



Zero Emission Technology

A New Cost-effective Technology to Abate Emissions from the Steel Sector

- Binoy Mishra

Director, Emission Control Associates
USA

bm@eca-zeroemission.com

Major problems in current coal emission control technologies:

- Globally, almost all major integrated steel plants have installed various pollution control mechanisms in their respective plants, including high capacity blast furnaces, FGD plant, sinter plant with ESPs, coke oven battery, high temperature membrane bag filters, electronic controllers in ESPs, etc. are some initiatives towards pollution control. Yet, the major GHG pollutants go unabated. The weaknesses in current emission control technologies include the following:
 - No commercially viable technologies for capturing and abating CO₂.
 - High Costs - very high capex; also very high opex.
 - Resource inefficient: use a lot of space, and consume significant amount of power, water, chemicals and catalysts;
 - ESPs: Not as effective in

collecting finer PMs, especially PM_{2.5}. Fabric Filter (baghouse) is able to handle any fine PM, but has high maintenance costs and higher pressure drops.

- SCR and FGD: use significant amount of energy, water, chemicals and reagents, and are therefore very expensive; high in capex and opex.

So far there has been no financially affordable, location agnostic and comprehensive (abating all emissions, and not just one gas) technology to capture, convert and safely dispose off CO₂ and other fossil fuel emissions, especially from the two major fossil fuels – Diesel and Coal. Therefore, there is a clear need in the market today for one emission control technology that could address ALL major pollutants from Diesel, Gasoline, Coal and other Fossil Fuels comprehensively, cost-effectively and applicable in all locations.

The Proposed New Technology: Zero Emission Technology (ZET)

The new ZET represents a new pathway to emission control through

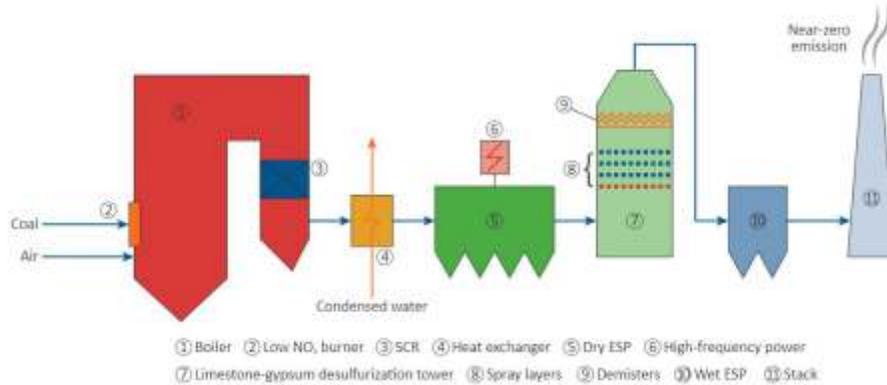
electro-chemical processes. It combines certain electro-chemical processes under controlled conditions (temperature, pressure and a liquid medium) to convert and condense various components of flues gases from fossil fuels into complex chemical compounds in liquid and semi-solid forms.

ZET has been successfully demonstrated and validated with both diesel and coal flue gases:

(a) COAL FLUE GAS:

According to M/s ECA, ZET has displayed remarkable results with the Coal flue gases: it fully eliminated CO, HC, NO_x and NO; reduced CO₂ by 99.9% and SO₂ by 95%. Moreover, it increased by 55% O₂ percentage in the exhausts exiting the ZET reactor.

Flue gases from bituminous coal were passed through the ZET reactor and intermediate materials obtained within the reactor were analyzed by a third-party expert – Dr. N. S. Chong, an acknowledged expert in Air Emissions. The end product was confirmed as predominantly Asphalt or Parking Lot Tar. Asphalt is a valuable construction material. Coal tar pitch has



Pollutants	Reduced From	Reduced To	Percentage Reduction
CO ₂	125.6%	0.1%	99.9%
CO	32.76%	0%	100%
HC	32,767 PPM	0 PPM	100%
NO _x	32 PPM	0 PPM	100%
NO	32 PPM	0 PPM	100%
NO ₂	0 PPM	0 PPM	N.A.
SO ₂	241 PPM	12 PPM	95.0%
O ₂	13.1%	20.3%	55% Increase

Pollutants	Reduced From	Reduced To	Percentage Reduction
CO ₂	2.90%	0%	100%
CO	0.11%	0%	100%
HC	485 PPM	4 PPM	99.2%
NO _x	161 PPM	6 PPM	96.3%
NO	71 PPM	6 PPM	91.6%
NO ₂	102 PPM	0 PPM	100%
SO ₂	83 PPM	1 PPM	98.8%
O ₂	16.6%	20.8%	25.3% Increase

been used as the base media for coatings and adhesives for many years, including roofing bitumen.

(b) DIESEL FLUE GAS:

ZET’s reaction and results with the diesel flue gases have been extremely successful, reducing CO, CO₂, NO₂ by 100%, Hydrocarbons and SO₂ by almost 99%, and NO_x by 96%:

Potential Benefits from Using ZET in the Steel Sector:

When successfully integrated with emissions from steel rolling mills and blast furnaces in steel industry, this will become a new technology for emission control. ZET devices could be retrofitted to bring down the pollutants, including GHGs, to meet the country’s emission standards and even beyond so that they could obtain carbon credits for abatement of carbon emissions.

The stated advantages of ZET’s use include the following:

- Simple & Proven technology - less moving parts
- Comprehensive – deals with all types of emission in one reactor
- Low Capex and Low Opex: For conventional technologies, the 10-year life cycle cost is about Rs 39 crores per MW (megawatt of electricity generated) for carbon, nitrogen and sulfur reduction technologies. Just for carbon capture portion, a 10-year life cycle cost of Rs 31 crores per MW. In contrast, 10-year life cycle benefit (not cost) for ZET is Rs 3.17 crore per MW. Hence the “difference” between the two technologies is about Rs 42 crores per MW in 10 years.
- A fraction of space required
- No expensive inputs, additives or catalysts
- Water efficient - can use waste water from steel plants
- Energy efficient - much less use of energy – about 5 watts per one metric ton per hour of flue gas flow
- Can be designed in scalable, modular units, easy to install and operate; eliminates expensive retrofits.

ZET will be a “technological leap” over the current emission control systems in that it will address all emissions comprehensively rather than one technology for one emission. ZET will also represent significant cost savings over existing technologies.

