DISASTER MANAGEMENT SYSTEM FOR SARDAR SAROVAR DAM KEVADIA COLONY, GUJARAT, INDIA.

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Abstract : Recently a world class monument of Sardar Vallabhbhai Patel's Statue of 182-meter height has been built on the dam site of Narmada river. As a result, it created a huge tourist attraction and tourist from all over the world comes to visit this incredible monument.

In spite of its gigantic reputation, there is a huge danger of flood. in the case of flood, there will be very high casualties if the water flows from dam. As a precaution to this problem, Sardar Sarovar Narmada Nigam Limited (SSNNL) and Gujarat State Electricity Corporation Limited (GSECL)
has decided to build a backup system which will work even in heavy flood scenario and will drain all the water overflowed from Main dam and will transfer that water to Reservoir Dam specially created to store water in this type of situations only.

With the help of latest technology, A waterproof Pumping station has been built which can also work when submerged in water. During flood like situation, this pump will suck the water from main pumping room and prevents main pump from failing.

This Project is divided in Two parts. First part includes Designing and calculating, and second part includes actual work implementation. In first part of the project, designing, selection and calculations are included of all the electrical aspects as well as other mechanical and civil aspects. After the approval of drawings and finalising the size of cables and pumps, Actual Implementation of project will start which includes making foundation for pumps under the dam, lowering and installing Pump set, laying of cable from Transformer to Main panel and Main panel to Pump Set and in last Commissioning.

Index Terms **-Cabling, Designing, Engineering, Pumps, Transformer Waterproof Electrification.**

I. INTRODUCTION

Sardar Sarovar Dam is built on the Narmada River near Kevadia Colony, Gujarat. Which has a gigantic reservoir of 30,000 hector. The dam's spillway Discharge capacity is 30.7 lakhs cusecs, making this dam at number three position in the World. This dam is not only used for reserving and collecting giant water, but this dam produces 1450MW of Electrical Energy. This energy is produced by two power houses located on the dam namely, RBPH (River bed power House) and CHPH (Canal Head Power House). Total 6 turbines of RBPH plane generates 200Mw Each generating 1200MW Totally, and 5 small 50 MW Turbines located at CHPH generates 250MW.

This dam is also a most favourite tourist place now a days because of World's tallest statue of Sardar Vallabhbhai Patel namely "Statue of Unity". It would be very dangerous if there are any natural calamities like Food would take place in the reservoir making it to spill excess water in the river and in the turbine and generator rooms. If this happens, then whole of the Sardar Sarovar Dam will be turned off because of Electricity failure. De-watering pumps will also stop working because of Short Circuit Problem and making a huge loss of Life and Property. To overcome this issue, a separate electrical system has to be design which can work perfectly under any type of Flood Situations, and during flood, it can remove water from the turbine and generator house and can flow the water to a specially designed reservoir build for storing Flood Water.

II. GENERAL OVER VIEW

During any water seepage or any Flood situation, water can easily enter in turbine room and generator room leading to failure of power generation. As a result of Power Failure, main De-watering pumps will be shuttled down and no water will flow outside the rooms.
To avoid this type of circumstances, a new Drain Pumping room is been installed besides the De-watering Sump which it totally Waterproof. When water will start seeping in De-watering sump, Drain Pumps will be turned on with the help of Sensors and they will remove the water from that room and will transfer the water to nearby reservoir specially designed to hold the water in this type of situation only.

