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Computer integrated capacity assessment of press shop with enhanced overall equipment Effectiveness

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Abstract
Overall Equipment Effectiveness is one of the most common and popular performance evaluation methods in the manufacturing industries. Overall Equipment Effectiveness (OEE) is critical when availability, performance, and quality are important to the organization. The OEE is intended to reduce breakdowns, increase availability, and thus improve the machine's effectiveness. The availability rate of the machine, performance rate of the machine, and quality rate of the parts are considered the main parameters for maximizing a manufacturing system's Overall Equipment Effectiveness (OEE). It has been discovered that a low availability rate contributes more than a performance rate and quality rate. The aim of this work was to improve Overall Equipment effectiveness (OEE) at a manufacturing company by implementing proper capacity analysis strategies. The operator on the shop floor should then be involved in each maintenance operation because he is closest to the machine and knows the abnormalities. The Breakdown list and Production Status also gives the company for 2 month. Calculating Overall Equipment Effectiveness based on data. The Overall Equipment Effectiveness is mainly depends upon three factors availability, performance and quality of parts. But this research work major contributing factor for less OEE in machine availability. Moreover, the first identified possible causes for machine downtime and data analysis. After that implement capacity assessment and bring machine in to basic optimum condition for use. We are also getting improved OEE after implementing integrated capacity plan. By improving the machine availability we are getting improvement in OEE from 30% to 38.18%.

Keywords: OEE, Reduce breakdowns, increase availability, performance rate and quality rate

Introduction
Overall Equipment Effectiveness (OEE) is a way to monitor and improve the efficiency in manufacturing process. OEE has become an accepted management tool to measure and evaluate plant floor productivity. OEE is broken down into three measuring metrics of Availability, Performance, and Quality. These metrics help gauge to the plant‘s efficiency and effectiveness and categorize these key productivity losses that occur within the manufacturing process. OEE highlights the actual "Hidden capacity" in an organization. OEE is not an exclusive measure of how well the maintenance department works. The design and installation of equipment as well as how it is operated and maintained affect the OEE. It measures both efficiency (Doing things right) and effectiveness (Doing the right things) with the equipment. OEE is calculated by obtaining the product of availability of the equipment, performance efficiency of the process and rate of quality products. Author suggested in their study, the implementation of OEE at a small enterprise using TPM methodology. To be successful achieve world class manufacturing, organizations must possess in effective maintenance. Overall Equipment Effectiveness (OEE) quantifies that well working of manufacturing unit and performs relative to its designed capacity, during the periods when it is scheduled to run frequent machine breakdowns, low plant availability, increased rejection are a great threat to increase operating cost and lower productivity. Finally the availability of machine has been increased from 69% to 85%, performance from 79% to 79%, quality from 90% to 96% and the OEE of machine increased from 65% to 80% [1]. OEE is an effective method for analysing the efficiency of a single machine and an integrated system. The case study of OEE was carried out from set-up stage to full implementation. The management made the decisions by relying on OEE results and its details, and the elimination of the root

