Greener Journal of Environment Management and Public Safety

ISSN: 2354-2276

Vol. 13(1), pp. 141-149, 2025

https://gjournals.org/GJEMPS

DOI: https://doi.org/10.15580/gjemps.2025.1.032725061

Performance Analysis of Ring Spinning Machine on Production Efficiency in Spinning Department 11 PT Sri Rejeki Isman, Tbk using OEE and FMEA

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ABSTRACT

PT Sri Rejeki Isman, Tbk is the largest textile industry in Southeast Asia that consider to maximize production capacity and quality products by production efficiency. The target production efficiency in the spinning department 11 is 94%. This study aims to increase the ring spinning machine performs by OEE (Overall Equipment Effectiveness) method and production efficiency by the FMEA (Failure Mode and Effect Analysis) method. The OEE result of the ring frame machine in January is 31%. It is very poor comparing by Japan Institute of Plant Maintenance that is 85%. The results of the FMEA's analysis find that the factor that is causing of below average production efficiency is the lack knowledge of human resources about true efficiency's definition.

ARTICLE'S INFO

Article No.: *032725061*
***Type*:** *Research*
Full Text: *PDF, PHP, MP3*
DOI: *10.15580/gjemps.2025.1.032725061*

Accepted: *02/04/2025*
Published: *30/07/2025*

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Keywords: *Performance Analysis, Ring Spinning Machine, Production Efficiency, OEE, FMEA*

1. INTRODUCTION

The textile and apparel industry is one of the industrial sectors that experienced the highest growth in the third quarter of 2019 at 15.08 percent. This surpassed economic growth of 5.02 percent in the same period. The country's Textile and Textile Products (TPT) industry has the potential to bounce back amid trade war tensions between the two global economic giants, the United States and China [7]. PT Sri Rejeki Isman, Tbk, one of the largest textile and garment companies in Southeast Asia which has a big role in Indonesia's economic growth due to its marketing that has spread throughout the world. In running the company's production wheels, of course, PT Sri Rejeki Isman, Tbk will pay attention to the small things that affect its products. One of them is to pay attention to the production efficiency of the enterprise [5]

In another definition, production efficiency is the ability to produce goods and services using an optimal combination of inputs so as to produce maximum output at the minimum possible cost and resource [8]. In accordance with the understanding above, we can conclude that the achievement of production efficiency is very important because it is related to everything, such as resource needs, production costs, and so on. Efficiency can be seen by monitoring the spinning department 11 of PT Sri Rejeki Isman, Tbk for a whole month in January 2022. After monitoring production efficiency, several reports were generated that did not reach the target. Therefore, it is necessary to have further review to solve these problems so that production efficiency can achieve the targets that have been planned.

Problem Statement

The formulation of the problem to be solved is as follows:

1. What are the factors that lead to the non-achievement of production efficiency targets?
2. How is the ring frame machine performed according to OEE (Overall Equipment and Effectiveness) calculations?
3. What are the most frequent causes that make production efficiency unattainable?

Objectives

The objectives of solving the above problems are 1) Analyzing the causes of non-achievement of production in the spinning department 11 PT Sri Rejeki Isman, Tbk; 2) Analyzing how often the causes of non-achievement of production are limited; 3) Analyzing the effectiveness condition of the working machine.

Advantages

The benefits of solving the above problems are 1) Knowing the causes of not achieving production in the spinning department 11 PT Sri Rejeki Isman, Tbk; 2) Knowing the level of how often the cause of not achieving production; 3) Knowing how the effectiveness of the machine works.

