LARA SUPER THERMAL POWER PROJECT
LOCATION MANAGEMENT INSTRUCTION

LMI 09-R0/EEMG/OIN/OPS/SYST/034

Determination Of Specific Water Consumption

All locations are required to comply with this Directive

Approved for Implementation by .....
HOP(LARA)

Date :.....27/7/18.....

Enquiries to : HOD(EEMG)

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5	PREPARED BY	Name: Prasanta Kanjilal Designation: Manager(EEMG)
6	CHECKED BY	Name: Rakesh Kumar Designation: DGM(EEMG)
7	CHECKED BY	Name: Neshar Ahmad Designation: GM(C&T)
8	REVIEWED BY	Name: R K Rout Designation: GM(O&M)
9	APPROVED BY	Name: Sanjay Madan Designation: HOP(Lara)
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DETERMINATION OF SPECIFIC WATER CONSUMPTION

1.0 INTRODUCTION

Large quantity of water is used in thermal power stations for cooling in condensers of steam turbine. It is either used in once through mode or in recirculation mode. In once through mode, whatever water is taken from water body is given back to water body, excepting little quantity consumed in evaporation. In recirculation mode, heat picked up in condenser is evacuated to atmosphere through cooling tower. In such cases, continuous addition of make-up water is required to take care of the evaporation as well as drift losses occurring in cooling towers. Also a part of re-circulating water is replenished with makeup water so as to maintain COC levels to acceptable limits.

In addition to consumption in CW/CT circuit, large quantity of water is consumed for wet disposal of ash, in production of de-mineralized water, as makeup in the cooling circuit of various coolers like lub. oil coolers, generator coolers, compressors etc., in housekeeping and firefighting applications. Water is also consumed for offices and for domestic application in township etc.

Water being a scarce resource all efforts are made to minimize the consumption of water. This objective can be achieved through proper selection and design of power plant schemes / systems at initial stage itself and by following proper operation and maintenance practices. Audit of water balance system also helps in identifying the wastage / inefficient utilization of water. Such audits compare the present flows in different water circuits and compare it with the designed flows, which help in identifying the problematic areas / systems.

As a first step towards systematic efforts for minimization of water consumption, it is essential to periodically measure / asses total water consumption and specific water consumption of the station. Regular monitoring and trending of

these parameters will help in quick identification of any deterioration. It will also help in assessment of impact of any modification / measures taken for water conservation.

At Lara STPP, 2x 800 MW units water system is designed in closed cycle. Water is envisaged to be drawn from Mahanadi River through a desilting basin to main plant reservoir. From this reservoir, water is pumped through various systems and subsystems for plant and colony use.

2.0 REFERENCE DOCUMENTS

I. COS-ISO-00-OIN/OPS/SYST/034 REV. NO.: 0, MAY 2010 AND

II. Water balance diagram of Lara (DRG. NO 9548-999-PDM-W-001 dated 16/07/2014)

3.0 OBJECTIVES

I. Determination of total water consumption of the station on monthly basis.

II. Determination of specific water consumption of the station on monthly basis.

4.0 DETERMINATION WATER CONSUMPTION

4.1 Methodology for the assessment of total water consumption for Lara STPP shall be based upon water schematic of the plant. In the event of any change in water system scheme, suitable changes shall be incorporated in the procedure. Total water consumed for the plant and township is to be considered for this purpose. It will be the difference between total water withdrawal (from all sources) and total water discharge. However, any discharged effluent is treated as water consumed (In case of Lara it is designed zero). Since water system for Lara STPP is designed for closed cycle operation, total water withdrawal from source / sources is the consumptive water of the station. Based on the approved water balance diagram of the station (Drg. No 9548-999-PDM-W-001 dated 16/07/2014), all points of water withdrawal is listed and water quantities as

measured / estimated against each withdrawal point are recorded and summed up to get total water consumption of the station (in KL). Specific water consumption for the first time has to be determined as benchmarking purpose after COD of the unit when all ancillary systems are in service as per approved drawings of the concerned unit and appropriate factoring may be taken for sharing of common water system with adjacent unit which is in the stage of erection /commissioning.

Following methodology is used for calculation

I. Wherever flow measuring device is installed at water withdrawal point / points, to be used for this purpose (Namely at MU PH, Raw water PT and Raw water ash pump disc hdr.etc.)

II. Where such measurement devices are not installed, withdrawal water quantity will be estimated, considering the pump flow and its running hours or portable flow meter.

III. Where water flow can't be measured in the absence of measuring device, it shall be estimated in line with its characteristic curves. Also aging / expected derating of the pump to be considered.

