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WATER CONSERVATION AND MANAGEMENT AT IGSTPS (3x500 MW), APCPL,

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Introduction

"Water" is essential to the survival of mankind. There are millions of people all over the world who don't have access to water, or if they have access, that water is unable to be used. Clean drinking water is scarce and people spending their entire day searching for it at some places globally.

With an increasing demand on natural water resources, and unabated pollution posed by industrial discharges into the environment, water conservation and its wisely management has become crucial. The implementation of zero discharge from industries may play a vital role to minimize the water consumption. The "Zero Discharge" theoretically means no discharge of any kind of pollutants into the environment. For all practical purposes, the concept of zero discharge necessarily means the following:

1) Recovery of reusable water/other materials from waste water;
2) Minimization or, no discharge of polluting substances into the environment away from the waste water treatment facility.

In India, the concept of zero discharge essentially emerged from the situation where industry is unable to meet the discharge norms set by the State and Central Pollution Control Boards. This led to pollution of the environment and subsequent litigation. Initially, the polluters were penalized to an extent necessary to clean the environment that the polluted. This concept was called Polluters Pay Policy. The essential ingredient of this policy, however, led the industry to initially pollute the environment- and later pay for environmental losses. Realizing that pollution is still uncontrolled and monitoring has become very much difficult with so many industries discharging the waste water in to the environment, finally a solution was conceived and the concept of zero discharge has emerged. In continuation to develop a practice for water conservation in power stations in view of water scarcity, Ministry of Environment, Forest and Climate change has issued new notification in December 2015 on new norms for water usage in power generation. All existing CT-based plants shall have to reduce specific water consumption upto maximum of 3.5m3/MWh within a period of two years from the date of publication of this notification.

In view of the above it has become a challenge for thermal power stations to comply the issued new norms regarding specific water consumption. For new plants to be installed after 1st January, 2017 shall have to meet specific water consumption upto maximum of 2.5 m3/MWh and achieve zero waste water discharged.

Plant Overview

Aravali Power Company Private Limited (APCPL) is a joint venture company with NTPC Limited, Haryana Power Generation Corporation Ltd. (HPGCL) and Indraprastha Power Generation Company Ltd. (IPGCL). Indira Gandhi Super Thermal Power Station is the flagship project of APCPL consisting of 3x500 MW units located at Jharli, Jhajjar, Haryana.

Make up water requirement for the project (3 X 500 MW) is 7400 m^3/hr. Water Linkage of 150 cusecs from Jawahar Lal Nehru (JLN) Feeder canal in a roaster of 16 days in 32 days period is available.

As per the commitment of station towards environment protection and sustainable development, water is being conserved through various practices to achieve the zero liquid discharge and green initiatives are being adopted to minimize the impact of industrial activities on environment.

Approach towards the water conservation at IGSTPS

To minimize the water consumption and achieve zero liquid effluent discharge at IGSTPS, the following systems have been provided and it will help station to comply the new water consumption norms from MoEF &CC

1. High Concentration Slurry disposal systems

For the first time in HCSD system has been provided in NTPC plants for such large capacity station in APCPL Jhajjar for handling the fly ash in wet form. Typical HCSD (High Concentration Slurry disposal) systems include the Clyde Bergemann solution designed to reduce water usage (up to 90% by weight), reduce ground and surface water pollution, reduce dust emission surrounding ash-dyke site, increase disposal area working capacity.

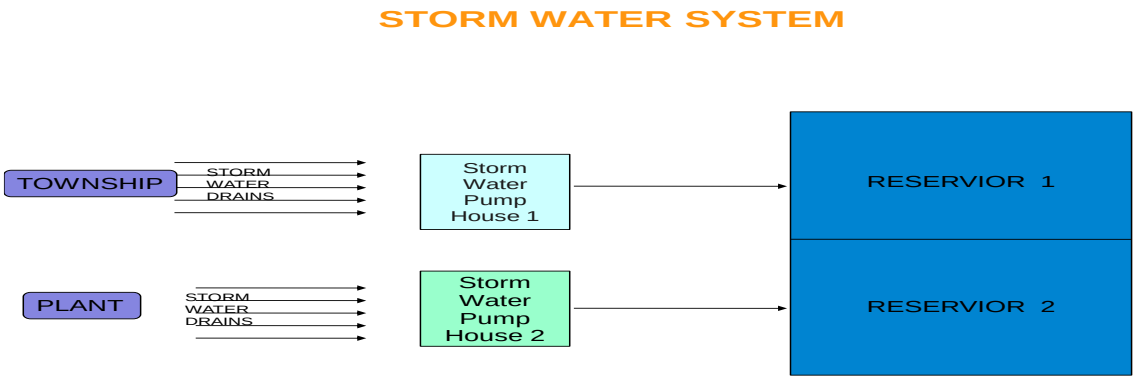
This system is supplied by WEIR, GEHO PUMPS, Netherland for Ash water ratio of 65:35 to conserve water as compared to 1:5 ash water ration used in conventional ash slurry disposal system. The system comprises of five mainline piston diaphragm pumps and five main pipe lines to the storage area.

