

# Wet Gas Scrubbers for Refinery FCC Emissions Control

Proven experience and reliability



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## Proven experience and reliability

With our acquisition of certain assets of Hamon Research-Cottrell in 2022, Babcock & Wilcox (B&W) is now a licensee of the ExxonMobil wet gas scrubbing (WGS) technology which allows refiners to reliably meet stringent fluid catalytic cracking (FCC) emissions regulations with well-proven technology.

### *Easily retrofits into existing plants*

Developed by ExxonMobil in the 1970s and now licensed by B&W, the WGS technology removes particulates and sulfur dioxide (SO<sub>2</sub>) by intimate mixing of the flue gases with an aqueous scrubbing liquid. The technology can also be enhanced to meet tighter restrictions on nitrogen oxides (NO<sub>x</sub>) or particulate.

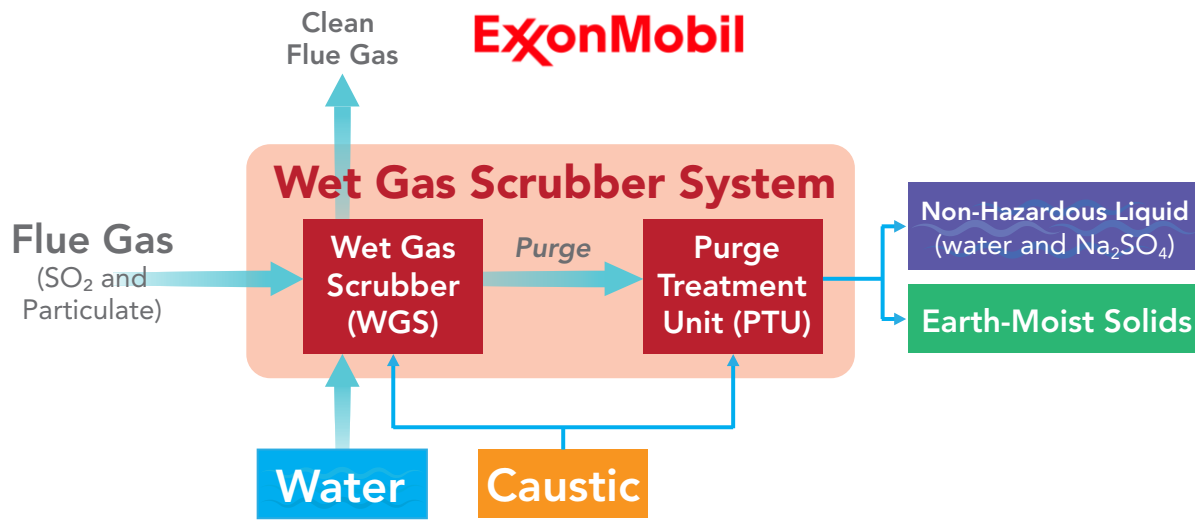
WGS technology can be retrofitted into full-burn or partial-burn FCC units, even those with first-generation carbon monoxide (CO) boilers and very low flue gas pressure.



The WGS jet ejector venturi (JEV) technology is an ideal choice for partial-burn units, where the available flue gas pressure is low. The JEV creates suction pressure at the venturi throat from the action of the recirculated scrubber liquid. The application of WGS JEV scrubbing may avoid the need to upgrade older CO boilers. This JEV design offers the lowest required inlet pressure of any commercial scrubber.

The WGS high energy venturi (HEV) technology is well-suited for full-burn units where higher gas pressures are available. The HEV design uses the available energy in the flue gas to create the small droplets needed to scrub particulate and SO<sub>2</sub> at high efficiency.

The typical scope for a WGS project includes the scrubber vessel from the flue gas inlet to the stack, the recirculation pumps and piping, scrubber instrumentation and control, caustic and water make-up systems, scrubber purge, and the purge treatment unit to produce solids for disposal and non-hazardous liquid.



