

**FEASIBILITY ASSESSMENT OF THE APPLICABILITY
OF TRI-GENERATION SYSTEMS IN THE APPAREL
INDUSTRY IN SRI LANKA: A CASE STUDY**

A.M.N. Shakya Abeynayake

(128351 H)

Master of Engineering

Department of Mechanical Engineering

University of Moratuwa

Sri Lanka

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DECLARATION

I declare that this is my own work and this thesis 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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List of Abbreviations

TGT	– Tri-generation Technology
TJ	- Tee Jay Lanka PLC
IPZ	– Industrial Processing Zone
HFO	– Heavy Fuel Oil
STG	– Steam Turbine Generator
KTPI	– Key Thermal Performance Indicator
KPI	– Key Performance Indicators
DCS	– Distributed Control System
OEM	– Original Equipment Manufacturer
CEB	– Ceylon Electricity Board
ESP	– Electrostatic Precipitator
GHG	– Greenhouse Gas
PRV	– Pressure Reducing Valve

ABSTRACT

In this study, the technical and financial performances of the first tri-generation plant installed in Sri Lanka were evaluated. This plant was installed at Tee Jay Lanka PLC; a leading knit fabric manufacturer in the local context.

In this tri-generation design, the thermal demand of the process was matched and the technology used was the Rankine cycle with a back-pressure turbine. The overall efficiency, heat to power ratio and the net electrical power were the technical parameters evaluated for the technical feasibility. The net cash flow was evaluated for the financial performance. The evaluation indicates that the TG plant operates below the technical performance of a TG system, which uses the same technology. The failure to operate the steam turbine was identified as the main factor for the underperformance. However, the financial feasibility was observed for the year 2016, indicating a positive cash flow throughout the year.

The detailed study reveals that the process steam flow variation caused the back-pressure variation and therefore, the tripping of the turbine. It was proposed to alter the turbine control mode from load command mode to the back-pressure mode. However, the turbine startups failed due to high vibration. After the dismantling of the turbine, it was found that the rotor had corroded and the turbine blades were loose. It was sent for repairs. Afterwards, the turbine is to be started under back pressure mode. If the operation is successful, the technical parameters which measure the performance will reach nominal levels.

The political factors affecting the performance were also reviewed in brief. The energy efficiency policies of the government are to be strengthened to encourage investment in energy efficiency projects. The policy of importing coal has to be reviewed again to assure a seamless supply chain especially for the small and medium scale users.