causes of breakdown losses and speed losses. Finally, after full implementation, OEE quality rate improved over 75 percentages, since availability rate were improved over 79 percentages, and performances was maintained at the same level [2]. Authors implemented TPM and 5S techniques to improve the availability, performance and quality of the machines. Though TPM, 5S technique, design of multi-fixture were focused, the availability and performance were improved significantly by minimizing the equipment deterioration and failure. After the implementation of TPM, 5S techniques and design of multi-fixture, the availability of machine has been increased from 67.73% to 70.78%, performance from 60.63% to 63.91% and the OEE of machine increased from 40.08% to 44.41% [3]. Humiras Hardi Purba *et al*. (2018) have suggested that the measurement of the effectiveness level of machinery/equipment using the method of Overall Equipment Effectiveness (OEE) [4]. OEE calculation results obtained from July to September 2015 with the largest percentage in July 2015 at 86.05% and the lowest in August at 79.58%. Factors that have the greatest percentage of big losses cutting the jig factor in the Blow molding department are reduced speed of 28.98%, loss of damage by 25.98%, adjustment and adjustment loss of 21.84%, loss of over-cut 11, 8%, loss of center 6.14, short termination of minor termination of 5.24%. Equipment failures that occurred during July to September 2105 have resulted in reduced machinery/equipment effectiveness, with the largest percentage loss of damage occurring in August at 6.22% **[**[5]. The issue of rejected items in the workplace. The author has identified a way for integrating the overall equipment effectiveness. To enhance the company's production system, he evaluated the machine's three measuring factors: availability rate, performance rate, and quality rate. He conducted a data analysis of total equipment effectiveness with an availability rate of 88.82 percent, a performance rate of 93.70 percent, and a quality rate of 98.20 percent, and OEE values of 81.73 percent machine performance improvement [6]. M. VivekPrabhu *et al*. (2014) have suggested that the performance measure indicator OEE is important tool for any equipment calculation and careful analysis is required to know the effect of various components. The excel sheets can be used as simplest way of tool to measure and monitor true data collection. Mansion OEE is calculated using Genetic Algorithm. Their study indicates OEE is one of the Performance improvement indicators. To achieve the OEE of 84.645% and optimized values are Availability 90%, Performance Rate 95% and Quality Rate 99% [7]. E. Sivaselvam *et al*. (2017) has studied all industries are in the situation to improve their productivity [8]. Every company is facing many challenging problems to produce better production rate. Manufacturers should be able to identify even the small factors affecting production growth. Clear identification of problem at the right time will help to increase quality as well as productivity rate. He concluded an OEE is a method to measure performance of production equipment in manufacturing [9]. Authors focused on the bending Machine and Welding Machine were identified as critical machines through grading of machines. Grading of machines was done based on the frequency of operation, volume of operation, failure, availability of alternatives and cost factor. The existing OEE level of bending machine and welding machine are 56.7% and 59.4% [10]. In this study investigates the analysis of machine failure, imbalanced posts and non-conforming products and was carried out a period of 4 months.in fact, we have balanced the assembly line, increased the availability of the bottleneck by using the equipment tool, and proposed action plans to reduce the defect ratio. It is concluded an OEE increased the efficiency of the assembly line of 37.2% giving an efficiency of about 76.2% exceeding the 63% set by the company [11]. Lisbeth de Carmen *et al*. (2020) focused to enhance performance and productivity. It is assumed that all parameters that can be measured, can be improved. Through this systematic study and with the formulation and development of the proposed and state of the art, evolution, and future trends of OEE indicators were better understood, OEE can be used to measure the productivity of cargo movement equipment in a warehouse [12]. Meanwhile, in the service sector, OEE can be used to measure client satisfaction in terms of the availability, performance and quality of the services received. Additionally, an OEE-based model can be incorporated into a balanced scorecard to visualize the overall productivity of a business [13]. In their study that, presently competition is high in all the industrial, TPM may be the only thing that stands between success and total failure for some companies TPM can be adapted to work not only in industrial plants, but also in construction, building maintenance, transportation, and in variety of other situations [14]. If everyone involved in a TPM program does his or her part, a usually high rate of return compared to resources invested may be expected. TPM success requires strong and active support from management, clear organizational goals and objectives for TPM implementation. Authors focused and OEE is applicable to both manufacturing and nonmanufacturing operations [15]. OEE can be used to save companies from making inappropriate purchases, and help them focus on improving performance of machinery and plant they already own. He concluded the OEE should be implemented at micro and small scale industries. By continuously measuring and comparing results from day to day or week to week, industry will see its performance improving. Some OEE improvements will happen due to the increased attention and focus on asset management. We expect this tool will be used by all engineering industries across all scales [16]. Tamer Haddad *et al*. (2021) has studied a considered strong evidence of how powerful by decreasing the losses in the setup process. Thus, the company has achieved an improvement in the OEE of the extrusion production line, which can increase the reliability of the processes, increase the stability of the production plans, and obtain financial gain as cost-saving. This research work is limited to the selected industry, production line type and size, and the available production technologies, these changes and improvements could be considered when applying this methodology to other similar manufacturing companies in other locations and industries [17]. It has studied to mark all the critical strategies associated with sustainable performance and to trace all possible drawbacks while measuring effectiveness through OEE (Overall Equipment Effectiveness). OEE is a tool of Total Productive Maintenance (TPM) without whom the effective utilization of resources is a difficult task. OEE supports the entire perspective on effectiveness uniquely and logically but also improves the life span of the machinery through improvements and monitoring in the maintenance operations and activities [18]. It was focused on the performance of Toshiba injection molding machine. The

