Dual Flow Tray Technology
New Build Wet FGD System

amec foster wheeler

- Superior Mass Transfer Capabilities allows comparable performance at reduced L/G ratios

- Design Comparison for 500 MW, 1.2% sulfur, 98% SO_2 removal

	Open Spray Tower	DFT Tower
Absorber Diameter, meters	15.0	15.0
Recycle Tank Retention Time, mins	5.0	5.0
Recycle Tank Height, meters	10.1	7.4
Number of Recycle Pumps	3+1	2+1
Recycle Pump Flowrate, m3/hr	6,100	6,670
Number of Trays	Zero (0)	One (1)
Overall Tower Height, meters	30.3	26.1
Absorber Power Consumption, kw	1,800	1,310
Pressure Drop, kPa	1.0	1.4

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- Capital Cost Advantages for DFT Absorber vs Open Tower
  - Absorber is shorter in height
  - One (1) fewer recycle pump and piping system
  - Smaller absorber area footprint
  - Smaller absorber access structure
  - Thinner absorber shell steel
  - Reduced foundations
  - Less auxiliary piping
  - Less electrical cable and conduit
  - Less instrument and control cable
  - Lower construction costs

- Identical (to slightly less) operating costs compared to open tower
  - Gas pressure drop power offset by lower recycle pumping rates

Dual Flow Tray (DFT) Technology
New Build Wet FGD System

- Maintenance Advantage
  - Designed for Maintenance Loads
  - Initial construction staging platform
  - Installed inspection platform
  - Shorter outages
  - Minimal scaffolding and Lift Equipment reduce outage costs

Dual Flow Tray Technology
Existing Wet FGD Upgrades

- Performance Improvement Chemistry Options
  - Operating pH increase
    - Limited by chemistry concerns
    - Limestone stoichiometry
    - Sulfite to sulfate oxidation
    - Gypsum purity
    - Scaling
  - Higher Quality Limestone
    - Smaller grind
    - Higher Reactivity
    - Not typically reasonable option due to cost / availability

- Marginal performance improvement (1% - 3%)

Dual Flow Tray Technology
Existing Wet FGD Upgrades

- Performance Improvement by Equipment Modifications
  - Wall Rings
    - Reduces flue gas sneakage along side walls of absorber
    - Most effective only if spray distribution system is poorly designed
    - Marginal improvement expected (1% - 3%)
  - Higher Pressure Spray Nozzles
    - Smaller spray droplet / More surface area for mass transfer
    - Higher pumping power
    - Recycle Pump Motor change
    - Droplet coalescence limits improvement
  - Alternate Style Spray Nozzles
    - Smaller spray droplet / More surface area for mass transfer
    - Droplet coalescence limits improvement

Dual Flow Tray Technology
Existing Wet FGD Upgrades

- Performance Improvement by Equipment Modifications
  - Additional L/G Ratio
    - Generally required for significant efficiency improvement (>5%)
    - Challenging to accomplish with an existing system
    - Is there plot space available for larger or more recycle pumps?
    - Is there absorber height available for more spray headers?
    - Will the recycle pipe size need modification?
    - Recycle tank retention time concerns
    - Outage time requirement
  - Dual Flow Tray Solution
    - 1st upgrade in 1991 of four existing open spray towers in USA
    - Most Recent upgrade done in May 2015 Startup
    - 42 open spray / packed bed absorbers have been retrofitted with Dual Flow Trays
    - Efficiency improvements from 80% up to 98%

Dual Flow Tray Technology
Existing Wet FGD Upgrades

- Dual Flow Tray Solution
  - Ideal for performance improvement of an existing upflow open spray tower
  - Full Scale Data indicate as much as 50% improvement in number of transfer units (NTU's) of existing open spray tower
    - 80% current SO2 efficiency → 90% SO2 efficiency
    - 85% current SO2 efficiency → 93% SO2 efficiency
    - 90% current SO2 efficiency → 96% SO2 efficiency
  - 1.0 – 1.5 meters of space required between top of inlet flue gas duct and lowest spray level
  - Adequate access into absorber recycle tank needed to install support steel and Tray Sections
  - Adequate Fan Capacity for expected 0.4 kpa pressure drop increase

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