*The WGS scrubbing technology can provide these advantages:*

- Avoids costly CO boiler upgrades with inlet scrubber pressures as low as zero inches of water
- Maximizes cat cracker availability – scrubber run lengths match longest FCC up-time in the industry
- Meets or exceeds stringent particulate and sulfur oxides (SO<sub>x</sub>) emission regulations
- Produces non-hazardous liquid
- Collects catalyst suitable for direct low-cost disposal

Refiners can take advantage of B&W's more than 155 years of experience and global leadership position in providing energy and air pollution control equipment to a wide range of industries.

*High reliability*

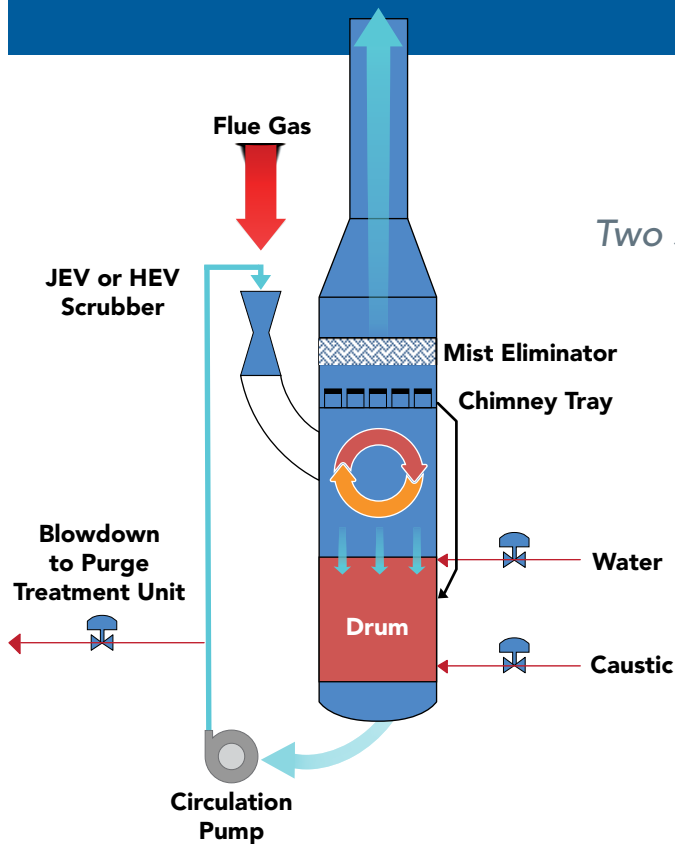
Since introduction of the technology in the 1970s, more than 50 FCC units have been fitted with WGS systems worldwide.

The robustness of the fundamental design is evidenced by many of the earliest units which continue to perform today. Subsequent improvements in design, performance and capital cost have continued to advance the technology while maintaining the integrity and reliability of the system.

With run lengths in excess of four years and matching the longest FCC up-time in the industry, WGS units have typically operated until the FCC is ready for its turnaround.

## Combined particulate and acid gas removal

For effective **flue gas pre-treatment in post-combustion carbon dioxide (CO<sub>2</sub>) capture applications** or for very high emission removals, wet electrostatic precipitator (ESP) technology can be integrated on top of the WGS. This arrangement provides for both acid gas reduction and particulate removal, including aerosols, all within a compact footprint.



### Two scrubber designs provide flexibility

#### High Energy Venturi (HEV)

- Uses gas pressure to push gas through venturi
- Gas kinetic energy breaks liquid into drops
- Preferred choice when flue gas pressure is high

#### Jet Ejector Venturi (JEV)

- Liquid flow in the venturi creates suction pressure
- Has lower back pressure than any other available scrubber
- Liquid kinetic energy breaks liquid into drops
- Preferred choice when flue gas pressure is low
- Ideal for retrofits with older CO boilers that cannot take high back pressure

### Babcock & Wilcox

1200 E Market Street, Suite 650  
Akron, Ohio, U.S.A. 44305  
Phone: +1 330.753.4511

[www.babcock.com](http://www.babcock.com)    

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