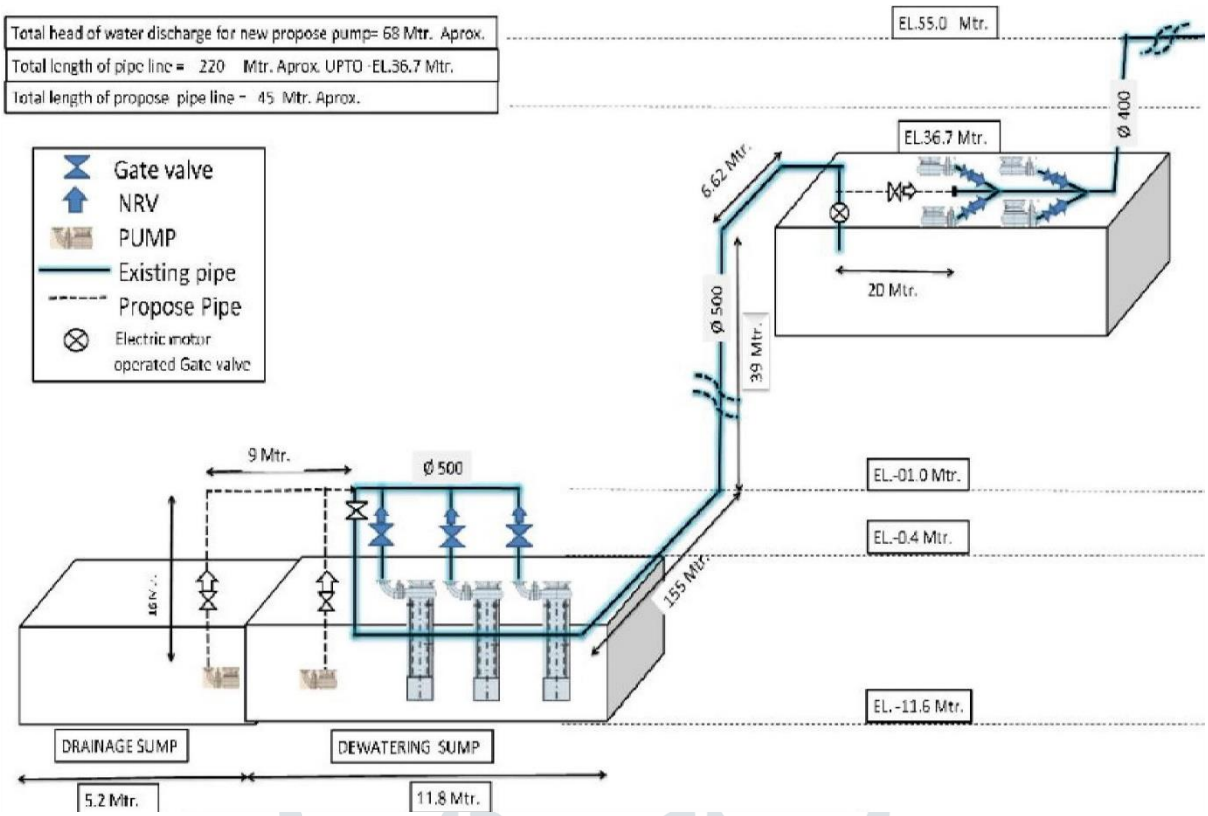


Figure 1. General over view.

III. COMPONENTS

Main component of this system is Pump. Pump is an electro-Mechanical Device which converts electrical energy into mechanical energy. High Power pumps can flow water with great speed. Generally, the capacity of pumps is decided as per the location and total water to be pumped in particular time. But in this case, we can't predict the water seepage during any flood, so with the available spared power supply, pumps of 400 Hp/300Kws 3 phase 440 V are used which has 1020m^3/Hrs of water flow. Total Two pumps are used. In this case Submerged Centrifugal Pumps are the only option as their characteristic for water flow is very high and Efficiency is also high.

For the constant power supply, Two Individual Diesel Generators of Rating 400 KW are installed near the panel room. This stand-alone system is best suitable for this project as we can turn on and off individually without disturbing the actual power grid.

A Step-down transformer is installed which converts 11 KV Voltage to 440 Volts which can further fed to the pumps. This transformer has capability of auto tap changing which can stabilise the voltage with whelp of feedback loop system and Relay. This Automatic Tap Changing transformer has two type of tap changing options, Manual and auto. We can change the output voltage within the range of +-15 % of total output. Total capacity of transformer is 1600 KW. Reason behind the high capacity is the inrush current of these high capacity pumps. Generally, the initial starting current is 25 to 30 times of rated current and can last for only Sone Milli Seconds. But the pumps draw 2 to 3 times of current for up to 1 minute or until it reaches its 70 % Speed. Thus, transformer is selected to withstand initial in-rush current without getting damaged.
Figure 2. Single Line diagram for general arrangement
Diesel Generator will Generate 11 KV Power supply. This supply will be fed through a transformer. Transformer will step down the power supply from 11 KV to 415 V. Further for Protection, different relays like Earth Leakage Relay, Over Voltage and Over Current Relay, and Automatic Tap Changing Relays are place along with the 3 Phase 4 Pole Air Circuit Breaker along with bus bar distribution system.

