



Powerspan's patented Electro-Catalytic Oxidation technology, known as ECO®, is an advanced multi-pollutant control technology that reduces emissions of sulfur dioxide (SO₂), nitrogen oxides (NO_x), oxidized mercury, and fine particulate matter (PM_{2.5}) in a single system. The ECO process also produces a commercial grade ammonium sulfate fertilizer co-product.

- 1 Flue gas from a coal-fired boiler passes through an electrostatic precipitator (ESP) or fabric filter to remove the majority of particulate matter.
- 2 A barrier discharge reactor oxidizes gaseous pollutants. Nitric oxide is oxidized to nitrogen dioxide (NO₂) and nitric acid, a small portion of the sulfur dioxide (SO₂) is converted to SO₃ leading to the formation of sulfuric acid mist, and some mercury is oxidized to mercuric oxide.
- 3 In the lower loop, spray nozzles distribute droplets of ammonium sulfate (AS) liquid into the flue gas. Water evaporates from the AS solution, saturating and cooling the flue gas, as well as concentrating the AS co-product.
- 4 The recycle pump circulates the AS liquid back to the spray headers, with a bleed stream to the co-product processing system.
- 5 In the upper loop, SO₂ and NO₂ are absorbed into the ammoniated solution. The absorbed SO₂ is in the form of SO₃. Interaction between the SO₃ and NO₂ oxidizes the SO₃ to sulfate and reduces the NO₂ to nitrogen and oxygen.
- 6 After exiting the upper loop, the flue gas enters a wet electrostatic precipitator (ESP). Aerosols generated in the reactor and ammonia scrubbing process steps, along with air toxics and fine particulate matter, are captured here and returned to the lower loop.
- 7 Scrubbed flue gas, essentially free of NO_x, SO₂, oxidized mercury, and particulate matter, exits to the wet stack.
- 8 The clear, liquid ammonium sulfate (AS) stream, which contains dissolved AS salts, oxidized mercury, and captured particulate matter, is sent to a filtration system that filters out ash, insoluble metals, and captured mercury.
- 9 The treated AS co-product stream, free of ash and mercury, can be sold in liquid form or sent to a crystallizer to produce crystals of the required size for sale into the fertilizer market.
- 10 Make up water is periodically used to rinse the walls of the wet ESP and to replenish the water lost to evaporation.
- 11 Ammonia reagent is added to maintain process chemistry conditions that result in a high SO₂ scrubbing rate.