Combined simulation and machine learning for process optimization in wood industry

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Keywords: Simulation; Digital Twin; Optimization; Sawmills; Decision support tools.

Context and objectives

The wood industry is one of the major industries in the Nouvelle Aquitaine and the lands of Gascogne region, the dominant species in this region is maritime pine. Sawmills (Fig.1) are the main industrial process that transforms wood from its original form -wood logs- into products, such as pallets, wood boards used in furniture, etc. However, most of these sawmills are old, equipped with machines from the 1970s, and their condition varies depending on the renovations carried out. Some of them have even had to close their doors due to insufficient income, due to the low capacity of their machines to optimize wood sawing, resulting in losses of raw material and therefore revenue. The objective is to create a simulation-based decision support tool that is capable of giving the managers an idea of the effect of investing in new machines not only but the detection of bottle necks and the crucial machines that needs to be replaced (Opacic 2010, Opacic et al. 2018). Not only but also calibrate the rate and speed of production in each line to have a smoother production flow.

Material and methods

By using the production monitoring and the data of the Gascogne bois saint symphorien sawmill for the year 2022, including the machine's production capacity, speed, stops and breakdowns and number of wood logs treated per day, a simulation model will be created. After analysing these data, a distribution laws will be used to feed the model to simulate and act as a digital twin for the sawmill. AnyLogic software is used for simulation (Borshchev 2013). Before the simulation comes the basic step of modelling using a general modelling language called HiLLS (Samuel et al. 2019). These tools: AnyLogic and @Risk software which is used to data fit production monitoring data, have been successfully used in a study for engineered wood products mill (Opacic et al. 2018).

First results

The production monitoring data is a complex data that has many faults, after these faults were corrected and data analysis is done we conclude that: Around 30% of time is wasted due to stops and breakdowns. Using pareto tool (Sokovic et al. 2009) it is clear that 35% of stops are mechanical and electrical stops. The lake of frequent electrical and mechanical maintenance leads to up to 10% of loses of the revenues that can be easily avoided. Frequent electrical and mechanical maintenance is crucial for sawmills optimized production.

The modelling and simulation are in progress, the first line in the sawmill has been modelled using HiLLS methods and the simulation using AnyLogic for the first line is in progress.

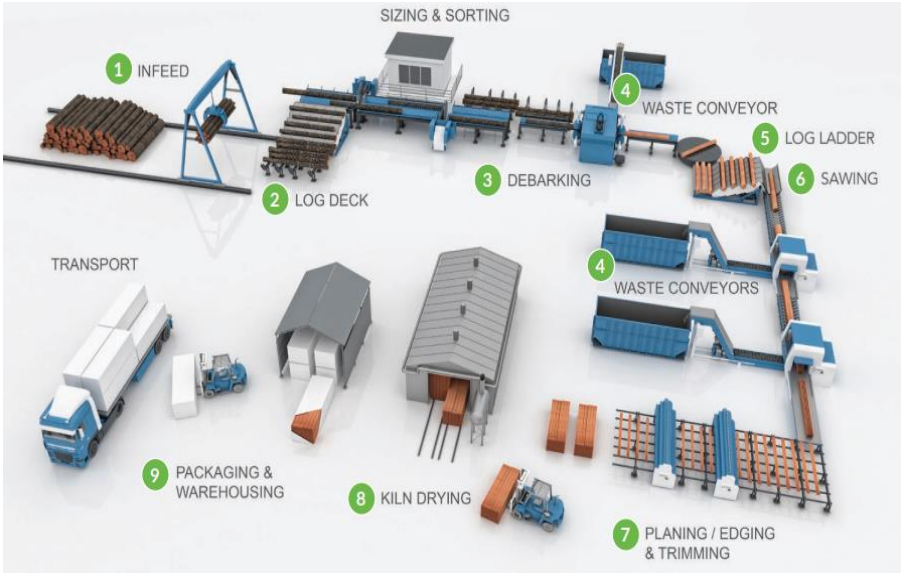

Fig. 2: Simplified industrial sawmill process by Regal Rexnord sawmills

Acknowledgements

I would like to thank Professor Régis POMMIER and Professor Mamadou Kaba Traoré for the opportunity that they gave me and for the frequent help they provide me during my studies. I also would link to thank my industrial supervisor, Mr. Laurent CASTETS and Gascogne Bois Saint Symphorien sawmill and all the workers for helping me during my studies in the sawmill. The project is funded by the Agence nationale de la recherche (ANR) and Gascogne Bois.

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