For Distribution power supply, a long copper bus bar has been placed through which all the outgoing feeders will bed attached. Total Two outgoing feeder and one spare feeder (For Future Needs) is kept.
The high capacity pumps will get supply from this Two Feeders. For Starting and Speed Controlling, Soft Starter is used which an prevent lasses and can increase efficiency of the motor. This soft starter will control Voltage and Frequency ratio, and as varying one of the parameters speeds will be controlled.

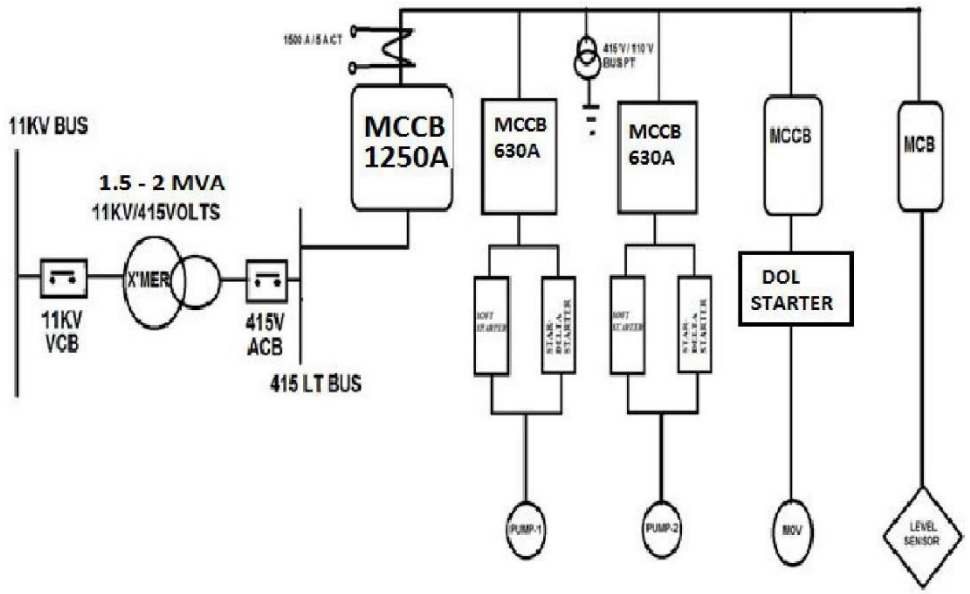


Figure 2. General Arrangement

IV. CHARACTERISTIC AND CROSS SECTION OF PUMP

The cross section of 400 HP Pumps is as shown below and characteristic of this pumps are also recorded and plotted.

PART NO.	DESCRIPTION	MATERIAL
101	Volute casing	Cast Steel
102	Suction BellMouth	C.I. IS 210 Gr FG 260
103	Impeller	CF 8M
104	Oil Chamber	C.I. IS 210 Gr FG 260
105	Seal Leakage Detector (IN OIL CHAMBER)	By Element
106	Lower Housing	C.I. IS 210 Gr FG 260
107	Lower Ball Bearing	Grease Lubricated
108	Stator Body	C.I. IS 210 Gr FG 260
109	Rotor Shaft	AISI 410
110	Thermal Sensor (IN WINDING)	By Thermal Overload Protector
111	Upper Ball Bearing	Grease Lubricated
112	Upper Housing	C.I. IS 210 Gr FG 260
113	Cable Gland	SS
114	Mech. Seal(motor side) (secondary seal)	Carbon V/s Cast Cr Mo Steel
	(pump Side) (Primary seal)	Sic vs Sic
115	"O" Rings	Nitrile Rubber
116	Wearing Ring(Casing)	Bronze / SS
##	Suction Strainer	SS 202
##	Fasteners	SS

