



सत्यमेव जयते

**NORMS FOR INSTALLATION OF FGD
for
NEW ENVIRONMENTAL REGULATIONS -
7th December-2015
(For Ammonia & Sea Water based FGD)**



(FROM 20th March, 2019 ONWARDS)

BRIEF REVIEW OF THE NEW MOEF&CC ENVIRONMENTAL RULE

The notification from MoEF&CC dated 7th December-2015 amends existing norms related to emission of SPM and introduces new norms for emission of SO₂, NO_x and Mercury from Thermal Power Plants (TPPs). It also specifies modified limits for specific water consumption by TPPs and insists to convert existing once through based condenser cooling system to recirculation type. Different limits are specified based on capacity of power plant and year of installation. A summary of new regulations on air emission is given in below:

NEW REGULATIONS ON EMISSION

Date of Installation	PM	SO ₂	NO _x	Mercury (Hg)
Before 31-12-2003	100 mg/Nm ³	600 mg/Nm ³ for <500MW 200 mg/Nm ³ for >=500MW	600 mg/Nm ³	0.03 mg/Nm ³ for >=500MW
After 01-01-2003 & Upto 31-12-2016	50 mg/Nm ³	600 mg/Nm ³ for <500MW 200 mg/Nm ³ for >=500MW	300 mg/Nm ³	0.03 mg/Nm ³
On or after 01-01-2017	30 mg/Nm ³	100 mg/Nm ³	100 mg/Nm ³	0.03 mg/Nm ³

SUMMARY OF NEW REGULATIONS ON WATER USE

Sl. No.	New requirement
1	All plants with Once Through Cooling (OTC) shall install Cooling Tower (CT) and achieve specific water consumption up to maximum of 3.5 m ³ /MWh within a period of two years from the date of publication of notification.
2	All existing CT-based plants reduce specific water consumption up to maximum of 3.5 m ³ /MWh within a period of two years from the date of publication of



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	notification.
3	New plants to be installed after 1 st January 2017 shall have to meet specific water consumption up to maximum of 2.5 m ³ /MWh and achieve zero waste water discharged.

Further, to the above MoEF & CC notification, MoEF &CC has subsequently issued an amendment dated 28th June 2018 for stack height post FGD and water Consumption which is mentioned below:

SUMMARY OF NEW AMENDMENT

Stack Height post FGD installation :

Sl. No.	Industry	Parameter	Standards	Remarks
1	Thermal Power plants with Flue gas Desulphurization (FGD)	Stack Height/Limit in Meters	Power Generation capacity : 100 MW and above $H = 6.902 (QX0.277)^{0.555}$ Or 100 m Whichever is more Less than 100 MW $H = 6.902 (QX0.277)^{0.555}$ Or 30 m Whichever is more Q = Emission rate of SO ₂ in kg/hr* H = Physical stack height in meter *Total of the all units connected to stack Note: These standards shall apply to coal /lignite based Thermal Power Plant.	

- All monitored values for SO₂ and NO_x shall be corrected to 6% Oxygen, on dry basis.
- Specific water consumption shall not exceed maximum of 3.0 m³/MWh for new plants installed after the 1st January 2017 and these plants shall also achieve zero waste water discharge.



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- Seawater based plants are exempted from conversion of once through to Cooling Tower based system.

TECHNOLOGY SELECTION

The So₂ reduction technology shall be done considering following factors:

- 1: Sulphur Content in Coal.
- 2: So₂ removal Efficiency requirement of particular plant.
- 3: Availability of Reagent (if Any).
- 4: Disposal and handling of By-product.
- 5: Locational/Geographical factors of the plant.
- 6: Plant life.
- 7: Space requirement for FGD facility.

COST

CAPEX:

The cost estimation given below is only indicative in nature and discovered through open competitive bidding for the projects already awarded:

CAPACITY GROUP (MW)	LAKH PER MW #
210	40.5
250	
300	39.15
500	36.45
525	
600	33.3
660	
800	27
830	



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The above CAPEX is “**Base Cost**” only, this base cost is with new chimney and without GGH and does not include Taxes-Duties and Opportunity Cost for interconnection.

NOTE: The additional CAPEX requirement for water channel construction (if any) for Sea based FGD (Closed Cycle) may be examined case to case basis.

The above Base cost may further vary as per the following conditions:

1. The increase in no. of units will reduce the CAPEX because of common facilities.
2. Range of SO₂ removal.
3. Chimney Layout such as using existing chimney as wet stack, new wet stack with single or multi flue cans, Chimney above absorber, provision of temporary chimney for making existing chimney operational and chimney material.
4. Choice of Corrosion protection lining in chimney, absorber and other sections of FGD.

Note: The cost may further come down in future due to increased number of vendors/suppliers as the market matures.

OPEX:

Operating Cost (OPEX) of FGD will be dependent on Reagent cost (if any), cost of Additional water consumption, O&M Manpower cost, APC of FGD, Dredging, By-product handling and revenue earned through disposal of by-product (if any) etc.

AUXILIARY POWER CONSUMPTION:

Auxiliary Power Consumptions (APC) is estimated to be maximum 0.8% in case of Ammonia based FGD and maximum 1% in case of open cycle Sea water based FGD operations. In case GGH (Gas to Gas Heater) is used maximum 0.3% additional APC may be required.

Note: The additional APC requirement (if any) for Sea based FGD (Closed Cycle) may be examined case to case basis.



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OPPORTUNITY COST:

Since interconnection of chimney with absorber may result in loss of generation, hence Power plants are advised to minimize this interconnection time by taking suitable measure so that the "Opportunity cost" associated with plant shutdown may have least impact on Tariff.