2. LITERATURE REVIEW

The textile industry is the largest contributor to Indonesia's foreign exchange receipts. In 2009, the textile industry contributed foreign exchange receipts amounting to 12.72% of exports of non-oil and gas manufacturing products and 9.58% of total non-oil and gas exports, although 85% of its raw materials were still imported in cotton. This industry not only makes a huge contribution to the country's GDP and foreign exchange, but also absorbs a lot of labor, both directly and indirectly. The market potential of Indonesian textile products is relatively large due to the need for fabrics of urban people, not only clothing but also other fabrics. Indonesia is one of the largest textiles producing countries in the world. In 2004, the sector managed to increase foreign exchange earnings by $7.6 billion. According to Thuborn, the total value of Indonesia's textile exports in 2007 was US$9.73 billion, of which the country ranked 12th in textile exports and 8th in garment export [6]

The textile industry is related to the design, production and distribution of yarns (spinning), fabrics (weaving) and clothing (garments). The raw materials may be natural, or synthetic using products of the chemical industry. One part of textile is spinning. Spinning is a process used to produce fibers or filaments from natural or synthetic polymers or convert natural or artificial fibers and filaments into threads by twisting or other means to bind together fibers or filaments that produce relatively smooth and continuous lengths of threads [9]. Raw materials are one of the things that must be considered in spinning. Raw materials can be one material and two materials or mixtures. Threads derived from two materials should be considered the ratio of their mixing. From three times experiment we can find that there is three formulas to make a yarn, from the three formula there is one the best blend material and formula that we can apply in Industry [3]

Spinning is one of the fields of textiles that produce products in the form of yarn. The production capacity for the spinning division in one textile company in Central Java is 566 thousand bales / year. The production figure is high, and each year the target is always fulfilled. The need for yarn, either through orders or orders or for further processing in the weaving or weaving department, encourages operators to be able to pursue planned production targets. In the spinning process, whether a production target is achieved is determined by the final stage of the process, namely the winding machine. However, in its implementation it is inseparable from various problems caused by various factors [2]

The definition of efficiency in output that efficiency is a comparison between output and input that refers to the achievement of a maximum output with a given number of inputs, that is to say with a large output ratio the efficiency is higher. It can be said that efficiency is the best use of inputs in the production of goods. Efficiency is the act of maximizing yields with minimal capital (labor, materials and tools) [10]

A ring frame machine is a machine that turns roving into yarn by giving it a twist. The fuctions of this machine, namely: 1) Stretching; 2) Giving a twist; 3) Winding. Briefly, the working principle of the ring frame machine begins with entering the roving into the drafting zone area. In the drafting zone area, the roving will be pinned by the front roll. The thread that comes out of the front roll will pass through the snail wayer and be rolled in the thread cop.

OEE is a method used as a measuring tool (metric) in the application of the TPM program to keep the device in ideal condition by eliminating the six main device losses. This OEE measurement is based on measuring three main ratios, namely availability ratio, performance ratio, and quality ratio. To get the OEE value, the three values of the three main ratios must first be known. Availability ratio is what describes the use of available time for activities that involve operating

a machine or system. Nakajima (1988) stated that availability is the ratio of operation time, by eliminating equipment downtime, to loading time [2]. This the formula used to measure the availability ratio is:

$$\text{Availability} = \frac{\text{operation time}}{\text{loading time}} = \frac{\text{loading time} - \text{downtime}}{\text{loading time}}$$

Performance ratio is a ratio that describes the ability of a facility to produce goods. This relationship is given by the speed of operation and the degree of net operation. Equipment operating speed rate refers to the difference between the ideal speed (based on the equipment design) and the actual operating speed. Net operating rate measures the maintenance of a speed over a certain period. In other words, it measures over a period of time when the equipment is operated at low speeds [2]. The measurement formula of this ratio is:

$$\text{Performance rate} = \frac{\text{processed amount} \times \text{theoretical cycle time}}{\text{operation time}}$$

Quality ratio is a ratio that describes the ability of equipment to produce products that are in accordance with standards [1]. The formula used for the measurement of this ratio is:

$$\text{Quality rate} = \frac{\text{processed amount} - \text{defect amount}}{\text{processed amount}}$$

The OEE value is obtained by multiplying the three main ratios. Mathematically, the OEE value measurement formula is as follows:

OEE (%) = Availability (%) x Performance Rate (%) x Quality Rate (%)

