

Consultancy Report on the Measurement of Inrush Current in the Water Pumps

Work order by: **Municipal Administration and Water Supply Department,
Gobichettipalayam Municipality.**

Letter Ref: **The Municipal Engineer's Letter Dt. 09-06-2022**

Measurements carried out by: 1. Dr. K.R. Valluvan, Professor, Dept. of ECE,
2. Mr. V. Sabarivelu, Asst. Professor, Dept. of EEE,
3. Mr. R. Gopalan, Asst. Professor, Dept. of ECE.

Date of Measurement : 11-06-2022

Date of Report : 01-07-2022

Gobichettipalayam Municipal administration is distributing water to the residents from its treatment plant located near the Bhavani River in Senkalari village. This project was started in the year 1958. To increase the quantity and quality of water supplied to the municipal areas, the administration is continuously improving the efficacy of the system by installing higher capacity, latest pumps and water pipe lines. Recently it added a separate water line comprising of a new set of pumps. This new system consists of the following:

1. Two parallel 120 HP Motor pumps to pump water from the river to the reserve tank.
2. Two parallel 180 HP Motor pumps to pump water from the Reserve tank to the overhead tanks located in various areas within the Municipality.

To ensure an uninterrupted water supply, 100% redundancy has been built into the system by the way of operating one 120 HP pump and one 180 HP pump alternately. That is each motor is operated approximately for 12 hours a day. Further to increase reliability of the overall system, there are two 500 KVA transformers which supply electrical power to the motors – any one transformer supplies at any given time.

The four motors are supplied from four individual control panels equipped with soft starters. The purpose of the soft starters is to limit the inrush (starting) current of the motors and thereby reducing the electrical and mechanical stresses on the motors and the pumps. The reduction in starting current of the motors also helps in keeping the transformer current within its rated Name plate value.

The entire new system is being commissioned by the supplier. During trials, it is noted that when 120 HP motor is running and then 180 HP motor is started, there is a tendency of the transformer's HT fuse blowing. It is also observed that, this is not happening when 180 HP motor is running and then 120 HP motor is started. As per the name plate of the transformer, it is capable of supplying the requirement current.

To validate the design of the system, the municipal administration wanted to measure the inrush currents of the motors. This task was assigned to Velalar College of Engineering and technology (VCET), through the letter dated. VCET possesses, an US make Fluke 434-II Power Quality Analyzer. Measurements were carried out in the motor control panels. The measurements show that the inrush currents of the motors are higher than the published values of 3.5 times the running current ($I_{inrush} > 3.5 \times I_n$) for a duration of 3 seconds. Combined with a running current of 1 motor, the inrush current of the other motor, can exceed the rated current of the transformer ($I_{Rated-TX} = \frac{500KVA}{\sqrt{3}V_l \cos\phi} = \frac{500KVA}{\sqrt{3} \times 415V \times 0.80} = 870A$) which may be the cause for fuse blowing. After ascertaining the soft starter characteristics with the published design specifications, the issue may further be examined to establish the smooth operation of the system.



Fig.1. 120HP Motor



Fig.1. 180HP Motor

Table 2.Motor Specifications

S.No.	Make	Motor Name Plate ID	HP	V _{nom} (V)	I _{nom} (A)	PF (cosφ)
1	ABB	3G1J20300001843125	120	415	158	0.84
2	ABB	3G2J20410090098613	180	415	228	0.85



Fig.3. Power Quality Analyzer FLUKE 434-II

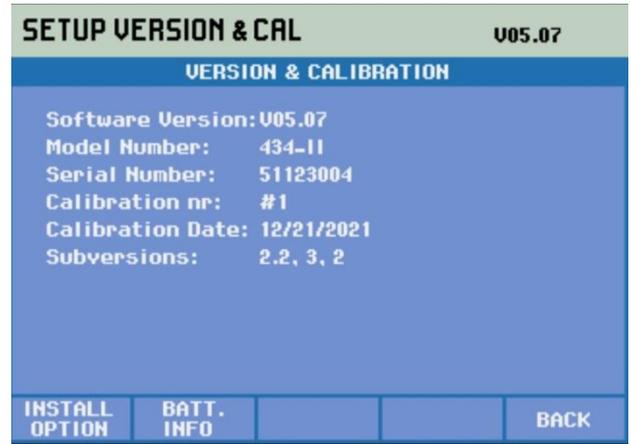


Fig.4. PQA Setup- Version and Calibration