

Simulation is changing the manufacturing industry

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In the manufacturing industry the globalization has meant an increase in competition and many industries are being moved overseas. In order to compete, companies have to constantly find new methods of making their production more effective. One way of doing this is to start using simulation software as an analytic tool. A simulation is when you create a virtual copy of your production. This copy can then be used in different ways to improve the real production.

Why use simulation software?

A reason why simulation is so useful is that it makes it possible to try changes on the production without disturbing the real thing. It also allows you to easily test how good a possible investment might be. This is very handy since downtime or changes in the manufacturing industry usually are very costly. In this fashion a project can be planned, executed, evaluated and remade before it has even been started.

Effortless analysis

Simulation software comes with a tool that gathers relevant statistics and automatically performs a production analysis. It is not uncommon the parts of the process that are slowing down the production to be unknown. To identify them this type of analysis has to be performed. To do such an analysis manually is very time consuming and requires experience. If you instead make a simulation model the analysis is just a click away and is updated automatically when the model is changed.

Easy to use

Making a simulation model is not as tricky as one might think. Many of the leading software developers provide a drag and drop feature, making the building process easy. This allows complete beginners to quickly be able to make simple models in no time. An example of a simple model is people queuing and being served at a bank. However, modeling is not always easy and to model something as complex as a car assembly line would require a lot of training.

How is it done?

The way to build a simulation model differs depending on what software is being used. Usually you are provided with some fundamental building blocks that, together with some basic programming, can be used to build nearly everything. An example of a set of building blocks is shown in the next section and where they fit in our previous example of a bank with a queue:

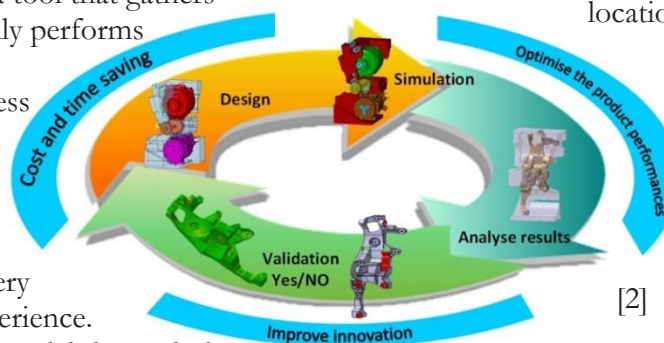
Entity – The things that are being made or handled. In the banking queue example the entity would be the customer.

Arrival – How the entity enters the model. This would be how often a new customer enters the bank.

Location – Anything that handles an entity, such as machines and conveyors. In our case this would be the desk where the customers are being served and the queue itself.

Process – How the entities are routed between the locations. In the bank this would be the queue leading to the desk.

Resource – A thing or person that provides a function. Examples of this are operators, repairmen and forklifts. In our bank this would be the clerk serving the customers at the desk.