IV. If possible, estimated pump flow should be verified with portable ultrasonic flowmeter and verified figure should be used for calculations.

V. Cooling tower losses is taken either as per design.

VI. Specific Water Consumption shall be calculated by dividing total water consumption of the station during the period (in KL) by total station generation (in kwh).

4.2 Presently Specific Water Consumption shall be calculated on monthly basis. Depending upon management requirement, the same should be calculated for any period, using the same methodology. For better and accurate results, calculation of total water consumption to be done while unit is running on 100 % capacity for a continuous duration of more than 48 hours. Determination of specific water consumption to be mandatorily done during hot summer days.

4.3 Description of Water system in Lara STPP

Water is envisaged to be drawn from Mahanadi River though make up pump to plant water reservoir. This water is pumped by Raw water PT pump to i) DM clarifier (165 m3/hr) ii) CW clarifier (4490 m3/hr) and through Raw water Ash pump to ash handling system (1330 m3/hr) ,among which ash handling system water is designed to be fully recyclable. Water at the outlet of the DM clarifier flows through to the gravity filter (165 m3/hr) and goes to the power cycle where evaporation loss as per design is estimated as 105 m3/hr. Water flow though CW clarifier is 4190 m3/hr and through CHP and dust suppression system is 300 m3/hr. From the outlet of the CW -clarifier ,135 m3/hr water goes through to the gravity filter for potable water system and 120 m3/hr goes to the ventilation system make up. Main CW system make up is 3760 m3/hr and make up to service water system is 120 m3/hr. Out of the total 3760 m3/hr water for CW system, evaporation loss is estimated as 3045 m3/ hr. All these calculations are based on 2x800 MW capacity units, when only one unit is running and declared commercial and other unit is not commissioned, half of the designed flow is considered for consideration of total designed water consumption.

4.4 Responsibility centres for determination of specific water consumption

Accurate measurement of total water and specific water consumption will require correct reading from flow measuring devices, hence calibration and healthiness of instruments to to be ensured.

Resp : HOD (C&I)

For measurement of total water consumption accurately at full load, it is to be ensured that all readings are taken at 100 % loading of the unit and at least 48 hours after stabilisation at full load. Since outage of auxiliaries during measurement will give erroneous result, hence planning and co-ordination to be ensured among maintenance, operation and EEMG to facilitate measurement at full capability of the unit.

Resp : HOD (Opn)/HOD(MTP)/HOD(EEMG)

Since any leakage in the system will give erroneous result in measurement of water consumption, hence all leakages are to be arrested prior to the measurement, for this, operation to raise notification after checking leakages and concerned maintenance dept to attend defects.

Resp : HOD (Opn)/HOD(MTP)/HOD(EEMG)

5.0 REVIEW

The Head of O&M will be responsible for reviewing this document on a 2-yearly basis or as necessary.

6.0 DISTRIBUTION

SL NO.	DATE OF ISSUE	ISSUED TO
1		HOP (Lara)
2		GM(O&M)
3		HOD(OPERATION)
4		HOD(MAINT)
5		HOD(MTP)
6		HOD(EEMG)
7		LARA INTRANET WEBPAGE

CHECKLIST FOR
DETERMINATION OF SPECIFIC WATER CONSUMPTION

	Description	Y/N	Remarks
1.	All water flow metes installed in the system are periodically calibrated.		
2.	All water flow metes installed in the system are in working condition.		
3.	Wherever in-situ flow meters are not installed, ultrasonic flow measurement is made to the extent possible.		
4.	In the absence of ultrasonic flow meter, flow measurement is done from characteristics curve of pumps.		
5.	Appropriate de-rating of pump is taken for flow calculation in case of characteristics curve is referred.		
6.	No lkg. in the system while flow measurement is done.		
7.	Measurement is to be taken only when unit is running at full capacity.		
8.	Design cooling water loss is taken for calculation		
9.	Readings are to be taken after unit running continuously for 48 hrs at 100 % capacity.		
10.	Calculation of water consumption is done as per approved LMI.		
11.	Design water consumption is compared, and exception is noted.		
12.	Exception is discussed in daily planning meeting.		

DO'S AND DON'TS

Do's

1. Water flow, if done though pump characteristic curve, proper aging factor to be applied.
2. Flow meters to be checked for healthiness.
3. Ultrasonic flowmeter, if used, then its healthiness to be ensured.
4. Monthly data to be collected.
5. Data collection to be done at 100% capacity.
6. Data collection to be done at least 48 hrs of achieving full load.

Don'ts

1. Data collection not to be done with leakage in the system.
2. No test to be performed at partial load.