FMEA is the way in which parts or processes that may not comply with specifications will cause defects or discrepancies and their impact on customers if these types of defects are not prevented or corrected. FMEA is usually carried out during the conceptual and initial system design phases to ensure that all possible failures have been considered and reasonable efforts have been made to correct them and minimize potential failures. The order or classification of various terminologies in the FMEA: 1) The potential result is the result felt or experienced by the end user; 2) The potential failure mode is a failure or defect in the design that causes the defect to not work as it should; 3) Potential causes of failure are design flaws and changes in variables that will affect the process and result in product defects; 4) Occurrence (O) is an estimate of the probability or probability that the cause will occur and produce a mode of failure that causes a certain result; 5) Severity (S) is a subjective estimate or estimate of how badly the end user will feel the consequences of the failure; 6) Potential safety problem, the result of which is very dangerous and contrary to the law; 7) Detectability (D) is a subjective estimate of how effectiveness and methods of prevention or shortness of measures; 8) Risk Priority Number (RPN) is the result of the multiplication between severity, detectability and rating occurrence [4]

FMEA analysis was obtained by weighting the values of Severity (S), Occurrence (0) and Detection (D). The root of the main problem is determined from the results of weighting. The severity weight is a scale of 110 that shows the influence of the resulting failure rate. The higher the severity value, the greater the impact of the error on the system. The occurrence weight is a scale of 110 indicating the frequency of failures. The higher the occurrence value, the more likely it is that an error will occur. Detection weights are a scale of 110 that indicates the difficulty of measuring to detect potential errors. After obtaining the calculation of the multiplication of the severity (S), occurrence (0) and detection (D) values, the RPN value calculation is carried out. Rpn value is used to determine the failure that is the top priority based on the highest RPN value. The higher the RPN value, the failure becomes the company's top priority to make improvements [11].

3. RESEARCH METHODOLOGY

Research methodology is the steps that will be carried out in the research to achieve the desired goal. The steps for solving problems in the development of this algorithm can be seen in the figure below.

