CASE STUDY

Line Capacity Improvement through Ergonomic Analysis, MODAPTS and Simulation Modeling

PROJECT SUMMARY

The client is a leading global supplier of automotive dampers and performance shock absorbers in commercial and defense segments. PMC was able to offer its expertise in Ergonomic Analysis, MODAPTS and Dynamic Simulation modeling to identify the challenges faced by the customer to improve the current throughput in their efforts for capacity expansion.

Our utilization of discrete event simulation techniques and Ergonomic analysis techniques allowed the company to identify utilization of all the stations and operators working in the production line, identify the potential ergonomically perilous activities carried out by the operator and provide solutions to the high-risk ergo concerns. The combination of Simulation Analysis along with Non-Value-added (MODAPTS) analysis and Ergonomic analysis has resulted in improvement in the line capacity and throughput.

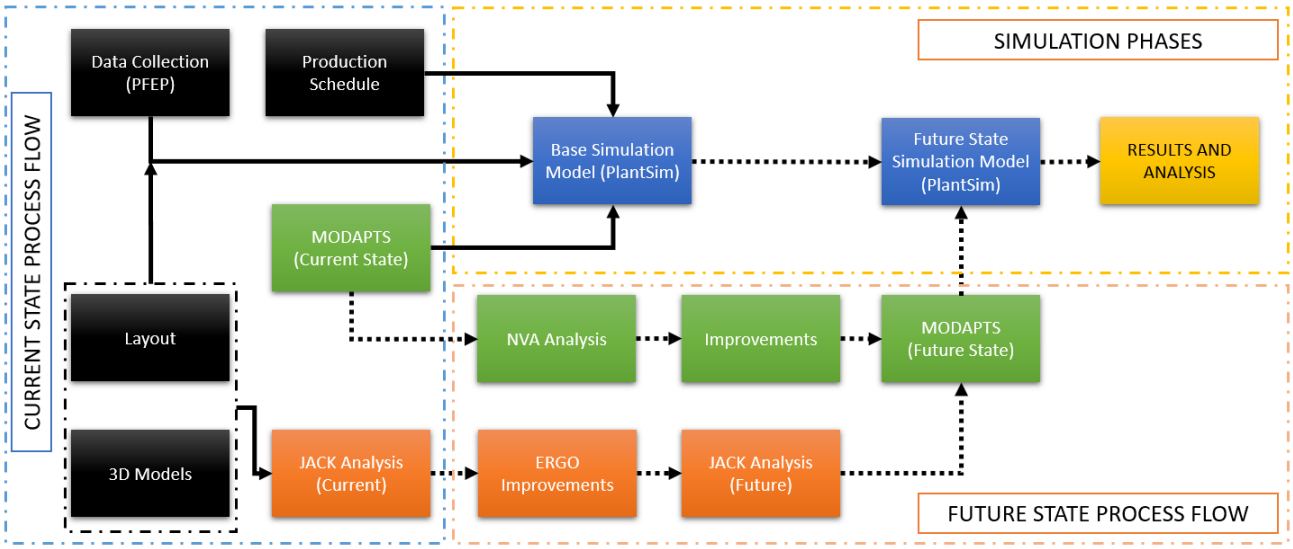
SYSTEM DESCRIPTION

The current line has 11 stations running 2 shifts per day. Each shift being 8 hours there are 11 operators allocated to the stations. There are 2 stations which are replenished by the line leaders in addition to the 11 operators. Out of the 11 stations, 2 station are outside the line in the current state, which will eventually be shifted to the line in the future state. There are 22 FGI parts for 2 different customers (Customer A and Customer B) making a share of 66.7% and 33.3% respectively. A third of the FGI parts produced for Customer A go through the offline machines currently. Essentially there are 2 different process flows with respect to the type of FGI being produced.

OPPORTUNITY

The current process flows and procedures at the plant have been proving to be inefficient to improve productivity, and meet customer demands due to ramping up of production and inclusion of new products on the line. With the unreliable equipment on the line the company had a challenge to improve their throughput with wide product variety and high changeover times. It was necessary for the client to focus on the current operational improvements to reduce the overall cycle time of the products.

