ENERGY & COST SAVING POTENTIALS OF EXISTING INDUCTION MOTORS IN THE PLANTATION SECTOR

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DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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ABSTRACT

The plantation sector of Sri Lanka, currently using more than 8,000 induction motors of the range of 10hp to 30hp. Most of those motors were installed in 1960s, 1970s and early 1980s. Those days' motors were designed for minimum first cost, not for the efficiency. Also those motors have been re-wounded several times during the last 30 – 40 years. Therefore, this study was focused on the energy and cost saving potentials of these motors.

In order to asses existing motors, which are then used to project a cost savings, the operating performances of these motors must be known. Comparison of actual motor efficiencies is certainly a valid tool to justify the use of one motor over another. Proper testing method is absolute essentials while the motor is in service. Since the standard test procedures are not practical at the field, alternative technique was used. The equivalent circuit parameters can be estimated by using the field test coupled with genetic algorithm. Accordingly a software program was developed and estimated the efficiency.

Data of 120 motors of 4 rubber factories and 5 tea factories were analyzed. The estimated efficiency was ranging from 68.75% to 86.01%. 74 motors are in the range of 75% to 80% efficiency which is even less than standard efficiency. 38 motors have been re-wounded more than 4 times and the details were not available for 30 motors. Total estimated energy saving potential for the selected motors for annum is about 414 MWh with EFF1 motors whilst, 353 MWh with EFF2 motors. The payback period of replacement is 3 years with EFF2 motors and 4 years with EFF1 motors. Also the Net Present Value (NPV) of investment after five years with EFF2 is Rs 7.0 million whilst the same with EFF1 is Rs 3.7 million.

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LIST OF ABBREVIATIONS

CEB	- Ceylon Electricity Board
CEMEP	- European Committee of Manufactures of electrical machines and power electronica
CSA	- Canadian Standard Association
IE	- International efficiency
IEC	- International Electro Technical Commission
IM	- Induction Motor
MEPS	- Minimal energy performance standards
NEMA	- National Electrical Manufactures Association
ODP	- Open Drip–Proof
PWM	- Pulse Width Modulation
RRI	- Rubber Research Institute
TEFC	- Totally enclosed fan cooled
TENV	- Totally enclosed none ventilated
TRI	- Tea Research Institute