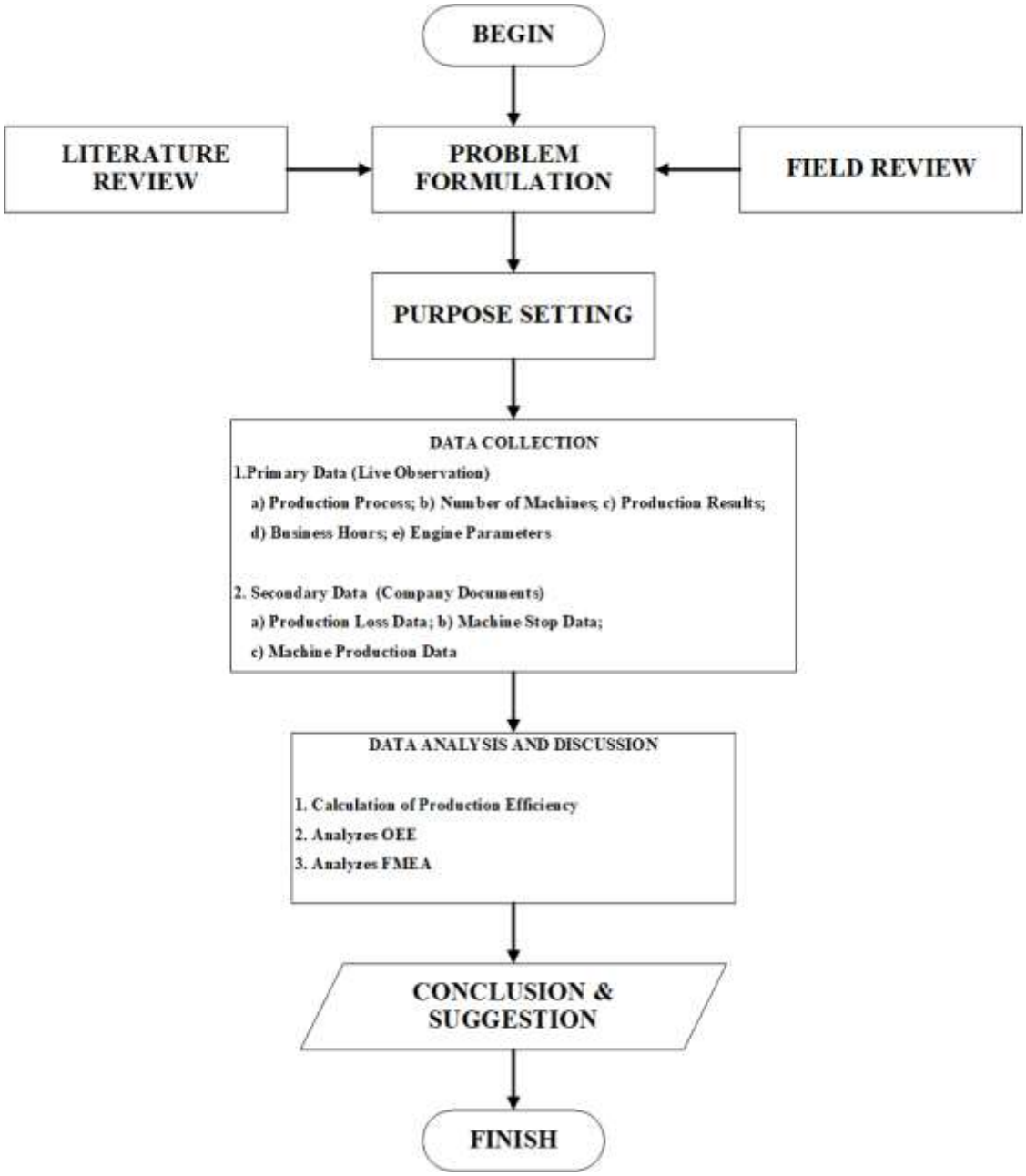

Figure 1. Research Methodology

Production achievements at PT Sri Rejeki Isman, Tbk often do not reach the desired target. This makes the company unable to get much profit. To find out the cause of this non-achievement of production efficiency, a direct review is carried out and a review is carried out based on existing data. After the review, the data obtained will be processed using the OEE and FMEA methods. The OEE method is used to find out whether the machine used has been effectively used or not. Based on the literature review, OEE has advantages such as simple calculations even though the data needed is quite a lot. Measuring the effectiveness of the machine using the OEE method is expected to be able to determine the level of effectiveness of the machine which can then be used as a reference to make improvements. While the FMEA method is used to find out what causes are most risky (most often occur) in not achieving production efficiency. FMEA analysis makes it easier for companies to solve the problems that cause non-achievement of production efficiency ranging from the most frequent causes to causes that only appear a few times.

4. FINDING AND RESULT

The production results on the manufacture of yarn are closely related to the production produced by the ring frame machine. Because at that time, the process of making yarn is already 90% which will then be rolled back in a winding machine which serves to improve the quality of the thread by removing poor quality yarn from the ring frame machine. The calculation of production efficiency is calculated by comparing the production produced by the packing part with the production produced by the ring frame machine. Here are the efficiency targets that must be achieved in January.

Table 1. Spinning Department Production Efficiency Target 11

No	Count	EFF Target	EFF Targets *x* Count
1	30 TC	95%	2850
2	30 CT	95%	2850
3	24 TC	95%	2280
4	20 TC	92%	1840
5	20 CT	92%	1840
Sum	**124**		**11660**

From the data above, the average efficiency target below is obtained.

$$\text{Efficiency Targets Average} = \frac{\sum \text{Efficiency Targets x Count}}{\text{Count}}$$

$$\text{Efficiency Targets Average} = \frac{11.660}{124}$$

$$\textbf{Efficiency Targets Average} = \mathbf{94}\%$$

Based on the production efficiency target above, the following is a calculation of daily production results obtained from the packing section.