The major advantages of HSCD system are as follows:

- Very low water consumption.
- The slurry is self-setting and also self-limiting so that in the ash pond ash will be deposited & dry by itself to form hard surface. This resulted reduced area of ash pond.
- The specific energy consumption is much lower than convention medium slurry system.
- Pipeline diameter is very less compared with the medium concentration slurry system results cost benefit.
- Problem of leaching and surface water pollution in the ash pond is completely eliminated.
- Ash from ash pond area could be utilized since it becomes dry fairly fast.

Picture showing the ash disposal at HCSD pond

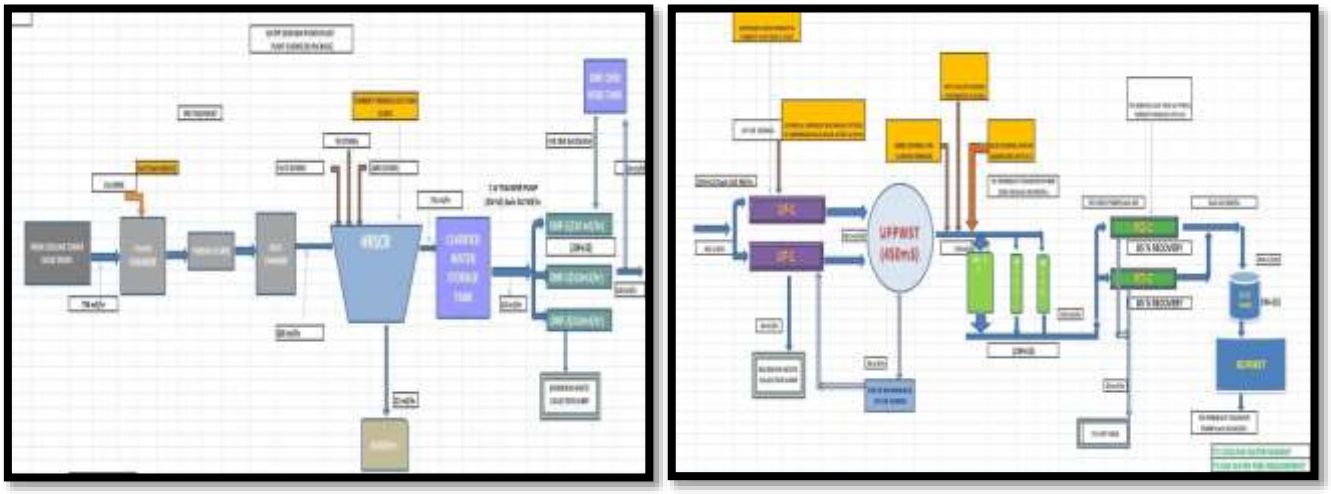
2. Storm Water Separation: Separate RCC drains for collection of rain water or storm water from plant and township have been provided. Storm water drains from plant and township are connected to storm Water pump Houses separately. The water from Storm water pump houses will be sent to reservoirs



3. RO Plant: To facilitate zero liquid discharge through recycling of effluents, RO plant of capacity 450 Cubic meter /hr. (225m3/hrx2) has been provided at station to treat the Cooling Tower Blow Down. RO system will decrease the turbidity of CW and will increase the life of CT Fills. The efficiency of Condenser will also increased with the system provided.

The treated water is being used to feed DM water requirement and cooling water makeup. The RO reject water being provided to the CHP for the purpose of yard sprinkling/water washing purpose. An overview of the RO system at IGSTPS is given below.