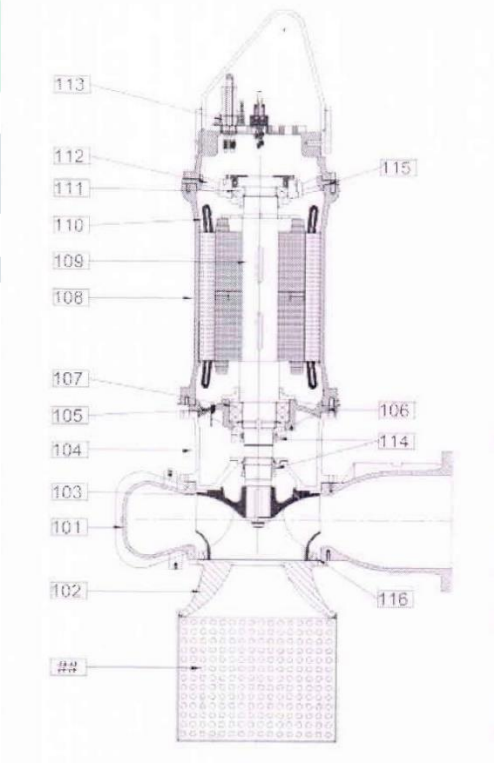


Figure 3. Cross section of High Capacity Pump

Characteristic of Efficiency, Discharge and total generation are as bellow.