Table 2. Production Per Day Per Yarn Number

Date	30 TC	30 CT	24 TC	20 TC	20 CT
Sum	1271,61	125	238,493	229,875	1701,84

From the daily production results above, it can be seen the average RPM (Rotation Per Minute), TPI (Twist Per Inch), and thread number. The three things above must be known so that the real efficiency of production can be known. Here's the calculation:

Table 3. Spinning Department Production Calculation 11

Count	Production	RPM	TPI	Count *x* Production	Count *x* Production *x* TPI	Production *x* RPM
30 TC	1.271,61	17.000	19,44	38.148,3	741. 602,95	2. 161. 7370
30 CT	125	17.000	20,53	3750	76. 987,50	2. 125. 000
24 TC	238,493	16.400	17,39	5.723,832	99. 537,44	4. 054. 381
20 TC	229,875	15.200	15,87	4.597,5	72. 962,33	3. 907. 875
20 CT	1.701,84	15.200	16,8	34.036,8	571. 818,24	28. 931. 280
Sum	3. 566,818			86. 256,432	1. 562. 908,455	60. 635. 906

From the data above, the average and efficiency below are obtained.

1. Average Count

$$\text{Average Count} = \frac{\sum \text{Count x Production}}{\text{Production}}$$

$$\text{Average Count} = \frac{86.256,432}{3.566,818}$$

2. Average TPI

$$\text{Average TPI} = \frac{\sum \text{Count x Production x TPI}}{\text{Production x Average Count}}$$

$$\text{Average TPI} = \frac{1.562.908,455}{3.566,818 \text{ x } 24,2}$$

$$\textbf{Average TPI} = \mathbf{18,1}$$

3. Average RPM

$$\text{Average RPM} = \frac{\sum \text{Produksi x RPM}}{\text{Produksi}}$$

$$\text{Average RPM} = \frac{60.635.906}{3.566,818}$$

$$\textbf{Average RPM} = \mathbf{17.000}$$

4. Number of Spindle Ring Frame Machine

$$\text{Total of Spindle} = \text{Total Machine x Total Spindle/Mesin}$$
$$\text{Total of Spindle} = 23 \text{ x } 1.824$$
$$\text{Total of Spindle} = 41.952 \text{ Spindle}$$

After obtaining the data above, a calculation of production efficiency for a whole month is carried out as below.

1. Production achieved if the production efficiency of the ring frame machine is 100% for 1 month

$$\text{Production/Month} = \frac{\text{RPM}}{\text{Ne x TPI}} \text{x} \frac{0{,}4536 \text{ x } 60}{840 \text{ x } 36} \text{x } 24 \text{ x } 30 \text{ x EFF x Jumlah Spindle}$$

$$\text{Production/Month} = \frac{17.000}{24,2 \text{ x } 18,1} \text{x} \frac{0{,}4536 \text{ x } 60}{840 \text{ x } 36} \text{x } 24 \text{ x } 30 \text{ x } 100\% \text{ x } 41.952$$

$$\mathbf{Production/Month = 5.814,99}$$

2. Production Efficiency in January

$$\text{Production Efficiency in January} = \frac{\text{Production Achieve}}{\text{Production if efficiency } 100\%} \text{ x } 100$$

$$\text{Production Efficiency in January} = \frac{3.566{,}818}{5.814{,}99} \text{ x } 100$$

$$\mathbf{Production\ Efficiency\ in\ January = 61{,}33\%}$$

From the calculation above, it can be seen that the achievement of production in January in the spinning department 11 is still very far from the existing target desired which is the efficiency target which must be 94% and the achievement is only 61.33%.

In determining the causes of not achieving production efficiency, of course, machine performance is very influential. The performance of the machine can be calculated using the analysis of overall equipment effectiveness as follows.

