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Analysis the Performance of the Jerry Cans Raw Material Mixing Production System with Computer Integrated Manufacturing Using Promodel Application

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Abstract. From the simulation data that has been tested in this experiment, it can be concluded that the data: Machine output data using conventional systems produces a mixing machine operating as much as 35% due to making new raw materials from the waiting process of the blow molding system, blow molding operates as much as 42.5% and experiences waiting process, and 15% racks which store raw materials that are not used in the process. While the integrated system produces a mixing machine operating output of 5% because there is no need to make a lot of new raw materials, and 47.5% blow molding works more maximum and produces results with low defects and 0% shelves because there are no unused raw materials, with an efficient ratio of 47.25% it can be concluded that using an integrated system can increase efficiency in a production process.

Keyword: integrated manufacturing, blow molding, packaging, promodel

INTRODUCTION

Industry in Indonesia is growing all the time, so that a lot of industries bring up new innovations and new discoveries that can make the industrial world more advanced. Due to the demand from consumers to produce products that have quality and can last a long time. A computer-integrated manufacturing system by shortening the time needed to produce a product that is more efficient and the resulting product is of high quality. So that industry can continue to use new technology [1]

One of the industries that must be developed is the cooking oil industry. This can be proven by the use of cooking oil in Indonesian society. Indonesian people are very dependent on cooking oil. This can be proven by the graph of the production of important food commodities in 2014 - 2018, where cooking oil in 2017 was produced at 9,509 tons and in 2018 it was produced at 9,889 million tons. [2]

Jerrycan is one of the innovative products of the plastic-based edible oil industry which has quality and can last a long time, but if the raw materials for jerry cans are not mixed well it can make jerry cans of low quality, so a more integrated computer system is needed to shorten production time and increase the quality of production that is produced.

The mixing process is the initial process in making jerry cans, where the mixing process requires the right ratio of raw materials and mixed until evenly to facilitate the melting process of raw materials so as to produce quality

products. In this study, the Promodel application is used as a tool to simulate the mixing process that is integrated with a computer.

METHODOLOGY

Research Methods Conducted In conducting this research, it is the first step taken is to conduct a literature study. Followed by identifying the problem and then formulating the problem that occurred. After all the data is recorded and made in the form of a chart, then determine the parameters you want to use for the experimental process using the Promodel application, so that the desired data is obtained [4]

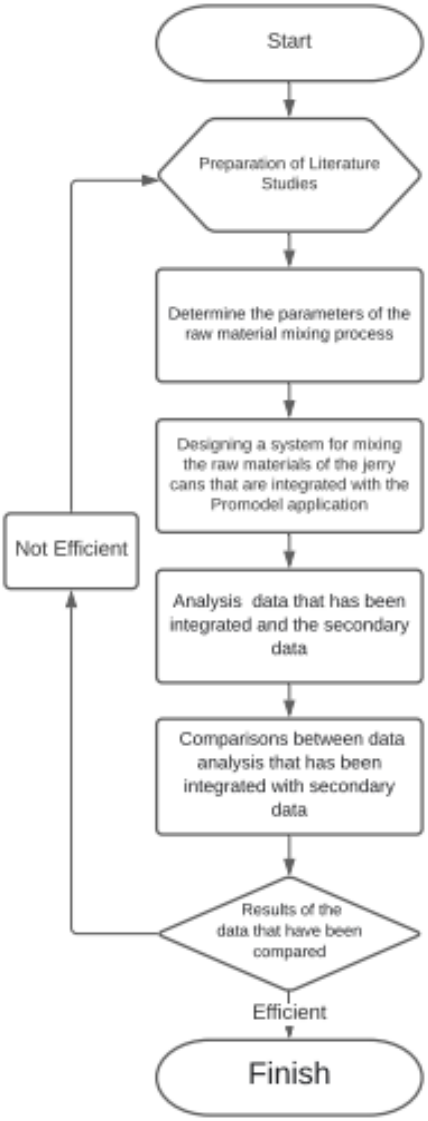

FIGURE 1. Flowchart of Research

The stages of the research carried out are as follows:

1. Prepare a literature study that discusses the research to be studied and looks for comparisons with secondary data.
2. Determine the parameters in the mixing process and the blow molding process related to the speed and efficiency of the process.
3. Designing a simulation using the Promodel application and designing a jerry can manufacturing plant system that still uses a conventional system with the Promodel application.
4. Making a location in the Promodel application which functions as a determination of the location of a process.
5. Determination of Entities that serve to describe materials or objects to be processed. This process uses 25 liter jerry cans.
6. Followed by the selection of Arrival, this menu serves to determine where a process will begin.
7. After Arrival, a process selection is made on the Processing menu, namely selecting the direction of the jerry cans to be processed and how long it will take to process.
8. When processing is complete, the simulation can be simulated immediately and will get the results of the simulation.
9. From Steps 1 to 8 it is repeated but used data that has been replaced with a system using Belt conveyors.
10. After a simulation using the Belt Conveyor is made, the data is compared with data using conventional systems.
11. The calculation of the efficiency between the two data above is made and a comparison is made which one is better for implementation in the factory.

