

Dr Gabriel J. Costello,
Department of Mechanical and Industrial Engineering,
Galway-Mayo Institute of Technology,
gabrielj.costello@gmit.ie

Thermo King Carbon Neutral Production Line Project

Abstract

This paper describes an ongoing collaboration between Thermo King and the Department of Mechanical and Industrial Engineering, in the Galway-Mayo Institute of Technology (GMIT). The company has an operation in Galway where it designs and manufactures truck and trailer refrigeration units. Thermo King is introducing a major new product in 2019 and has set challenging Factory Sustainability Goals that includes the entire production process being carbon neutral. Three Engineering students, guided by the Lecturer and the Thermo King Project team, are developing a specification for the line to meet a recognised international standard. The project is being carried out as part of the students' final year projects (FYP).

Problem Statement/Challenge

The growing pressures of climate change has resulted in calls for businesses and industries to adopt more sustainable practices in line with best-in-class CSR (corporate social responsibility) processes. However, this undertaking involves the need to balance demands for business growth with being environmentally proactive. To achieve this, companies must work towards carbon neutrality in their processes, buildings, subsidiaries and ultimately in the entire corporation.

Thermo King established its presence in Galway in 1976 and presently employs over 600 people. Thermo King is a subsidiary of the Ingersoll Rand Corporation and the Galway site is Ingersoll Rand's largest operations facility in the Europe, Middle East, India and Africa (EMEIA) region. Originally set up as a manufacturing location, it has recently added research and development (R&D) of the next generation of truck and trailer refrigeration units to its Galway capabilities. This new product development is a major project for the Galway location and involves a team of over 50 design engineers. Thermo King is making a very significant investment to develop a world class assembly line to manufacture the new product. The project team has set challenging Factory Sustainability Goals for the new design:

- Entire assembly production process to be fully carbon neutral
- Utilisation of renewable energy sources such as PV solar panels to power all electrical inputs (tools/machines etc.)
- Use of renewable fuels such as Bio-diesel during factory auto-run verification testing

A successful project will make the Galway production line the first Carbon Neutral facility in the Ingersoll Rand Corporation.

Solution Implemented

To take the first step in the achievement of these goals, Thermo King is collaborating with a GMIT team that includes this Lecturer and three Level 8 students from Mechanical Engineering and Energy Engineering. The work is being undertaken as part of the students' final year projects. The task involves the students conducting research and spending one day per week on-site, working in close collaboration with Thermo King Employees from New Product Introduction (NPI) Management, Manufacturing Engineering and EHS Engineering.

The aim of this initial project is to develop a detailed specification and road-map of how Thermo King Galway can design and run a carbon neutral assembly line for their new product. The following work items have been implemented:

- Define a recognised standard for assessing and achieving carbon neutrality.
- Gather data on current energy usage used in the existing SLXi assembly line.
- Establish a process to calculate the carbon footprint of the existing SLXi assembly line.
- Identify examples of companies that have implemented carbon neutral manufacturing processes.
- Investigate suitable renewable energy solutions for the new assembly line.

Results Achieved

This is an ongoing project with the following results envisaged by the end of April 2019:

- BSI PAS 2060 Standard chosen and an implementation process will be developed.
- Carbon footprint of the existing production line will be mapped.
- One Irish example (Keogh's) and three international examples of Carbon Neutral manufacturing facilities will be assessed i.e. MAN plant in South Africa, Volvo plant in Sweden and Audi Plant in Belgium. The resulting recommendations for Thermo King Galway will be outlined.
- Detailed plan for implementation of the carbon neutral production line will be presented.
- Offsetting options to achieve full carbon neutrality will be defined.
- Renewable fuel options for the test facility will be suggested.
- Renewable energy plan for the site will be presented.

The installation of the new production line is scheduled for Q4 of 2019. Furthermore, it is foreseen that this project will lead to further collaboration between GMIT and Thermo King during the implementation stage of the new Thermo King production line.

The three students involved in this project are:

Stephen Wade - Level 8 Mechanical Engineering (Energy Stream)

Steven Burke - Level 8 Mechanical Engineering (Design Stream)

Brendan Rooney - Level 8 Energy Engineering