analysis was performed by applying Failure Mode and Effect Analysis (FMEA) with support from other tools such as Pareto chart, Cause and Effect Diagram (CED), and six big losses. By following the whole framework of the research, it finds causes of why the OEE does not meet the target. He concluded that there are several causes of why the OEE does not meet the target. First, the machine is not well maintained because of no chemical for cleaning the heat exchanger. Thus, the oil in the machine is too hot. Second, the used method does not have an excellent system to control spare parts. It takes more time to repair a machine [19]. Moreover, analysis of capacity and of OEE calculation it was reached the following conclusion: these methods determine correct results regarding the efficient optimization of the production process. With the help of the job shop, the flow shop, the cellular shop and the analysis the following results were obtained: percent above/below DPV for bottleneck operation is -2.28%, percent above/below facilities DPV for bottleneck operation is 3.36% [20]. Authors studied the OEE measurement is that the average level machine effectiveness in pulp machine. It losses that have the most significant effect on the low effectiveness of the overall equipment of the pulp machine is reduced speed in the amount of 27.6%. To minimize the losses, one of the ways that can be done is by maintaining the actual speed of operation and maintains the wear on each roll of pulp machine [21]. It is focused focusing to increasing their production and efficiency Overall equipment effectiveness (OEE) helps to increase efficiency and effectiveness of the industry. It is concluded that maintaining this factor above 95% and small changes in operation flow process will enhance the efficiency of the industry [21]. Authors has conducted a work, on considered the single-product, multi periods, multi-resources lot sizing problem, under production capacity constraints and with sequence-dependent launch times and costs. An industrial company that manufactures and commercializes thermoplastic pipes. The aim of this work is to help decision makers choose the best and most suitable period of the system studied in order to minimize investment costs while meeting market demands [22]. Mainly it has inferred to generated a production planning module in Microsoft excel to included forecasting, lot sizing and production planning and order release. He concluded an easy to use some specialized software may be the cost in time of software selection the financial cost of implementation and customization of flexibility, low cost, and spreadsheet based solution [22]. Based on the calculations, it was found that the best-performing component of the OEE is quality, the value of which has not dropped below 95% over the period considered. This turned out to be a great result for the company, considering the fact that the plant strives for the best quality of production [23]. It was focused of improvement was aimed at improving performance. Things that must be done to overcome the low value of performance is the monitoring of employee performance at the glazing and packaging stages to reduce the inefficient work of the engine. The average value of IQF machine OEE is 62.87% with an availability value of 96%, performance 65.84%, and quality 99%. OEE values on IQF machines are still below the standard OEE value in the world, which is 85% which is considered still low. The main factor influencing the low OEE value on IQF machines is a reduction in engine speed (Reduce speed) with a percentage of 87%. Other factors that cause losses are 6% (idle and minor stoppage), 5.3% (Setup and adjustment), 1.2% (Defect losses), and 0.5% (yield losses). From the analysis using cause and effect diagrams can be known the cause of the decrease the speed of the engine is in humans with the factor of employee indiscipline in carrying out the task so that the process becomes slow [24]. It has analysed to show that production effectiveness in the multiproduct production system has been significantly improved by MPSE. In addition, MPSE amends the deficiencies of previous OEE measurement methods in terms of accuracy, flexibility and continuous improvement. In order to verify the improvement results, the total production output, which is the main index to evaluate the production performance in the enterprise, is recorded. The total production outputs of Enterprise Q from 2016 to 2019 are (theoretical load times in the four years are nearly the same). It can be seen that the production output in 2019 has a sharp increase, compared to the steady rise from 2016 to 2018. The relevant and valuable production data helps the management to efficiently monitor the workers. Information on human capital can optimize the true capacity of the workers performance. The awareness of OEE is essential for industries when it comes to decision making. The simple metrics of the OEE brings to light all the valuable information required by the management. The Production data should be very well interpreted and fully utilized in order to optimize available resources within the industrial sector. This will reduce wastage and increase the production yield. By taking these necessary steps industries can improve and maintain more efficient production lines [25]. With a practical example in actual manufacturing processes environment, the framework has been discussed. This framework is beneficial to the engineer especially the beginner to start measure their machine performance and later improve the performance of the machine. From the literature review, Company was facing problem with the low performance and breakdown of the machines. Hence it was essential to reach up to the roots of problem and required to correct them for desirable performance, and also process yield was variable data. For this problem out of 7QC tools including Cause and Effect diagram use to identify particular cause and effect of failure of equipment and use pillars of Total Productive Maintenance (TPM) methodology like Preventive Maintenance and Jishu hozen.

