ABSTRACT

Small Make-to-order or subcontracting manufacturers produce a variety of parts for their customers in variable batch sizes; they must have a highly flexible but still competitive manufacturing production system. Since different products are produced, their environment is considered highly dynamic or turbulent. In such environment, there are limited number of manufacturing system alternatives to improve the productivity and the efficiency of those manufacturers. At first, they are forced to adopt a traditional job shop layout. After the introduction of Cellular Manufacturing (CM), which is an established international practice to integrate: equipment, people and systems into “focused -factories”, “mini-businesses”, or “cells” with clear customers, responsibilities and boundaries, such environment can be handled better by CM.

This research aims to develop a model to solve the machine assignment problems in intra-cell layout of cellular manufacturing system under static and dynamic environments with an objective of minimizing the total cost in a planning horizon. The total cost is defined as the sum of material handling cost, relocation cost and production loss cost. The production loss
cost is included in the model, because while considering dynamic environment the production loss occurs during the relocation of layouts. In this work, two types of layout are considered, namely linear single row layout and multi-row layout.

In static environment, there is no change in the number of parts in the product mix or demand during the planning horizon. But in the dynamic environment the changes occur due to the customer needs, competitive in manufacturing. In this research, two types of dynamic environment are considered namely, demand fluctuation and changes in number of products in the product mix. The former is illustrated by an example from the literature and the later is explained with a case study, which is done in a small scale manufacturing industry doing sub-contract for many companies.

The Genetic Algorithm (GA) is proposed to solve the model. To examine the performance of the proposed GA, data sets taken from the literature are used and the results are compared with other approaches addressed in the literatures.