Let us make our own model

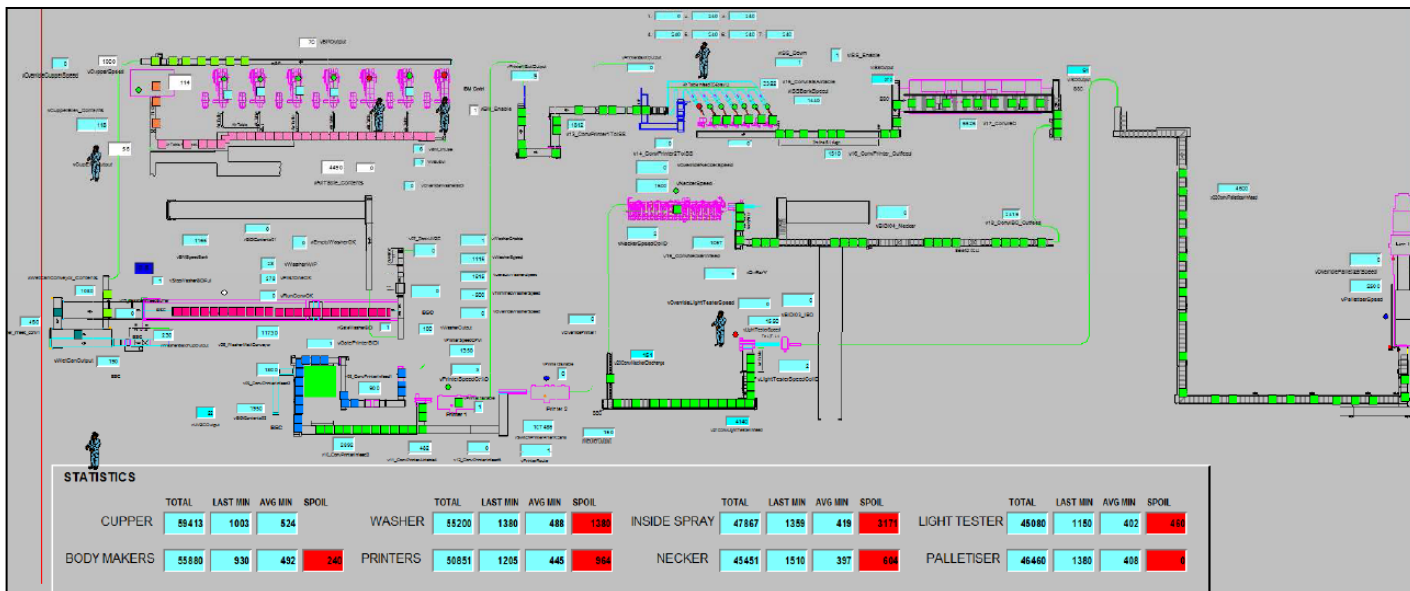
So, in order to build our bank queue we would first have to make two locations, the queue and the desk. Some data has to be entered to make the locations behave as intended. The data in our case is how many people can fit in the queue and how long it takes to serve a customer at the desk. We also have to make a clerk at the desk and define how often he/she is available. The next step is to define a customer entity and then how often new customers arrive. Lastly we will have to route how the customer goes from the entrance to the queue, to the desk and then out again.

The downside to simulation

Even though simulation is a great tool it, as most things, has some flaws. A simulation model will always be an approximation of reality. If the model differs too much from reality the statistics gathered from it will be misleading.

An industrial example

Below is an example of a model currently in use. The model simulates the production of aluminum cans.



Simulation of a production line for aluminum cans

The manufacturing of an aluminum can is quite complex and requires a surprising number of steps. The main ones are as following:

1. Cupper – Portions aluminum film into cups
2. Bodymakers – Shapes a can without a neck
3. Washer – Surface treatment
4. Printer – Applies the label
5. Inside sprays – Applies protective coating on the inside
6. IBO – An oven that hardens the coating
7. Necker – Makes a the neck at the top
8. LT – Quality control

Each one of these eight steps also corresponds to main locations in the model. The other locations are mostly conveyors. The entities are the aluminum cans and the process is the routing the conveyors take. The arrival is an aluminum coil that feeds the cupper with raw material and resources are operators and repairmen.

Results

The simulation has initially seemed reliable by having a total production that is within a small error margin of the real process under normal conditions. It has also been shown to mimic productions flows of the real process under some disturbances, such as bodymaker downtime. Even though further testing has to be performed, this indicates the model can be used to make predictions in the future. An important thing to keep in mind if you are considering building your own model is; when it is done it can not tell you how it should be changed to increase its efficiency. The model can tell you where the bottleneck is, but the idea on how to improve it has to be your own.

Image references

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[2] <http://www.intechopen.com/books/numerical-analysis-theory-and-application/crash-fe-simulation-in-the-design-process-theory-and-application>, 2014.07.08