Data analysis of breakdown loss

Machine breakdown time has a significant impact on machine production and operating time. In addition, machine breakdown leads to quality issues and the loss of valuable production time. Overall Equipment Effectiveness (OEE) is one of the availability measurement techniques used to calculate machine effectiveness in any company. The OEE calculation will assist us in determining the machine's availability rate, performance rate, and part quality rate. To calculate OEE, we first need past failure data, such as machine or equipment data, and a production status report, as well as all shift breaks, such as lunch and tea breaks, shift length, and ideal run rate. So, first gather all previous breakdown reports from March 2022 to April 2022. Collect the number of shifts in a month and the number of holidays in this step to calculate the proper overall equipment effectiveness per shift. The table 1 and 2 shown below

Table 1: Breakdown Report (March 2022)

March 2022 Report (24 working day/ 48 Shifts)			
Date	**Machine Name**	**Break down losses**	**Total Time in Minutes**
01.03.2022	T6,T7,T1,T8,T9,T10	No plan	3420
02.03.2022	T6,T7,T1,T8,T9,T10	No plan	2940
03.03.2022	T1 to T11	Power cut	660
03.03.2022	T6,T7	No plan	1840
03.03.2022	T11	Die problem	500
04.03.2022	T1 to T11	Power cut	990
04.03.2022	T6,T7,T1,T8,T9,T10	No plan	2070
05.03.2022	T4,T5	Crack problem	400
05.03.2022	T6,T7,T1	No plan	2900
07.03.2022	T1 to T11	Power cut	825
07.03.2022	T6,T7,T1,T8,T9,T10	No plan	2715
08.03.2022	T6,T7,T1,T8,T9,T10	No plan	5100
09.03.2022	T3	Job over lap	80
09.03.2022	T8	Line pin problem	100
09.03.2022	T6,T7	No plan	1620
10.03.2022	T2	Ejection problem	200
10.03.2022	T5	Die filler bush damage	300
10.03.2022	T6,T7,T1,T8,T9,T10	No plan	1360
10.03.2022	T11	Die problem	900
11.03.2022	T6,T7	No plan	3240
12.03.2022	T6,T7,T8,T9,T10	No plan	2640
14.03.2022	T5	Linear bush broken	800
14.03.2022	T6,T7	No plan	1840
15.03.2022	T6,T7,T8,T9,T10	No plan	2700
16.03.2022	T6,T7,T8,T9,T10	No plan	735
16.03.2022	T1 to T11	Power cut	214
17.03.2022	T1 to T11	Power cut	660
17.03.2022	T6,T7,T1,T10	No plan	4380
18.03.2022	T1 to T11	MD meeting	990
18.03.2022	T6,T7,T1,T8,T9,T10	No plan	6000
19.03.2022	T1 to T11	Power cut	495
19.03.2022	T4	Grease problem	60
19.03.2022	T6,T7,T1	No plan	3045
21.03.2022	T6,T7,T1,T8,T9,T10	No plan	3600
22.03.2022	T6,T7,T1,T8,T9,T10	No plan	4185
22.03.2022	T1 to T11	Power cut	495
23.03.2022	T4	Centre bolt	130
23.03.2022	T6,T7,T1,T8,T9,T10	No plan	2990
24.03.2022	T6,T7,T1,T8,T9,T10	No plan	340
24.03.2022	T1 to T11	Air compressor problem	720
24.03.2022	T11	Die problem	1160
25.03.2022	T1 to T11	Pallet nil	2220

So, after data collection step we analyse this data and using the Formula of OEE to calculate the Availability, Performance and Quality rate to know Real Time Overall Equipment Effectiveness of Best Engineering and Stamping Technologies Company. Table 3 represented as production report in the year of March 2022 - April 2022.