TABLE 1. Material composition that use in this analysis

Material	Composition
HDPE plastic pellets	70%
Haipet binder	0,9%
Recycle material	29,1%

Simulation in the manufacture of a jerry can manufacturing plant system uses a promodel simulator which is commonly used to know and simulate a process or flow of an activity from a company, factory, or a system. In this simulation, initial data that still uses conventional processes are used from data [7] where the author uses a stopwatch, data collection, and calculates the efficiency of the machine to be able to process data. Then on the data that will be used, I use the specifications I want, namely processing HDPE into 25 Liter Jerry Cs.

RESULT AND DISCUSSION

From the results of simulation experiments that have been obtained and carried out then the data is inputted into table form. Following are the experiments obtained after simulating this experiment.

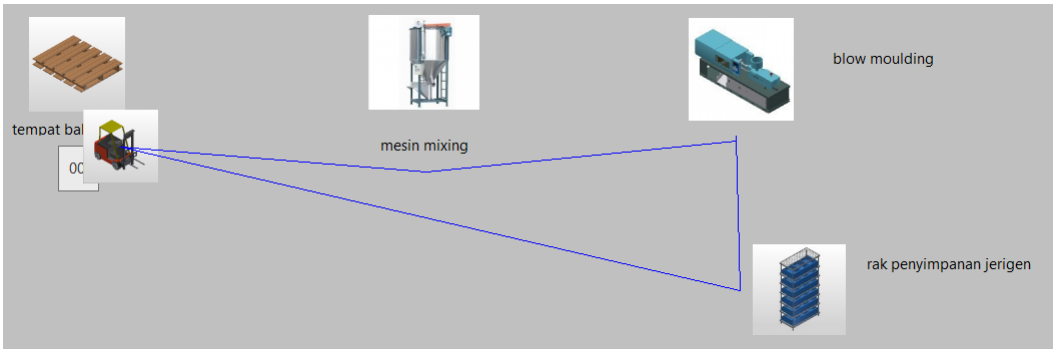

FIGURE 2. Location Promodel simulation for second data for Secondary data

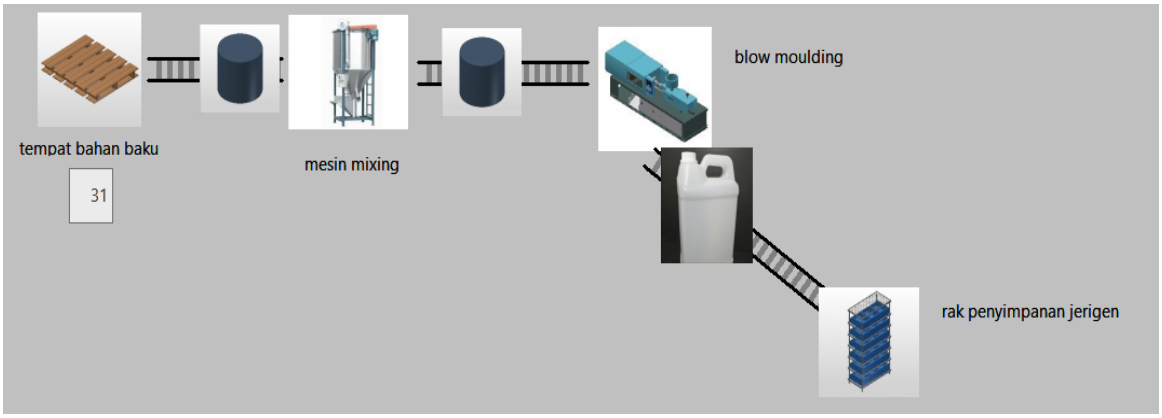

FIGURE 3. Location Promodel Simulation for Integrated Systems

In making the location Promodel for an integrated system, the velocity calculation of the Belt conveyor rate is carried out. Using the formula V = s / t [3] to obtain the speed on the conveyor belt. With the length of the conveyor 15 meters and also the time used 15 seconds, the conveyor speed is 1 m / s. By calculating the conveyor speed, it can produce an integrated output.