FLOW CHART OF RO PLANT AT IGSTPS



3. Ash water Recirculation system:

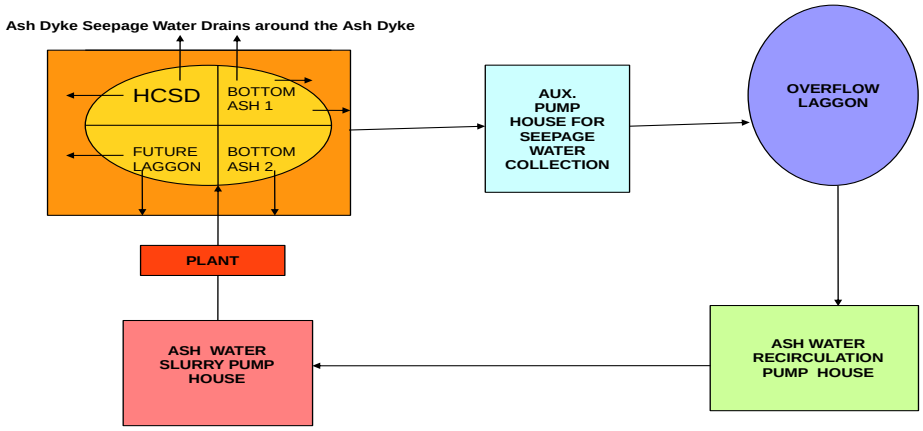
In order to reuse waste water i.e. decanted water from ash dyke, station is equipped with Ash Water Recirculation System which is provided for pumping the water recovered from ash pond to Overflow lagoon to plant ash water sump. There are 3 AWRS pumps in parallel with 2 working and 1 standby with capacity of 750m3/hr each.

4. Natural draft cooling Towers:

In order to minimize the evaporation losses and conserve water and energy, station have been provided with natural draft cooling towers for the condenser cooling water system.

5. Ash Dyke Seepage Water Collection Drains:

There is no river or canal or water collection sources in the district of Jhajjar and this huge amount of water cannot be allowed to damage the crops of the locals. A RCC drain has been constructed around the ash dyke for collection of seepage water. The drain is approx. 6.765 km. The collected seepage water is pumped to Overflow lagoon by two nos. of pump houses. The decanted water from overflow lagoon is further pumped to Ash Water Pump house through Ash Water Recirculation Pumps. This system saves huge quantity of fresh water as make up used for deashing in plant.



6. Sewerage treatment plant:

Sewage Treatment Plant with capacity of 1150 m3/day has been provided at Permanent Township, IGSTPS. This STP will treat the raw sewage of township generated from water closets, kitchen and bathrooms and includes the waste from other non-residential buildings i.e. Club restaurant, Guesthouse and Canteen etc.. The treated sewage quality will meet permissible standards as prescribed by Pollution Control Board. After Treatment BOD will be reduced from 200 mg/litre to 30 mg/litre and TSS will be 100mg/litre from 350 mg/litre.

The treated sewage is disinfected before being used for horticulture work in township. A network of pipeline has been laid in whole township for this purpose. There will be no sewage discharge outside the plant premises. Few Characteristics of STP are as given below:

A	Flow	1150 cum /day
B	Average Flow	58 cum/hr
C	Peak Flow	175 cum/hr
D	BOD	200 mg/litre
E	Suspended Solids	350 mg/litre

7. Coal Slurry Settling Pit:

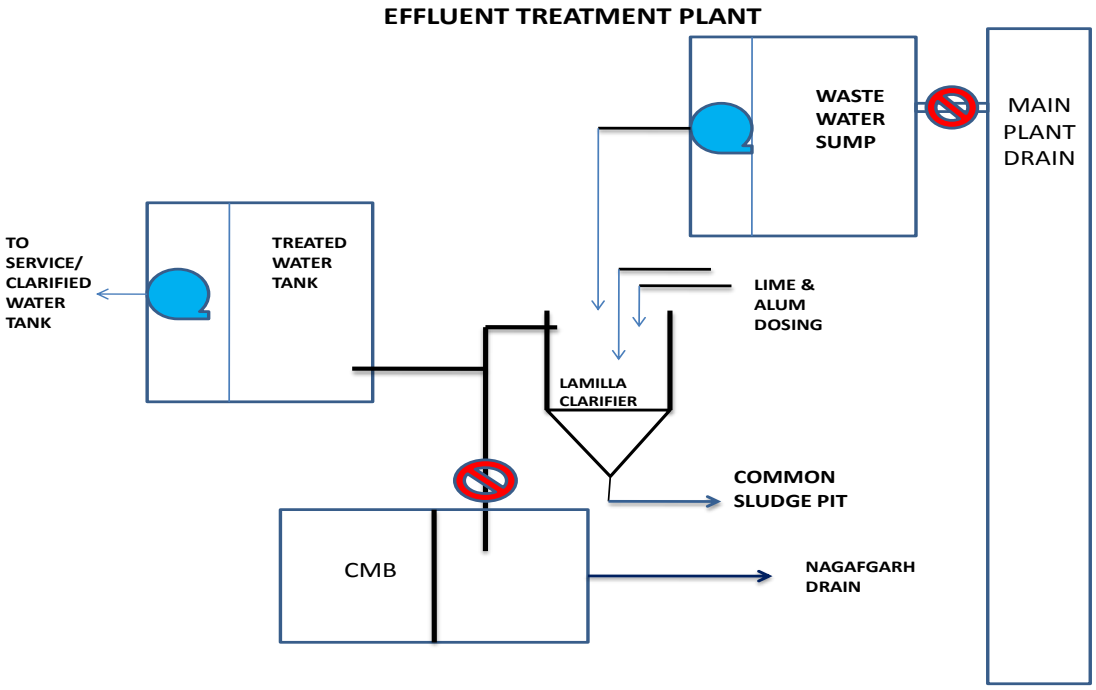
Station has been provided with a full fledged coal slurry settling pit with necessary pumping station. All waste water generated from washing and other activities from CHP is being diverted to the coal settling pits via drain. Required chemical dosing is being done for settling of coal dust particles. After treatment the decanted water is pumped to CHP for reuse in water spraying system at coal yard, washing of TPs/roads and wagon tippler areas etc..The treated water from CSSP is also being used as input water requirement at Ash Brick Plant.