Table 2: Breakdown Report (April 2022)

April 2022 Report (25 working day/ 49 Shifts)			
Date	**Machine Name**	**Break down losses**	**Total Time in Minutes**
01.04.2022	T6,T7,T1,T8,T9,T10	No plan	3120
02.04.2022	T11	Die problem	1500
02.04.2022	T6,T7,T1	No plan	2880
04.04.2022		Air level problem	330
04.04.2022		Air compressor Maintenance work	660
04.04.2022	T6,T7,T1,T8,T9,T10	No plan	2610
05.04.2022	T11	Die problem	80
05.04.2022		Air leakage	120
05.04.2022	T6,T7,T1	No plan	1180
06.04.2022	T1	No plan	2760
07.04.2022	T4,T5	Overlap problem	600
07.04.2022	T6,T7	No plan	2340
08.04.2022	T6,T7,T8,T9,T10	No plan	4860
09.04.2022	T11	Die problem	400
09.04.2022	T6,T7,T8,T9,T10	No plan	2720
11.04.2022	T11	Die problem	400
11.04.2022	T6,T7	No plan	2060
12.04.2022	T6,T7,T8,T9,T10	No plan	2040
13.04.2022	T1 to T11	Power cut	385
13.04.2022		Air problem	330
13.04.2022	T6,T7,T8,T9,T10	No plan	5185
15.04.2022	T6,T7,T8,T9,T10	No plan	510
16.04.2022	T6,T7,T8,T9,T10	No plan	4290
16.04.2022	T4	Grease leakage	510
18.04.2022	T11	Die problem	600
18.04.2022	T1 to T6	Fork life delay	360
18.04.2022	T6,T7,T8,T9,T10	No plan	3660
19.04.2022	T2	Die problem	320
19.04.2022	T6,T7	No plan	1960
20.04.2022	T11	Die problem	600
20.04.2022	T6,T7,T8,T9,T10	No plan	2820
21.04.2022	T6,T7,T8,T9,T10	No plan	1980
21.04.2022	T11	Die problem	420
22.04.2022	T6,T7,T1	No plan	1980
23.04.2022	T6,T7,T1,T8,T9,T10	No plan	3400
23.04.2022	T11	Die problem	800

Table 3: Production Report (March 2022 - April 2022)
Production Report of March 2022 - April 2022

Month	Total Pieces Produce / Month	Rejected Pieces	Good Pieces
March-22	352737	487	352250
April-22	367023	413	366610
Total	719760	900	718860

Data Calculation of OEE

Calculation of Overall Equipment Effectiveness (OEE) per 1 Shift Availability = (Net available Time ÷ Total Available Time) x100

Net available time = Total available time - Total downtime

Plant operating Time = 12 hours × 60 = 720 minutes

Total available time = 720 - 120 = 600 minutes

Performance = Actual Produced quantity ÷ Quantity Planned as per norms

Quality = (Rejection Quantity ÷ Produced Quantity) x100

Table 4: Losses report (March 2022 - April 2022)

Month	Time Losses in Minutes	Working Day	Total Shift	Losses/Shift in Minutes
March	102439	24	48	2134
April	84830	25	49	1731
Total	187269	49	97	3865

Table 5: Calculation and Analysis of Data (March 2022 - April 2022)

Month	Plant Operating Time/shift in Min	Break Time	Total available time /Shift in Min	Losses/Shift in Min	Total Pieces/ Shift	Rejected Pieces/ Shift	Good Pieces/ Shift
March	720	120	600	2134	352737	487	352250
April	720	120	600	1731	367023	413	366610
Total	1440	240	1200	3865	719760	900	718860

Table 6: Manual Calculation of OEE value

Month	Availability	Performance	Quality	OEE=A×P×Q
March	41	70	99	28
April	43	71	99	30