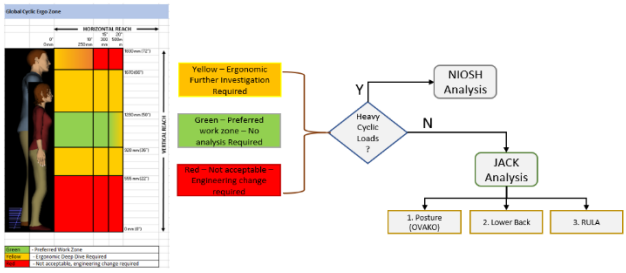
APPROACH

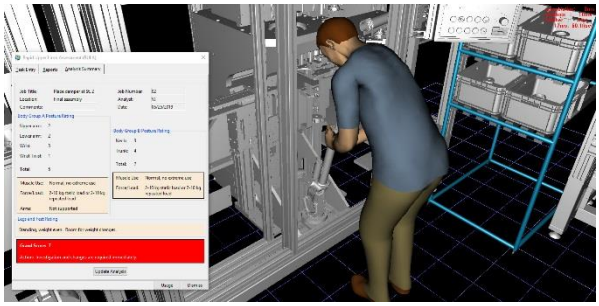


Production Modeling Corporation ♦ 15726 Michigan Avenue, Dearborn, MI 48126
Phone: 313-441-4460 ♦ Fax: 313-441-6098
Website: www.pmcorp.com ♦ Email: sales@pmcorp.com

a) Data Collection and Validation (PFEP): Data collection in simulation modelling is a vital process that highlights the required data sets and their desired properties such as accuracy, sample period and format to allow the simulation model to achieve the project objectives. A PFEP (Plan for Every Part) was developed with the data collected from various sources and validated on the line.

b) Ergo Analysis (JACK): All the operator movements associated with operations, handling etc., during production for each station have been captured and studied. The 3D models of the stations were imported to JACK to study the movements of the operators at and between the stations and the postures were simulated. The Ergo analysis provided qualitative and quantitative rating to the movements of the operator. One of the rating systems that provide the magnitude of risk associated with a task is RULA (Rapid Upper Limb Assessment). From the analysis, the medium to high risk items were identified and suggestions/improvements were made on these operator movements. The suggestions were re-simulated in Jack and results were provided. This unique technique of PMC has ensured that the customer identified the tasks that will need immediate changes and eventually it would save on cycle time due to minimization or elimination of high-risk tasks.





c) MODAPTS: PMC's expertise in MODAPTS is utilized in this case to identify the Non-value added and waste movements of the operators in the process for each station. All the operator movements were video recorded and analyzed utilizing a custom built MODAPTS sheet created by PMC. The MODAPTS sheet gives an account of all the Value Added, Non-Value Added and Waste activities associated with the process. Based on the operations suggestions were made on tasks, equipment utilized in the operations by the operator and standard operating procedures to minimize the Non-Value Added and Waste times associated with the cycle. At this point MODAPTS and JACK analysis improvements go hand in hand, since any changes made to ergonomics would reflect in MODAPTS due to change in the operation.

d) Simulation Model (PlantSim): The layout, the PFEP and the Production Schedule are fed to PlantSim, to get the base simulation model. The current process flows of material and the operators are incorporated in the model. The current capacity and throughput are obtained after running the simulation for 40 days with provided schedule. The changes made through Ergo analysis and NVA study are incorporated in the simulation study to get the future state simulation model and an analysis of the simulation results were made.

SOLUTION

The improvements made through the MODAPTS NVA analysis and the JACK ergonomic analysis resulted in efficient utilization of the operators at the stations. By simulating the changes made and running scenarios the following throughput improvements have been achieved.

1. Base model + MODAPTS NVA Analysis + Jack Ergo Analysis – 4.33% improvement in throughput
2. Scenario 1 + Addition of resource – 25.56% improvement in overall throughput
3. Scenario 2 + Change in SOPs – 41.77% improvement in overall throughput

BENEFIT

The unique approach to problem solving through simulation not only achieves the output the client wishes for but also identifies the hazardous and perilous processes along the way and aims to keep the work environment streamlined and safer while being efficient at the same time.

Production Modeling Corporation ♦ 15726 Michigan Avenue, Dearborn, MI 48126
Phone: 313-441-4460 ♦ Fax: 313-441-2547
Website: www.pmcorp.com ♦ Email: sales@pmcorp.com