ANALYSIS OF EFFICIENCY AND PERFORMANCE OF THREE-PHASE ELECTRIC MOTOR AS HIGH PRESSURE PUMP FOR REVERSE OSMOSIS PROCESS

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ABSTRACT

Three-phase electric motors are the main component in Reverse Osmosis (RO) systems, functioning as the driver of the High Pressure Pump (HPP). This study aims to analyze the efficiency and suitability of motor capacity with respect to the actual load demand. Field measurements were carried out to obtain operational parameters including current, frequency through a Variable Frequency Drive (VFD), and power factor. The results show that the motor operated at 166 A with a frequency of 26.1 Hz and an input power of 51.4 kW, which represents only 23.4% of the nominal capacity of the 220 kW motor. This condition indicates that the motor operates under partial load far below the optimal range of 75–100%, resulting in reduced energy efficiency, increased power losses, and uneconomical operating costs.

The evaluation shows that the appropriate motor capacity for the actual demand is within 100–110 kW, allowing the motor to operate at 85–93% load with higher efficiency. The technical recommendations proposed include replacing the oversized motor with a smaller capacity, optimizing VFD settings, evaluating pump working pressure, and conducting regular operational monitoring. Therefore, this study concludes that the use of a 220 kW motor in the RO A system is oversized and requires optimization to achieve energy efficiency and improve the overall operational effectiveness of the RO system.

***Keywords**: Three-phase motor, partial load, energy efficiency, High Pressure Pump, Reverse Osmosis.*