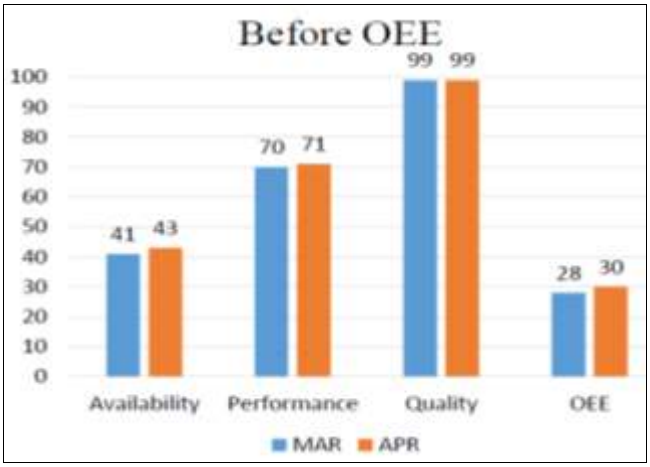

Fig 1: Before Implementation of OEE

From data collected during month of March 2022 to April 2022 that we are used to calculating the Overall Equipment Effectiveness by multiplying rate of performance and quality with availability. By calculating the OEE we can identify that machine are less OEE because of less availability (fig.1) of the machine. So, we identify the possible causes that why machine is not working and that have to improve the availability rate. With the help of fish-bone diagram we are getting the possible causes for less OEE. The cause & effect diagram also helpful us to why machine is not working and its causes.

Finding and Factors

The Six Big Losses are forms of waste as shows fig.2. They do not add value to the products. Instead, they reduce a machine's effectiveness (which is measured by the OEE). To apply OEE and take part in improvement activities, it is

important to use this knowledge of the different types of equipment-related losses.

The bar chart can be used to identify significant losses and production problems.

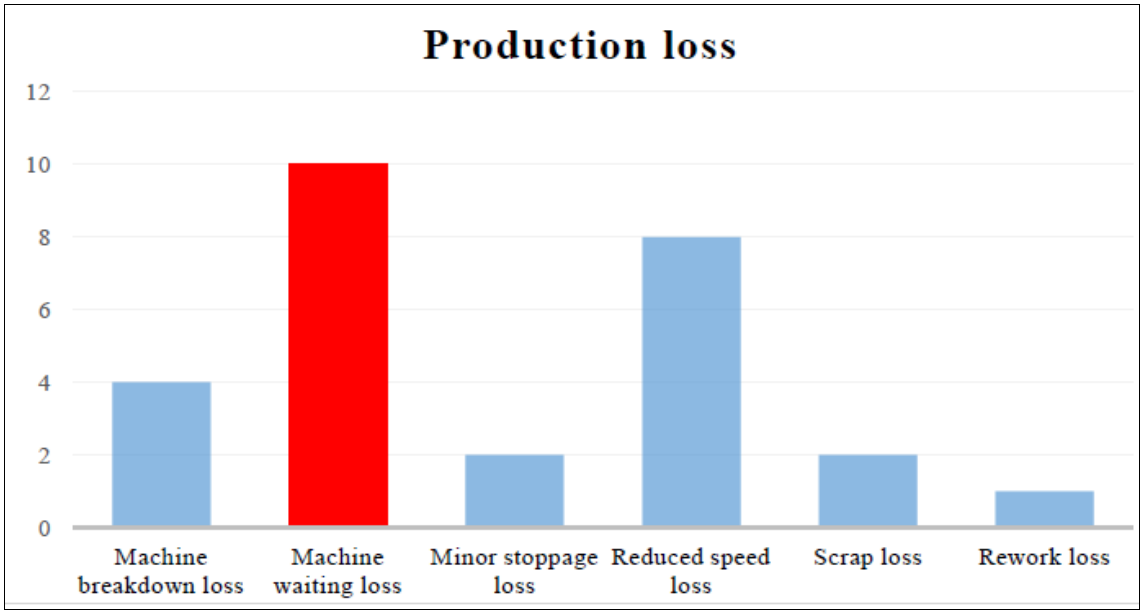

Fig 2: Production loss

Major Problems to be identified

a) Information flow of Manual documentation
b) Waiting loss
c) Die problem

Machine waiting loss

A waiting loss occurs when the machine is waiting for something. This can be further divided into sub-categories: idle or line restraint. Firstly, when a machine is idle, it means that production time has been lost because the machine does not make any products. For example, when a changeover occurs, the machine normally has to stop producing for some time in order to change tools, dies, or other parts. A waiting loss occurs when the machine is waiting for something. This can be further divided into sub-categories: idle or line restraint. Firstly, when a machine is idle, it means that production time has been lost because the machine does not make any products. For example, when a changeover occurs, the machine normally has to stop producing for some time in order to change tools, dies, or other parts. Secondly, when a line restraint occurs, it means that the machine is standing still because of supply or transport problems on the production line. This would happen when the operator is waiting for material, either from stores or previous machine.

