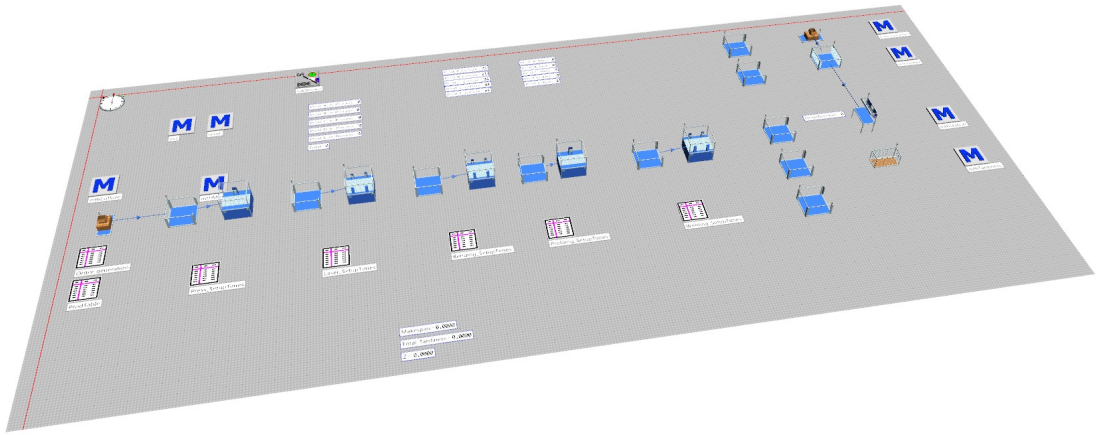
Production Planning Optimization using Technomatix Plant Simulation



Problem Statement

- Delivery delays faced by a medium-sized Sub contracting company producing 5 types of products each with its own production sequence, processing and setup times.
- Processing station : Pressing, Lasering, Bending, Profiling and Welding
- Present condition : For 100 customer orders sum of all delays is **17days**.

Objective

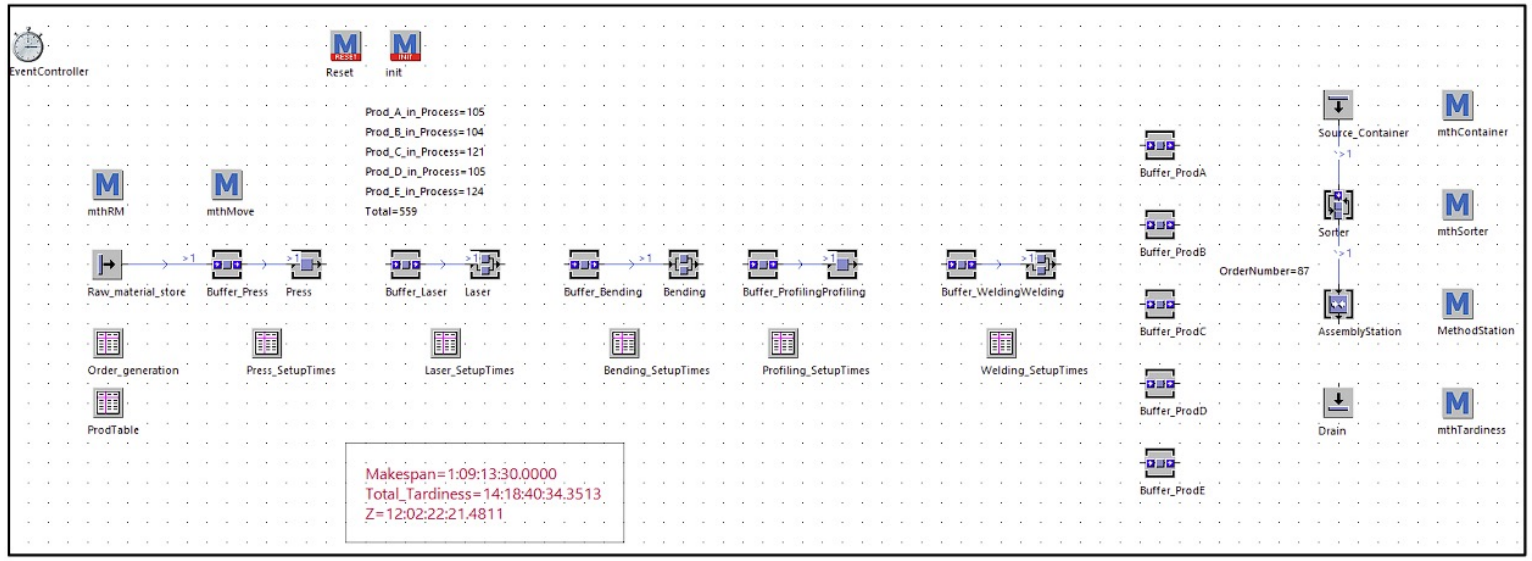
- To **improve delivery reliability** by changing **production sequence** of customer orders and by changing the lot sizes.

