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A Simple Energy Usage Toolkit from Manufacturing Simulation Data

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A fundamental problem in the management of energy usage is the inability to clearly predict any possible energy saving opportunities. The cost of both under or overestimating potential returns on investment can be prohibitive to a decision maker. In recent years the simulation of energy usage using existing manufacturing simulation tools has increased in popularity among researchers, but it is decision makers who need to see the benefits of this discipline. This paper proposes an interactive manufacturing energy management toolkit which makes use of existing productivity simulation models for the prediction of energy usage. An interactive Microsoft[®] Excel[®] based toolkit is developed to control Lanner's WITNESS[®] discrete-event simulation software using Microsoft[®] Visual Basic[®] for Applications. The toolkit has the ability to predict potential areas where energy saving opportunities can be made within a complex manufacturing line, and is accessible from management presentations and proposals. The interactivity of the toolkit provides an environment which facilitates efficient hypothesis testing. The paper includes an industrial case study where the approach was used to quantify theoretical savings from certain energy usage reduction scenarios within a complex automotive engine manufacturing line.

1. Introduction

The cost of industrial energy used to achieve the required product throughput is set to rise globally in the foreseeable future, as illustrated in Figure 1. This is mainly due to the ever increasing cost of fossil fuels and the need to reduce greenhouse gas (GHG) emissions (International Energy Council 2012). Despite global efforts to reduce energy usage, industrial energy consumption is forecast to increase over the next three decades, especially in non-OECD (Organisation for Economic Co-operation and Development) countries, as shown in Figure 2 (U.S. Energy Information Administration 2013).

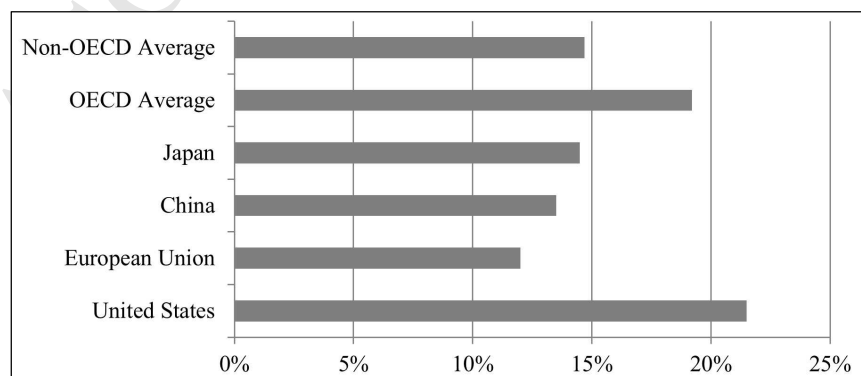


Figure 1: Predicted percentage change in end-user electricity prices from 2011 to 2035. (International Energy Council 2012)

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