Table 4. OEE (Overall Equipment Effectiveness) Analysis of Ring Spinning Machine Spinning Department 11

Period	Loading Time (Jam)	Downtime (Jam)	Operating Time (Jam)	Actual Output (Bale)	Product Defect (Bale)	Plan (Bale)
Sum	17112	4004	13108	3167	1173	4340

From the data above, it can be seen the availability ratio, performance ratio, and quality ratio below.

1. **Availability Ratio**

$$\text{Availability} = \frac{\text{operation time}}{\text{loading time}} = \frac{\text{loading time} - \text{downtime}}{\text{loading time}}$$
$$\text{Availability} = \frac{\text{loading time} - \text{downtime}}{\text{loading time}}$$

$$\text{Availability} = \frac{17112 - 4004}{17112}$$

$$\text{Availability} = 0{,}766$$

$$\mathbf{Availability = 77\%}$$

2. **Performance Rate**

$$\text{Performance rate} = \frac{\text{processed amount} \times \text{theoretical cycle time}}{\text{operation time}}$$

$$\text{Performance rate} = \frac{3167 \times 3{,}5}{17112}$$

$$\text{Performance rate} = 0{,}647$$

$$\textbf{Performance rate} = \mathbf{65}\%$$

3. **Quality Rate**

$$\text{Quality rate} = \frac{\text{processed amount} - \text{defect amount}}{\text{processed amount}}$$

$$\text{Quality rate} = \frac{3167 - 1173}{3167}$$

$$\text{Quality rate} = 0{,}629$$

$$\textbf{Quality rate} = \mathbf{63}\%$$

4. **OEE (%)**

OEE (%) = Availability (%) x Performance Rate (%) x Quality Rate (%)
OEE (%) = 77% x 65% x 63%
OEE (%) = 0.315
OEE (%) = 31%

From the results of the OEE calculation above, it can be seen that the performance of the ring spinning machine which is the main machine for making yarn is very far from the standard. The standard used is the Japan Institute of Plant Maintenance (JIPM) standard where they have set a benchmark standard that has been widely practiced around the world, namely a) If OEE = 100%, production considered perfect; only manufacture flawless products, work in fast performance, and no downtime; b) If OEE = 85%, production is considered world-class. For many companies, this score is a suitable score to serve as a Long-term goal; c) If OEE = 60%, production is considered reasonable, but indicates there is great room for improvement; d) If OEE = 40%, production is considered to have a low score, but in most cases it can be easily improved through direct measurement (e.g. by tracing reasons for downtime and addressing the sources of the causes of downtime individually).

The world class benchmark standard recommended by JIPM, namely OEE = 85%, while the calculation results show only 31% results, then it is classified as very low. And based on the standards of the Japan Institute of Plant Maintenance, if the OEE calculation result is 40%, it is classified as low production, especially with a yield of 31%. For this reason, further research on TPM (Total Productive Maintenance) is needed so that the OEE value can increase.

The data processing above shows that production efficiency has not been achieved in accordance with the target. In every problem, of course, there is a cause for the problem to occur. So that you can find out the cause of this failure to achieve production efficiency, an analysis is needed. The analysis used is to use the FMEA (Failure Mode and Effect Analysis) method, so that it can be known the potential causes of failure and evaluate risk priorities. The value weighting for the FMEA analysis was obtained from the results of the questionnaire results that had been filled out by employee representatives in the spinning department 11, including managers, supervisors, trainers, squad heads, quality control, admins, mechanics, and operators.

Table 1. FMEA (Failure Mode and Effect Analysis) Analysis causes of non-achievement of production efficiency

Failure mode	Types of Defects	Potential Effects of Failure	Causes of potential failure	Severity	Occurrence	Detection	RPN
Production efficiency is not achieved	Falling production efficiency	Production efficiency should be achieved every day in accordance with the target	Material arrives late	10	8	5	400*
			Production temperature/room temperature, RH	8	5	3	120
			Dirty working environment	5	3	2	30
			Operators are less dexterous in work	10	5	3	150
			Shortage of machine operators or HR (Human Resources)	10	8	6	480*
			Auto-doffing technology is less than optimal	9	5	3	135
			Many machine parts are error damaged	8	5	4	160*
			The process of connecting threads is wrong or not up to standard	9	5	2	90
			The number of cop yarn that is late to connect	10	7	5	350*
			The abundance of late engines roving blocks	9	6	4	216*