Methodology

- Discrete-event simulation and genetic algorithm optimization using Technomatix plant simulation.

Task 1: Initial Material flow model development

- An initial material flow model to serve as a baseline for subsequent optimization was created.
- Used **init method** to generate 100 random orders with random no. of product types.
- Initial production sequence : Alphabetical order of product types (A to E)
- Calculated **Makespan** (Total time required to process all orders) and **Total tardiness** (Sum of all delays).



Task 2: Optimization with Genetic algorithm

- To **minimize** the **Makespan** and **total tardiness** according to given objective function **GA wizard** was used.
- Product table and lot sizes were given as optimization parameters and bounds were defined.
- The simulation was run with experimentally suitable parameters for no. of generations and size of generations.

No. of generations	Size of generation	Minimized Z
5	5	1:07:27:40.1726
5	10	2:11:34:17.5726
10	10	1:02:03:36.5452
15	15	1:02:27:54.9227
20	20	22:30:13.5641

Result

- The genetic algorithm optimized the problem by minimizing the objective function.
- The GA optimized both production sequence and lot sizes given as optimization parameter to **reduce the fitness value** from **17 days to 22 hours.**
- Optimized production sequence : **ProductB > ProductA > ProductC > ProductE > ProductD**

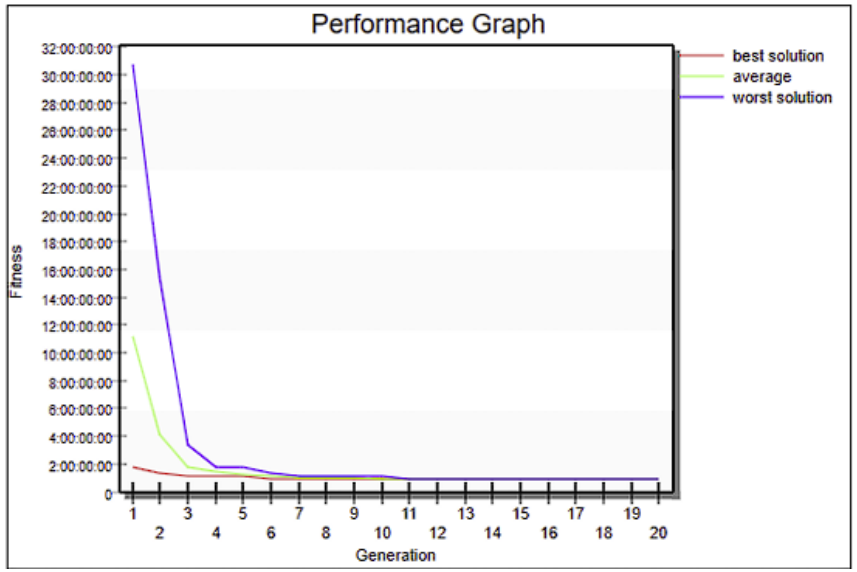


Fig. Example Evolution of the fitness values of the generations

Discrete-Rate and Discrete-Event Simulation Modelling in Production planning

Problem Statement

- Optimizing production processes in a cookie factory using simulation models.

Objective

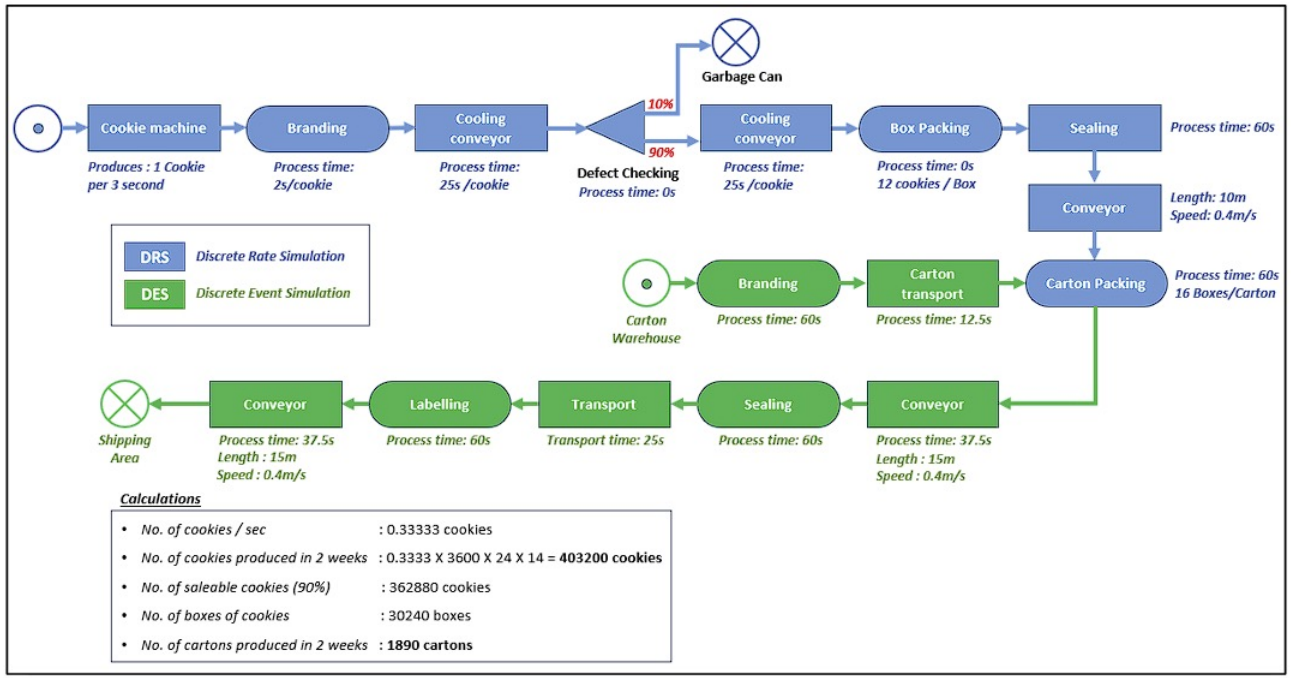
- Identify bottlenecks and **estimate production capacity** over two weeks..