Process flow refers to the various operations that occur in each section. Best engineering has two lines of production. The first line has six machines arranged horizontally. For example, the first part of fig 3 is 71682, which has six operations, and the second part of fig 3 is 64586, which has five operations. In the first part, there are fulfilled machines, so each machine is working to produce the part, but in the second part, there are five operations, so availability is six, but only five machines are required, so one machine can be ideal and is considered waiting loss.

In best engineering, data is collected using the traditional method of paper work. Data collection is inefficient and more time-consuming.

Fig 3: Fixed Operations to utilize all the machines

Fig 4: Machine ideal and waiting for next operation

The T11 press coil feeder machine has particular facing the majority of die problem. The press machine speed and automatic coil feeding generate a high rate of breakdown loss in the die, which has an impact on production rather than delivery time as shown in figure 4.

Table 7 and 8 shows an capacity Analysis is an evaluation of the production capabilities at a manufacturing plant or

similar facility. It's also an evaluation of a factory, production process, line, or machine to determine its maximum output rate. Our Capacity analysis Excel Template is one of our most popular supply chain and operation templates. If you love this template, you'll also want to check out our make or buy analysis, cost of quality, Stoppage Analysis and master production schedule templates.

A machine loading is a plan to balance supply and demand in the production of a commodity. It tracks the production of a product over a period of time, and is a fundamental piece of any manufacturing business. Like any schedule, a production schedule is built to be flexible. It responds to fluctuations in demand and sets up inventory to avoid stock outs. Using our free production schedule template for excel will help you improve efficiency and control costs. Everything about the manufacturing process is covered in this template. It helps you determine what needs to be produced, how much of it you need to make and when it needs to happen.

Table 7: Capacity Analysis spread sheet

BEST ENGINEERING AND STAMPING TECHNOLOGY			MONTHLY SCHEDULE MAY-22					
S.NO.	PART NAME	PART NUMBER	MODEL	CUSTOMER	OPENING FG STOCK	SCHEDULE QTY	CUSHION QTY	NEED TO PRODUCE
1	BRKT-RR S/ABS MTG RH	71682-B4000	BA	SHI	0	750	75	1887
2	BRKT-RR S/ABS MTG LH	71672-B4000	BA	SHI	590	750	75	0
3	EXTN-W/HSE INR FR LH/RH	71634/44-B4000	BA	SHI	0	750	75	1828
4	REINF QTR INR FRT LH	71618-B4400	BA	SHI	0	750	75	475
5	REINF QTR INR FRT RH	71628-B4400	BA	SHI	0	750	75	1775
6	REINF - FR S/MBR INR LH	64634-F9000	HCI	SHI	1500	3275	327.5	2600
7	REINF - FR S/MBR INR RH	64644-F9000	HCI	SHI	1500	3275	327.5	3740
8	BRKT-ENGINE MTG FR LH	64654-H6000	HCI	SHI	3000	3275	327.5	3100
9	BRKT-ENGINE MTG FR RH	64664-F9000	HCI	SHI	5000	3275	327.5	793
10	BRKT RR SEAT BACK LWR LH	71638-H5000	HCI	SHI	526	3275	327.5	0
11	BRKT RR SEAT BACK LWR LH	71648-H5000	HCI	SHI	200	3275	327.5	0
	SUPPORT FR SHK/ABS							

