

Resource Optimization of Medical Lab Operations

PROJECT SUMMARY

A medical testing laboratory wished to employ the use of discrete-event process simulation and its allied industrial-engineering techniques in improving operations, and hence services to its clients, both hospitals and clinics.

SYSTEM DESCRIPTION

The operations studied intensively and comprehensively at this laboratory comprised the delivery of medical specimens to the laboratory, their processing within the laboratory, pick-up and delivery of items entrusted to its courier service, and delivery of test result reports and medical supplies to its client hospitals and health care clinics. At the initiation of the project, the laboratory used a fleet of fifteen courier vehicles, employed fifteen full-time-equivalent headcount, and ran eleven total courier routes daily (only one of these a local run).



OPPORTUNITY

Originally, courier routing instructions were handwritten on route sheets. Also, the laboratory was acutely aware of chronically high specimen processing costs, due primarily to overtime attributed to unbalanced rates of specimen arrival. The number of requisitions processed was typically between 1,000 and 1,100 per day. Unbalanced rates of specimen arrival resulted in suboptimal utilization of medical technologists. Overtimes were frequently enforced, in addition to the implementation of a midnight shift, to achieve required turn-around-time of 24 hours. Early observations and discussions with the client attributed this undesirable situation to suboptimal workload leveling.

APPROACH

Construction of the simulation model began concurrently with the collection and statistical analysis of its input data. The simulation software tool chosen in consensus by the client and PMC was Enterprise Dynamics®. For the convenience of both the modelers and the client's management, the simulation model was constructed to read its input data from Excel® workbooks and to export its numerical results to Excel® workbooks.



SOLUTION

The results of this simulation study included several pertinent and valuable recommendations, among them:

1. Optimizing routes initially in use allowed the re-allocation of two couriers.
2. One re-allocated courier, redeployed as a runner, retrieved specimens from other couriers returning to the site.
3. Workload leveling achieved as a result of optimizing the routes helped the client eliminate the night shift and improve utilizations of medical technologists during the morning shift. The workload leveling achieved is illustrated in Figures 1 and 2, which show the percent utilizations of the medical technologists in the chemistry department. Resource leveling improved from “considerably worse than two-to-one” to “uniformity of usage within 10%.” Similar improvements were achieved in the serology, microbiology, and hematology departments.

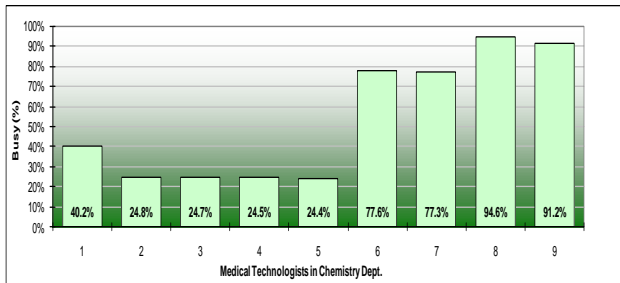


Figure 1

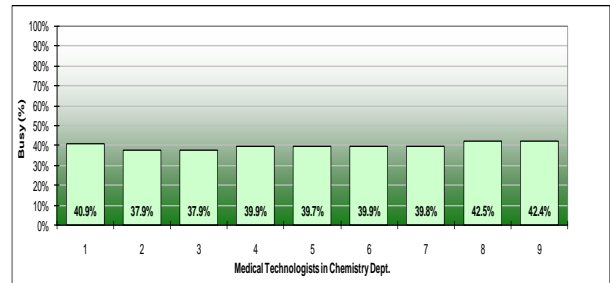


Figure 2

BENEFIT

Attractively, no personnel represented by the payroll cost savings were laid off; rather, the client company deployed them in expansions of this service and in newly offered services, thereby increasing its profitability. Additionally, as a result of a first successful foray into simulation by the client company, its management is now considering the use of simulation for an incremental study focusing attention more specifically on the “in-house” laboratory operations. Figure 3 below illustrates the 3D animation used for the analysis portion of the study.

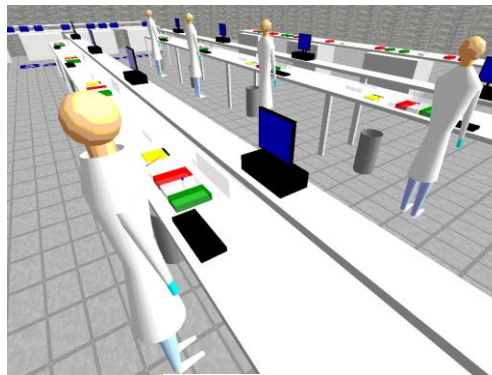


Figure 3