FITTING OUT MACHINERY FOR REFERENCE CHANGE IN A HOSIERY PLANT: A DES APPROACH

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Research proposal

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1. PROBLEM STATEMENT

The hosiery industry is on charge of all the processes relevant with the elaboration of socks from the transformation of yarn to a hose using knitting machinery to the termination processes such as stamping, needlework and non-skid technology.

In the hosiery industry, the fundamental process is to knit the sock; this is knitting a large amount of threads, giving form to a design previously developed. To knit a sock is necessary a single machine and it takes approximately one minute, but even if the process is really difficult (because it depends on the complexity of the sock, the number of colors, the length of the sock and many other variables) it hardly would take more than three minutes.

For a hosiery plant that produces hundreds of different references in small batches, fitting out a machine for changing the current reference may take considerable time and it depends on several aspects:

- Design specifications: Length of the sock, number of colors, number of needles, striped design, among others
- Known reference / New reference
- Change variables: different tissue type, increase in the number of threads, among others

Besides this, there are other factors affecting productivity and speed of the process. These include uncertain demand i.e. stochastic nature, the amount of resources available, the use that is given to these and experience of the staff.

On the other hand, discrete-event simulation (DES) is a simulation approach with four key elements: activities, queues, entities and resources. DES models a system as a set of individual entities moving through a series of queues and activities in discrete time (Tako & Robinson, 2009).

In these order of ideas, is intended to implement in Simul8[1] a DES model for the process of fitting out machinery for changing production batches for different references in a hosiery plant with 816 places to locate knitting machines and hundreds of references in its portfolio. This model will allow to analyze this process and the time a machinery set is stopped because of this. Some analysis may also be performed on the distribution of the staff required for the changes.

Using DES for modeling this process is mainly justified because the attributes of the entities can be randomly generated and detailed monitoring to entities can be performed (Gunal & Pidd, 2005).

Another general feature of the models analyzed with discrete-event simulation is that focuses on areas and specific system problems and use historical information from the process (Lane, Monefeldt, & Rosenhead, 2000).

2. OBJECTIVES

2.1. GENERAL OBJECTIVE

Implement a DES model for the process of fitting out machinery for reference change in a knitting plant using Simul8.

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[1] www.simul8.es

2.2. SPECIFIC OBJECTIVES

- Understand how the process works by experimenting with the developed model.
- Identify key variables that affect the productive times by fitting out machinery for changes.
- Test different settings for the requirement and distributions of staff responsible for fitting out machinery when changes are required.

3. BACKGROUND

About hosiery it's possible to find some studies in economic, historical or political topics, evaluating the growth of this in some geographic areas, the effort of the government to improve conditions in this industry or evaluate the impact of one negotiation in this (Carter, 1909; Murphy, 1952; Smith, 1963). Upon the manufacture process some studies provide ideas for understanding important issues in this industry (Akalin, Isgoren, & college of, 2004; Vrljicak, Srdjak, & Skenderi, 2004). Nevertheless, some previous studies have been made to this process at the plant where the project will be developed, the analysis of these will be part of the research and the most essential studies to create the model.

4. JUSTIFICATION

In the hosiery industry, understood as a production process, is necessary to find strategies and procedures to make processes more efficient, reducing mechanical damage, machinery failures and improving the quality of the final products. Although fitting out machines for changing references is a necessary process, this

should be done in a minimum time. In this sequence of ideas, the project provides a first look at how the process works and under what conditions must be completed.

About the software, Simul8 is chosen because it allows easy experimentation even for no experts modelers, make decisions from the obtained results and it contains optimization plugins like Optquest that will be useful in future researches.

5. SCOPE

This research aims to implement the existing model in a knitting plant for the process of fitting out machinery for changing different references using Simul8 and also an exploratory analysis of the data obtained.

6. METHODOLOGY

This project will be worked together with the engineer Camilo Higuita-Carvajal and the next activities will be developed:

1. Review of previous studies in the area.
2. Formulation and description of the model.
3. Data picking of times of service
4. Distribution fitting.
5. Model implementation on Simul8.
6. Experimentation with the completed model.
7. Exploratory analysis of the data.

7. SCHEDULE

Activity	Week													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Research proposal	▓	▓	▓											
Review of current information		▓	▓	▓	▓									
Formulation and description of the model			▓	▓	▓									
Data picking of service times				▓	▓	▓	▓	▓						
Distribution fitting									▓	▓	▓			
Model implementation on Simul8						▓	▓	▓	▓	▓	▓			
Experimentation with the completed model									▓	▓	▓	▓	▓	
Exploratory analysis of the data														▓

8. INTELLECTUAL PROPERTY

The results of this research are property of the tutor: Camilo Higuita-Carvajal and the student: Melany Cristina Viana-Campiño in equal proportions.

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