COMPUTATIONAL PERFORMANCE

In an effort to bench mark the heuristic algorithm, 13 problem sets were first scheduled using the MILP formulation to obtain optimal solutions. The heuristic algorithm was then used to schedule the same 13 sets of final products.

In using the heuristic algorithm formulation, only one run was necessary in obtaining a near optimal or optimal solution. When running MILP formulation with large numbers of integer variables, it is common to encounter data output memory storage problems due to the huge amounts of data generated from the search procedure implemented in trying to find an optimal solution. When the MILP took too much time to find a solution then run was restarted using a different upper bound to make the search proceed much faster in some cases. The results of the runs based on the MILP model and the heuristic algorithm are summarized in Tables 1 and 2. Comparison of the results for the two methods is shown in Table 3.

CONCLUSION

In this study, the problem of scheduling a set of N final products on M machines with product assembly consideration in a make-to-order job shop environment was addressed. A Mixed Integer Linear Programming model was developed, based on a strategy where sub-jobs that are identical are considered as separate nodes as they occur in a bill of material (BOM). A heuristic algorithm was also developed to solve the model more efficiently.

The heuristic algorithm (in the worst case) came within 3.94% of the solution obtained by MILP model. However the heuristic algorithm solve each problem in less than 1 CPU second, whereas MILP model took (in the worst case) 9000 CPU seconds to arrive at a solution that was aborted due to resource restrictions (exceeded time limit).

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Table 1 Results of the Test Problems using MILP