

Chapter 5

Conclusion

This research was initially studied through observation. The result from observation was a suspicious problem which was transportation problem; late delivery, accident, maintenance, and etc. Value stream mapping and 9 logistics activities analysis were the first 2 analysis tools to study the root causes of the case study problem. The results of analysis showed that the case study had a transportation problem. Information from shell fleet card showed that the fuel consumption was lower than average, it was 8, 5 and 4 kilometers per liter for pick-up truck, medium truck and large truck respectively. A number of current fleet was 17 trucks (pick-up = 7, Medium = 8, Large = 2). Current routing was still using only personal experience from planner or senior driver without information to support decision making. Additionally, accident occurred frequently, while was studying period, there were 2 accidents. First accident caused from careless driver drove over limit because wanted to delivery on-time. Second accident consisted from tire blew out, root cause was bad maintenance. Even though, the production was good, finished goods will become work in process before delivery; the arrangement customer by customer. Furthermore, the issue about some rush product cut in current production line because truck had to leave the building by delivery schedule but some products which need to be in that truck neither finished yet nor even started. Effected to production that had to pause, and then affected to the whole production schedule more lateness. All these problems can solve by new proposed model of transportation management system with crossdocking system that can deliver product by batch not by customer. This system was able to load finished goods into the truck immediately after the batch finished and left the building straightaway when full capacity or nearly full because they can temporary hold products at crossdock and arranged by customer at crossdock instead of loading area of factory. They can deliver to crossdock even if customers not open their shop yet and customers will have more choice to pick products up by themselves exchanged with discount.

The routing of new transportation management system with crossdocking system was calculated by Genetic Algorithm to minimize total distance. The algorithm was used code of Evolver 6.0 (add-in for Microsoft Excel), Palisade decision tools and run in Microsoft Excel 2003 on Microsoft Windows XP Professional, version 2002 service pack 3 with an Intel(R) Core(TM) i5 CPU M520@2.4Ghz 1.99GHz, 1.85GB of RAM.

The sensitivity analysis of GA parameters for VRP without crossdocking system experiment were set mutation rate at 0.05 and crossover rate at 0.6, 0.7, and 0.8, and population was used 180, 270 and 360 with run time 100,000 trials 30 times per set. The results of calculation were total distance reduced from 6,354 to 3,944 kilometers so was reduced 2,410 kilometers or 38 percent of current route for VRP without crossdocking system. The system needed 2 pick-up trucks, 6 medium trucks and 1 of large trucks which were all reduced number of fleet from current method.

Next solution was a VRP with crossdocking system. Began this step with crossdock site selection, the selection in this thesis was done by using MCDM tool, SAW for ranking all candidates. After 8 potential crossdocks in each province were selected, the delivery route between crossdock to crossdock would be considered to be VRP. The number of crossdock in crossdocking system was analyzed by sensitivity analysis by reduction one by one of crossdock which had lowest demand from 8 crossdocks until 3 crossdocks. Every case of crossdocking system had to be solve VRP between crossdock by using GA and also from every crossdock to customer in their service area. The best answer (The lowest total cost) of VRP with crossdocking system was at 4 crossdocks with 2 medium and large trucks for delivery goods to crossdocks and 1 pick-up truck and 3 medium trucks to deliver from crossdock to customer. Total distance of this solution was 3,158 kilometers and total cost 423,700 Baht. Total distance was reduced 3,196 kilometers or 50 percent from current.

From cost-benefits analysis, break-even point and payback period was 36 days for VRP without crossdocking system and 29 days for VRP with crossdocking system. IRR of VRP without crossdocking system was 18 percent with total invests 411,400 Baht and another one was 20 percent with total invests 423,700 Baht. Both solutions were performed that they had potential to improve transportation system from current method in term of cost and performance. However, the chosen solution was the VRP with crossdocking system because it had BEP, IRR, PB and also total distance value better than VRP without crossdocking system but it needed a little bit more investment 12,300 Baht. Moreover, VRP with crossdocking system was a flexible method about transportation because they can hold the delivered products at the crossdocks. This system have no need to wait until time to deliver came and they can reduce a lot of work in process at loading area which VRP without crossdock or current model cannot perform. Consequently, this is a worthwhile investment and also well prepared for the company growth because this project can increased service level and reduce transportation cost and more steady production then they can handle when more volume come and expanded more new distribution channel to customer as well.

Further Research

In this thesis used cost-benefits to judge which solution was the selected solution for case study in economics point of view. In the performance was used just only distance to evaluate but there were more important assessment topics such as the total delivery time with time window of each customer. Moreover, there was an assumption in this research which were ignored the real world problem. It was a truck ban road, in this research did not have this constraint. The further research should be added the truck ban constraint and time window with cost, time and distance evaluation.