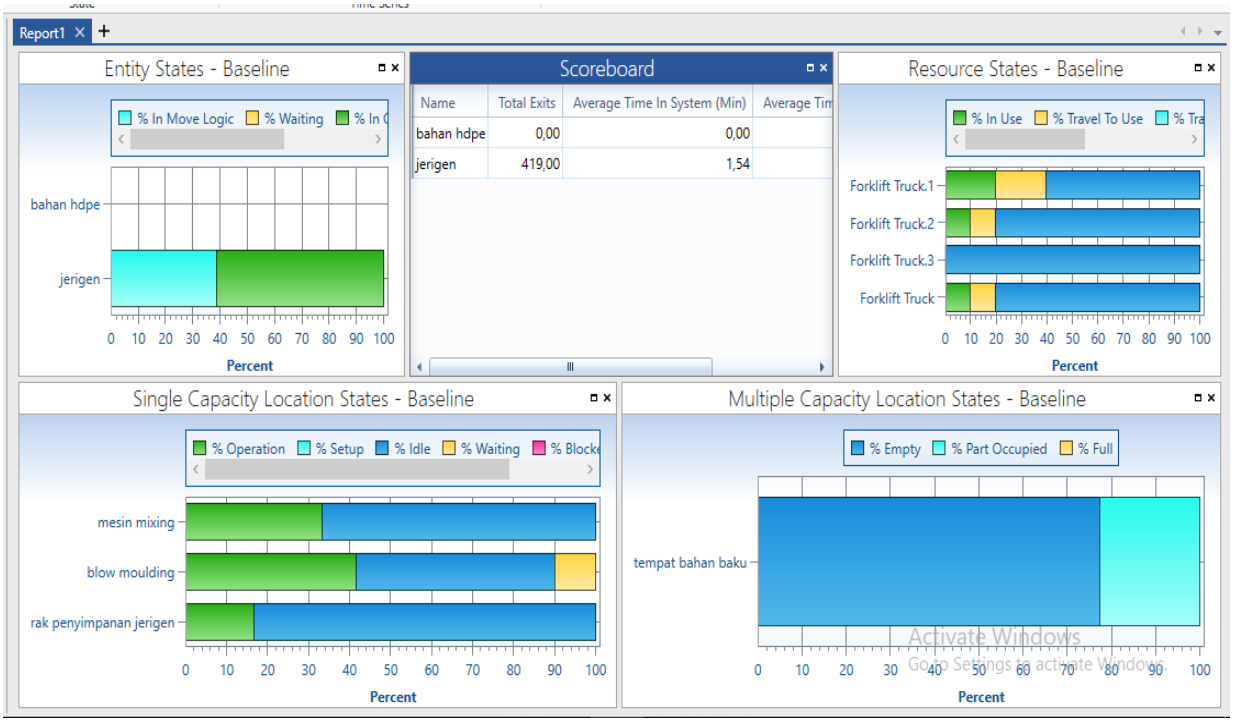

FIGURE 4. Output of Secondary Data Simulation with the Promodel application

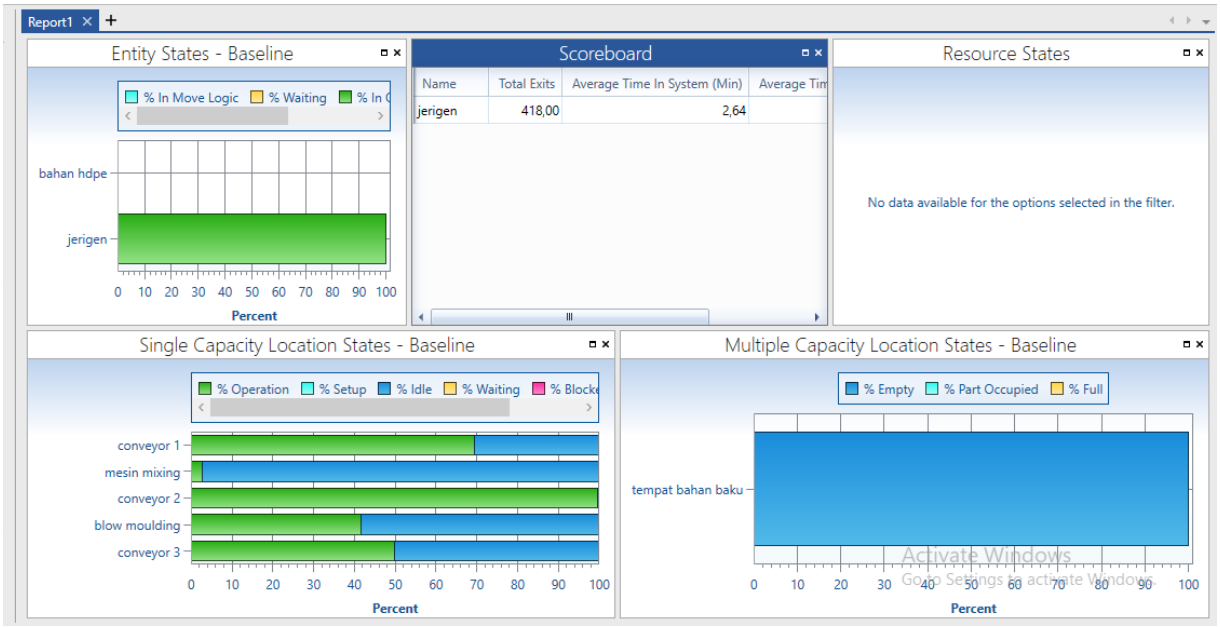

FIGURE 5. Output system that have been Integrated System with the Promodel application

From the results that have been simulated by the Promodel application, it can be seen that in Figure 4 it has the same output but the resulting efficiency is lower and causes the machine to experience idle compared to Figure 5, the results are the same in Figure 4 of 418 and Figure 5 of 419 these results are simulated for 7 hours corresponding to 1 shift.

In the simulation output of secondary data in Figure 4 it can be seen that the mixing machine only operates 35% due to producing more wasted material in the blow molding machine, 42.5% blow molding, and 15% storage rack which keeps defective results. For 7 hours and at the output The simulation in Figure 5 shows that the mixing machine operates 5% because the results are not wasted and the maximum is, blow molding is 42.5% which produces maximum goods without being wasted, and 0% storage racks do not store waste products. So it can be concluded that integrated use produces more effective results than conventional use.

Then in the secondary data simulation it can be seen that it has more Blocked / waste compared to the integrated system simulation because in the secondary data simulation it still uses a conventional system while the integrated system already uses a well integrated belt conveyor. For comparison calculations

CONCLUSION

In this study it can be concluded that the integrated system simulation produces better results than secondary data simulation using conventional systems which can be seen from graphs and tables 4 and graphs and tables 5. From the simulation it can be seen that the data generated in the integrated system is more effective. compared to secondary simulation data. And when the efficiency calculation is done, the value is 37.25%.

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REFERENCES