8. Effluent Treatment Plant (ETP)

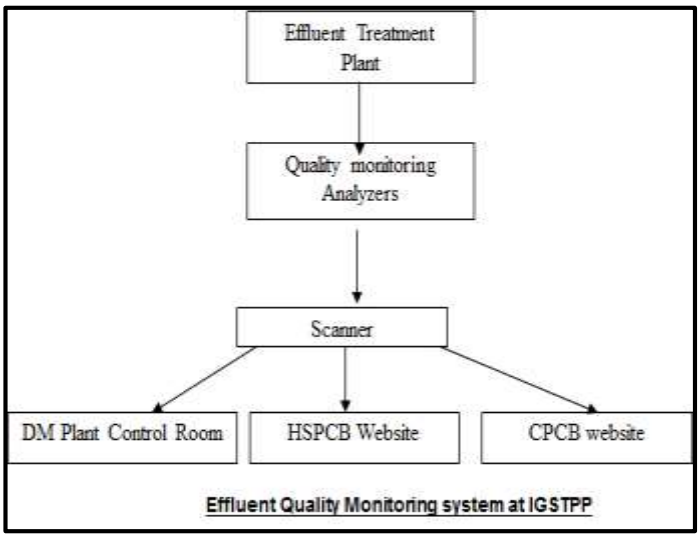
As mentioned earlier plant is designed for zero liquid effluent discharge with arrangement for the collection of waste water from plant process as well as storm water separately.

The waste service water generated due to floor washing etc. having high suspended solids and require treatment for removal of total suspended solids. An Effluent Treatment Plant has been provided with an objective to optimize the water consumption and treat the effluents from the plant processes for recycle and reuse.

For collection of waste water generated from Main Plant area, drains have been One waste water pump house is installed inside the plant premises which discharge the effluent water to the effluent treatment tank through tube settler. The treated water is used as service water for the purpose of washing in main plant and ESP areas etc.



There is no liquid effluent going outside the plant premises conforming commitment of station for Zero Discharge. Station has hooked up EQMS data to CPCB & HSPCB website.



By taking above initiatives and regular monitoring of various system, station is able to achieve continual improvement in water consumption

The trend of consumption for raw water and DM water for the last few years is given below.

	2012-13	2013-14	2014-15	2015-16
Process Water	2,64,57,769	18466110.9	1,91,40,755	16,223,628.60
Domestic	17,63,851	1231074.06	12,76,050	1,081,575.24
Cooling water	11,75,900	820716.04	8,50,700	721,050.16
Total Consumption	2,93,97,520	20,517,901.00	2,12,67,505	18,026,254
Total Generation(MU)	4953.76	5302.87	7025.10	5798.185
Sp. water consumption.(L/U)	5.93	3.87	3.02	3.16

Table1. Water consumption trend at IGSTPS

Conclusion

Now a day's Environment has become a serious concern for everyone and steps are being taken on international and national level for Environment management in sustainable manner. According to the present scenario on water scarcity globally, water conservation is the only solution to maintain the balance of nature. In this view as presented in this paper above, APCPL/IGSTPS is conscious towards Environment protection and adopted a no. of initiatives for water conservation. Station is working on Zero Effluent Discharge and for achieving the same, many system as ETP,STP, AWRS, CSSP and RO etc have been commissioned to treat the waste water and recycle & reuse the treated water with in the plant. HCSD is itself a state of art technology to reduce the huge water consumption for ash disposal. In addition to the water management practices, regular monitoring and corrective action for minimizing water losses is being done and reports reviewed by O&M heads. A dense greenbelt has been developed around the reservoir to reduce the evaporation losses.

All efforts made at station for water conservation, the water consumption is reduced 5.9 L/U in 2012-13 to 3.1 L/U in year 2015-16. The steps taken at IGSTPS shows its commitment towards a journey for environment protection and an approach towards sustainable development.