Chapter 5

Fuzzy Logic Application in Improving Maintenance in a Beverage Manufacturing Company

ABSTRACT

Fuzzy logic approach was done on a beverage manufacturing company focusing on the bottle washing process. The main problem is that the pneumatic valve of the bottle washer that controls the discharge of clean bottles sometimes sticks or fails, which results in significant loss of production since this is a bottleneck operation. The main causes of failure were found to be the temperature and pressure, which often fell outside the required ranges, and minor contributions to failure due to moisture and abrasive particles. In order to solve this problem, a model reference adaptive fuzzy controller was designed for the pneumatic valve using the MATLAB software. The model reference adaptive control (MRAC) system consists of the reference model that has the desired output of the system. The error resulting from the difference between the actual system output and that of the reference model is executed by the fuzzy logic controller (FLC). The simulation of the behaviour of the valve in response to the reference model was done using Simulink.

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NEW HIGHLY AUTOMATED PRODUCTION PLANT INSTALLED IN DEVELOPING NATION OF AFRICA

BMC has installed a state of the art Mechatronics controlled filling system. The new plant was manufactured in Germany by the company called Krones. The Krones Group, headquartered in Neutraubling, Germany, plans, develops, and manufactures machines and complete lines for the fields of process technology, bottling, canning, packaging and intralogistics (Krones, 2012).

Every day, millions of bottles, cans and specially-shaped containers are “processed” on lines from Krones; particularly in breweries, the soft-drinks sector and at still-wine, sparkling-wine and spirits producers, but also in the food and luxury goods sectors, as well as the chemical, pharmaceutical and cosmetic industries. Since being founded in 1951, Krones has evolved far beyond its original role as a mere producer of machinery and bottling lines. The company has meanwhile become an “all-round partner” for its customers, creating harmonious, optimised synergies of mechanical engineering, line-related expertise, process technology, microbiology and information technology. Today, Krones is synonymous with “systems engineering” (Krones, 2012).

Line 1 at BMC

The design for an assembly / production line is determined by analysing the steps necessary to manufacture each product component as well as the final product. All movement of material is simplified, with no cross flow, backtracking, or repetitious procedure. Work assignments, numbers of machines, and production rates are programmed so that all operations along the line are compatible (Encyclopedia, 2011). Line 1 at BMC starts from the palletizer where empty dirty/clean bottles enter into production up to the depalletizer whereby filled bottles with product are ready for the market.

The data shows that the bottle washer is the one that has a lot of breakdowns, 2209 minutes (36.816700 hours) in January 2012 only, Table 2 and Figure 1. It is then followed by the palletizer. Bottle conveyors, empty bottle inspector and the filler are also having some breakdowns.
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