1. Karionugroho A., (2019). “Upaya Mengurangi Waste Pada Produksi Jerigen 25 L Di Pt. Batara Elok Semesta Terpadu Gresik” (doctoral dissertation, universitas muhammadiyah).
2. Syam, B., Sentono, B. W., Hamsi, A., & Siregar, R. E. (2007). Analisis Proses Produksi Jerigen Plastik Menggunakan Mesin Pencetakan Tiup. Jurnal Penelitian Saintika, 7(1),4-10.
3. Noviyasari, C. (2011). Simulasi Sistem Perencanaan Dan Pengendalian Produksi Pada Perusahaan Manufaktur. Jurnal Manajemen Informatika (JAMIKA), 1(2).
4. Lu, M., & Wong, L. C. (2007). Comparison of two simulation methodologies in modeling construction systems: Manufacturing-oriented PROMODEL vs. construction-oriented SDESA. Automation in Construction, 16(1), 86-95.
5. Adhikary, K. B., Pang, S., & Staiger, M. P. (2008). Dimensional stability and mechanical behaviour of wood–plastic composites based on recycled and virgin high-density polyethylene (HDPE). Composites Part B: Engineering, 39(5), 807-815.
6. Struble, D. S., & Safian, J. W. (2006). U.S. Patent No. 7,153,127. Washington, DC: U.S. Patent and Trademark Office.
7. Elisabeth christine santosa. (2018). Analisis Efektivitas Mesin Stretch Blow Moulding Botol Plastik Pet Pada Cv. Jordan Plastics Semarang Dengan Meminimumkan Six Big Losses (Doctoral dissertation, Unika Soegijapranata Semarang).
8. Danang Mahardika Prabowo.(2018). Analisis Pengaruh Kecepatan Dan Massa Beban Pada Conveyor Belt Terhadap Kualitas Pengemasan Dan Kebutuhan Daya Dan Arus Listrik Di Bagian Produksi Pt. Indopintan Sukses Mandiri Semarang (Doctoral dissertation, Universitas Muhammadiyah Semarang).
9. Ricky Humisar Siahaan.(2011) Studi Temperatur Optimal Terhadap Campuran Bahan Polypropylene Dan Polyethylene Pada Proses Mixing Untuk Pemakaian Plastic Injection Moulding” (Doctoral dissertation, Universitas Sumatra Utara).
10. MIZE Fellow, J. H., Bhuskute, H. C., Pratt, D. B., & Kamath, M. (1992). Modeling of integrated manufacturing systems using an object-oriented approach. IIE transactions, 24(3), 14-26.