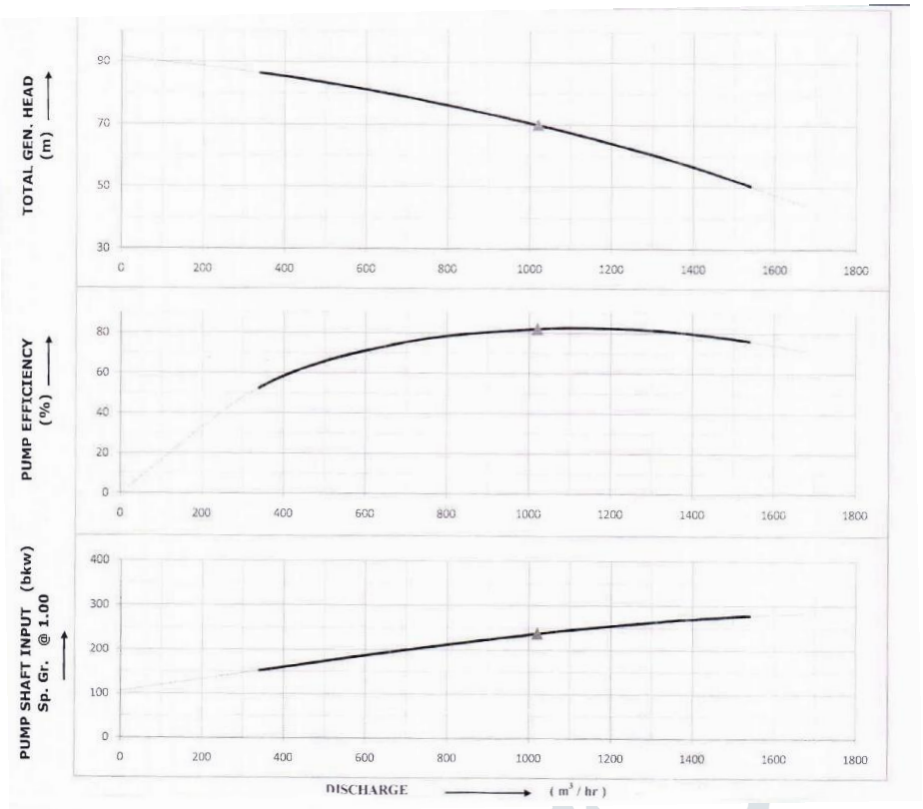
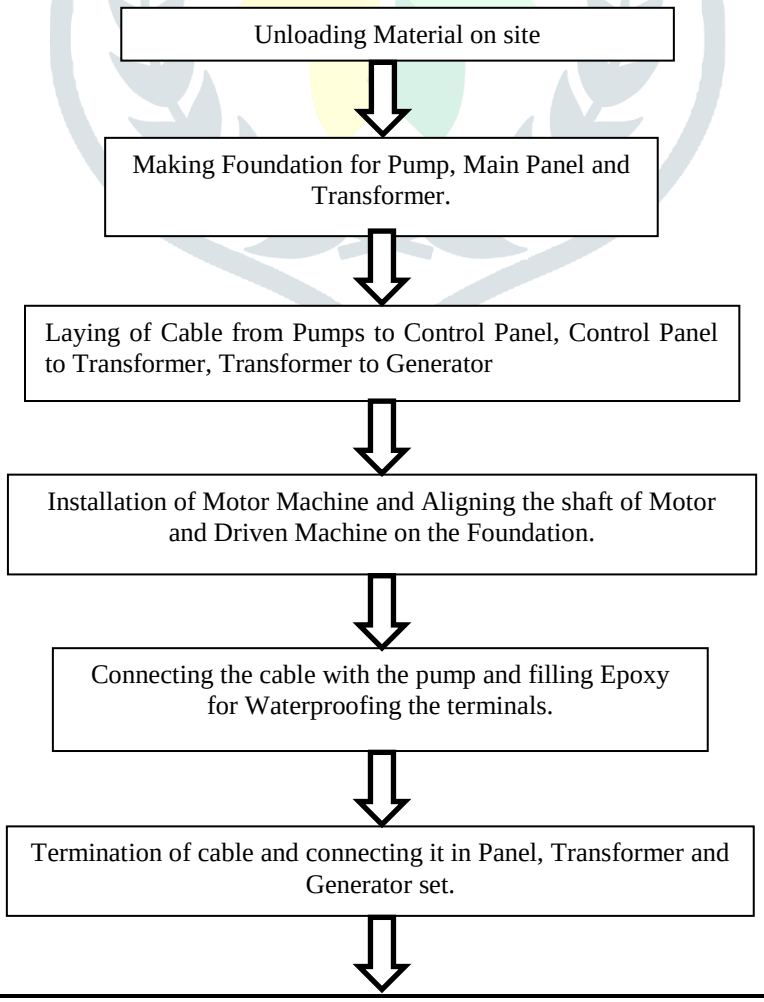
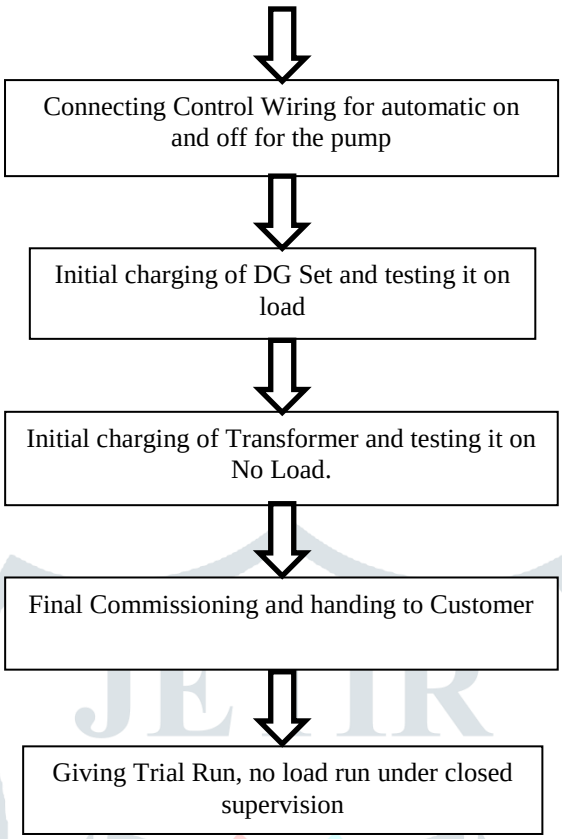


Figure 4. Characteristics of Pump

v. FLOWCHART OF INSTALLATION PROCESS





VI. CONCLUSION

This paper has described the process for building Disaster proof Electrical installation system which can work under any circumstances. This paper including Selection methods of Pumps, Transformer, and control panel. We can build this type of system in every hydro-power plant so that we can avoid any losses of life as well as infrastructure during any Flood.

VII. REFRENCES

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