After calculating the data above, where the determination of the value is taken from the questionnaire filled out by the employees and staff mentioned above, it can be seen that from 10 the cause of not achieving production efficiency there are 5 causes that have the highest number of RPN values, where the high RPN value indicates that these causes are the ones that often occur and must be resolved first. Here are 5 causes of not achieving production efficiency with a high RPN value in the spinning department 11: 1) The first cause is the lack of machine operators or human resources. The lack of operators and human resources has the highest RPN points compared to other causes, which is as many as 480 points. The high point is caused by many employees or operators in spinning 11 who go in and out of the company for no apparent reason, so that when the machine operator experiences a reduction will automatically affect the performance of the production itself; 2) The second cause is that the material arrives late. This late arrival material occupied the second highest RPN value with 400 RPN points. The high point is caused by the lack of materials or raw materials in the company. So that when the materials or raw materials run out, the department inevitably has to temporarily stop the production process; 3) The third cause is the large number of threads that are late to connect. The number of threads that were late to connect occupied the third highest RPN value with RPN points of 350 points. The high point is caused by the lack of human resources or machine operators, so that when there is a broken thread, it is not immediately connected. Ring spinning machine with the number of spindles of 1824 spindles and there are 23 machines, is not comparable to the number of machine operators; 4) The fourth cause is the large number of engines that are late roving blocks. The number of machines that are late in the roving block occupies the fourth highest RPN value with RPN points of 216 points. The high point is due to the lack of human resources or machine operators. So that if there is a change of process or the end of roving simultaneously, inevitably there must be a machine that must give way and it is too late to change the roving or roving block. Ring spinning machine with the number of spindles of 1824 spindles and there are 23 machines, is not comparable to the number of machine operators; 5) The fifth cause is the number of engine parts that are error or damaged. The

number of engine parts that are error or damaged occupies the fifth highest RPN value with RPN points of 160 points. The high point is due to the absence of machine spare parts. So that if there is damage to one of the engine parts, the mechanic will outsmart it by repairing the machine part so that it can still be used. Continuous repair will result in the machine part being damaged and when a breakdown occurs, the automatic production process will be disrupted.

5. CONCLUSION

Based on the results of the analysis that has been carried out, it can be concluded that the factors that cause the non-achievement of production efficiency targets in the spinning department 11 are material late come, production temperature and RH room are not up to standard, dirty working environment, operator is less dexterous in working, lack of human resources, auto-doffing is not runs smoothly, many machine parts are damaged, the thread splicing process is wrong, many thread cops are late to connect, the roving block process is late. In addition, after calculating the performance of the machine using the OEE (Overall Equipment Effectiveness) method, it turned out that the performance of the ring frame machine produced a low value of 31%. This low value defines that the ring frame machine which is a yarn making machine is less than optimal in operation. To determine the level of risk of factors causing the non-achievement of production efficiency in the spinning department 11, an analysis has been carried out using the FMEA (Failure Mode and Effect Analysis) method. The results of the FMEA analysis show that there are 5 factors that most often lead to the non-achievement of production efficiency in the spinning department 11. These factors are lack of human resources (480 points), late material arrival (400 points), the number of late thread cops (350 points), the number of late engine block roving (216 points), and the number of engine parts that are damaged or error (160 points).

Based on the analysis that has been carried out, the advice given to the company is 1) The company must improve machine performance by paying attention to maintenance schedules, material availability, and other factors that cause the machine is stalled; 2) The company needs to research more about TPM (Total Productive Maintenance) so that the OEE value can increase; 3) In accordance with the results of the FMEA analysis above, the lack of human resources have the highest points so that the company must solve the problem by coordinating with the HRD (Human Resource Development); 4) The company must find a solution best regarding the factors that cause the non-achievement of production efficiency.