Methodology

- Discrete-Rate Simulation (DRS) and Discrete-Event Simulation (DES) in **ExtendSim**.

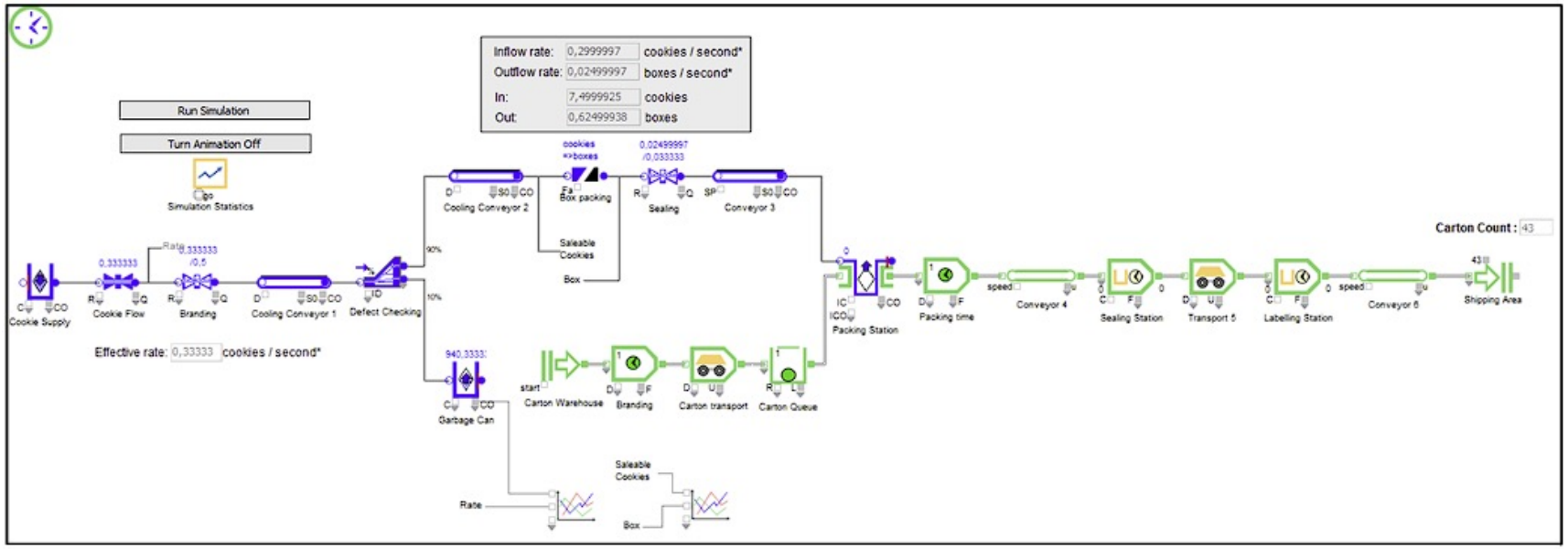
Task 1: Conceptual Model

- Developed a conceptual model for the process and made rough calculations for expected throughput.
- Selected modelling technique to be used for different processes involved.



Task 2: Modelling and Simulation in ExtendSim

- The production process based on selected modelling techniques were modelled.
- The simulation was run for 2 weeks to determine the throughput.
- Bottleneck analysis for all the processes were carried out based utilization at different stages.
- Result of rough and simulated calculation were compared.



Conclusion

- Both of these projects helped me understand how **material flow simulation can significantly improve production planning efficiency** and **delivery reliability.**
- Demonstrated the effectiveness of simulation and practical applications of these techniques in enhancing manufacturing processes.