulatory controls will continue to lower the permissible level of such pollutant emissions.

A major challenge facing coal–fired power plants is controlling emissions of sulfur and nitrogen oxides, particulate matter, and mercury in a cost-effective manner. Interactions between the old and new equipment can create undesired results. The IECM was developed to provide preliminary performance and cost estimates for new base load power plants as well as existing plants considering technology retrofits.