6. REFERENCES

[1] Betrianis, Suhendra, R., 2005. Pengukuran Nilai Overall Equipment Effectiveness Sebagai Dasar Usaha Perbaikan Proses Manufaktur Pada Lini PRODUKSI (Studi Kasus pada Stamping Production Division Sebuah Industri Otomotif). Jurusan Teknik Industri 5, 91–100. https://doi.org/10.9744/jti.7.2.pp

[2] Dharma, F.P., Hardiman, H.D., Ikatrinasari, Z.F., Purba, H.H., 2019. New development fiber material: use DoE approach to determine the best formula for blended fiber silk (Samiya Cynthia Riccini and Semi-Natural Fiber). IOP Conf. Ser.: Mater. Sci. Eng. 508, 012105. https://doi.org/10.1088/1757-899X/508/1/012105

[3] Dharma, F.P., Ikatrinasari, Z.F., Purba, H.H., Ayu, W., 2019. Reducing non-conformance quality of yarn using pareto principles and fishbone diagram in textile industry. IOP Conf. Ser.: Mater. Sci. Eng. 508, 012092. https://doi.org/10.1088/1757-899X/508/1/012092

[4] Hermawan, I., 2011. Analisis Dampak Kebijakan Makroekonomi Terhadap Perkembangan Industri Tekstil Dan Produk Tekstil Indonesia. BEMP 13. https://doi.org/10.21098/bemp.v13i4.269

[5] KMTL FTP UB, 2019. PT SRI REJEKI ISMAN Tbk (SRITEX). URL http://kmtl.tp.ub.ac.id/pt-sri-rejeki-isman-tbk-sritex/

[6] Mahaji Puteri, R.A., Prasetyawati, M., 2019. Analisa Penyebab Kegagalan Kemasan Cup Minuman Instan Aloe Vera. Prosid Sem Nas Teknoka 3, 27. https://doi.org/10.22236/teknoka.v3i0.2909

[7] Ministry of Industry of The Republic of Indonesia, 2019. Industri Tekstil dan Pakaian Tumbuh Paling Tinggi. URL https://kemenperin.go.id/artikel/21230/Kemenperin:-Industri-Tekstil-dan-Pakaian-Tumbuh-Paling-Tinggi

[8] Prakoso, F.B., 2020. LAPORAN PRAKTIK KERJA LAPANGAN: Pengamatan Efisiensi Produksi Benang T/Rdi Departemen Spinning III PT Sri Rejeki Isman. Akademi Komunitas Industri Tekstil dan Produk Tekstil Surakarta.

[9] Pujianto, H., Dharma, F.P., Hindardi, D., Tuwarno, T.P., 2021. Penentuan Setelan Rotor Mesin Open End Untuk Pembuatan Benang Ne 6 sebagai Upaya Jaminan Atas spesifikasi dan Kualitas Pada Workshop Pemintalan di Ak-Tekstil Solo. IJL 4, 46. https://doi.org/10.22146/ijl.v4i2.66993

[10] Sutanto, H.A., Imaningati, S., 2014. Tingkat Efisiensi Produksi Dan Pendapatan Pada Usaha Pengolahan Ikan Asin Skala Kecil.

[11] Ulfa, A.M., Adnan, S.R., 2021. Pengukuran Kinerja Mesin 3 dan Analisis FMEA pada Proses Produksi Resin di PT. XYZ. JOPT 7, 92. https://doi.org/10.35308/jopt.v7i1.3110

Cite this Article: Dharma, FP; Helvianto, AW; Bintang, HS; Pujianto, H; Rahmawati, ND (2025). Performance Analysis of Ring Spinning Machine on Production Efficiency in Spinning Department 11 PT Sri Rejeki Isman, Tbk using OEE and FMEA. *Greener Journal of Environmental Management and Public Safety*, 13(1): 141-149, https://doi.org/10.15580/gjemps.2025.1.032725061.