The efficiency of an electric motor represents the behavior of the motor during the conversion of the electric power to mechanical power. The difference between input and output is due to losses comprising of iron loss in the core, friction and windage losses and the copper losses in the stator and rotor. Even though higher horse power motors are typically more efficient, their losses are significant and should not be ignored. The various losses may be quantified appropriately like Stator copper loss (37%), Rotor copper loss (18%), Iron Loss (20%), Friction and Windage loss (9%) and Stray loss (16%). The efficiency can be improved by reducing the various losses in motor. Various attempts are made to reduce the losses in induction motors and this work has been taken up primarily to reduce the rotor copper loss using Die cast Copper Rotor (DCR) technology.

It is widely known that the conductivity of copper is about 40% higher than aluminum. An improvement in motor efficiency can be expected by using DCR motors to replace the traditional Die cast Aluminium Rotor (DAR) motors, super efficiency or ultra-efficiency motors can be produced based on copper rotors, especially in the area of small size motors.

In this work, some fundamental aspects concerning the efficiency of induction machines are dealt. The standards and the prescribed methods for the determination of the energy efficiency of induction machines are discussed. This work is especially concentrated on 3 phase motors of small/medium ratings from 0.37 kW to 11 kW, where the technology of Die
cast copper rotors seems easily feasible and the contribution to efficiency improvement is seen substantial. By replacing the existing Die- Cast Aluminium Rotor motors with Die- Cast Copper Rotor motors the efficiency can be improved from EFF2 to EFF1 or even from EPACT to NEMA Premium. This can be accomplished without changes in motor design and without increasing much active materials otherwise necessary.

This work also investigates the performance of DCR towards upgradation of the overall efficiency of the submersible pump sets of various ratings and stages. The cost effective manufacturing of the submersible pump sets are experimentally verified by decreasing the stack length of the submersible motors against various grades of laminations. The testing method of the submersible motors are in line with IS 8034.

A performance comparison between conventional DAR and proposed DCR submersible pump sets are also made, by actual tests with the existing and a modified slot geometry of stator and rotor slots for submersible motor of (5–10) HP 3 phase wet type water cooled induction motors in accordance with IS 9283 performance requirements. The possible efficiency improvements and cost saving opportunities as obtained with three grades of laminations are also enclosed.

This work also includes a report of the investigation of the performance comparison of 1.5 kW and 3.7 kW Mono block pump sets with existing Die- Cast Aluminium Rotor and proposed Die- Cast Copper Rotor at the field.