SCHEDULE QTY | CAPACITY SUMMARY

Table 8: Capacity Planning spread sheet

S.NO	CUSTOMER	PART DESCRIPTION	PART NO	MODEL	OPERATION	QTY FOR CAPACITY	FINAL QTY	WIP STOCK	NORM/ Hrs	Batch Qty	Lead time for Batch Qty	Tool Setting Time	Total Lead Time	250T PNEU-01	200T PNEU-02	200T PNEU-03	200T PNEU-04	200T PNEU-05	200T PNEU-06
1	SHI	BRKT-RR S/ABS MTG RH	71682-B4000	BA	BLANKING	1887	1887	0	500	825	1.65	0.1	4.00	4.00					
2					FORMING	1887	1887		500	825	1.65	0.1	4.00		4.00				
3					FORMING	1887	1887		500	825	1.65	0.1	4.00			4.00			
4					FLANGE & RESTRIKE	1887	1887		500	825	1.65	0.1	4.00						
5					PIERCING	1887	1887		500	825	1.65	0.1	4.00						
6	SHI	BRKT-RR S/ABS MTG LH	71672-B4000	BA	FORMING	0	0		500	235	0.47	0.1	0.00		0.00				
7					FORMING	0	0		500	235	0.47	0.1	0.00			0.00			
8					FLANGE & RESTRIKE	0	0		500	235	0.47	0.1	0.00				0.00		
9					PIERCING	0	0		500	235	0.47	0.1	0.00					0.00	
10	SHI	EXTN-W/HSE INR FR LH/RH	71634/44-B4000	BA	BLANKING	825	825	0	500	825	1.65	0.1	1.75	1.75					
11					FORMING	825	825		500	825	1.65	0.1	1.75		1.75				
12					FORMING	825	825		500	825	1.65	0.1	1.75			1.75			
13					TRIMMING	825	825		500	825	1.65	0.1	1.75				1.75		
14					FLANGE & RESTRIKE	825	825		500	825	1.65	0.1	1.75					1.75	
15					PIERCE & PART OFF	825	825		500	825	1.65	0.1	1.75						1.75
16					PIERCING	825	475		500	825	1.65	0.1	1.75	1.75					
17	SHI	REINF QTR INR FRT LH	71618-B4400	BA	BLANKING	825	825	0	500	825	1.65	0.1	1.75		1.75				
18					FORMING	825	825		500	825	1.65	0.1	1.75			1.75			
19					FLANGE & RESTRIKE	825	825		500	825	1.65	0.1	1.75				1.75		
20					PIERCING	825	825		500	825	1.65	0.1	1.75					1.75	
21					PIERCING	825	1775		500	825	1.65	0.1	1.75						1.75
22	SHI	REINF QTR INR FRT RH	71628 - B4400	BA	FORMING	825	825		500	825	1.65	0.1	1.75	1.75					
23					FLANGE & RESTRIKE	825	825		500	825	1.65	0.1	1.75		1.75				
24					PIERCING	825	825		500	825	1.65	0.1	1.75			1.75			
25					PIERCING	825	1775		500	825	1.65	0.1	1.75				1.75		
26		REINF - FR	64634 -		BLANKING	2600	2600		500	1047	2.09	0.1	5.45						
27					FORMING	2600	2600		500	1047	2.09	0.1	5.45			5.45			

SCHEDULE QTY | CAPACITY SUMMARY

An inventory spreadsheet is a useful tool for collecting and storing basic information about the items you have in your warehouse, as well as how to obtain more when the time comes. Fishbowl offers an inventory spreadsheet that you can use as a guide to get started with inventory management.

Table 9 shows production lead-time is best described as the time it takes to create a product and deliver it to the consumer. As mentioned earlier, this can involve how long it takes to get the materials and products from other suppliers if you aren't making your offering entirely in-house. It may feel like production lead-time is something beyond your control if you're relying on outsourced products or materials. However, even if you can't make your supply chain work faster to suit your needs, you can actually control how lead-times affect your business once you have an understanding of how long it will take on average to complete the manufacturing process.

Table 9: Production lead time spread sheet

Best Engineering and stamping technology				PRODUCTION LEAD TIME(PLT)					
PART NAME : SEPARATOR 1			PART NUMBER : TJEX-M20-00024 / 25					MODEL : XH5	
S.NO	SEQUENCE OF OPERATION	MACHINE	OUTPUT/ Hrs	TOOL SETTING TIME (in Hrs)	BATCH QTY/LOT	LEAD TIME IN Hrs	TOTAL LEAD TIME PRODUCTION	CUMULATIVE IN Hrs	REMARKS
1	BLANKING	110T	8	0.5	200	25.0	25.5	2.7	
2	PIERCING	75T	8	0.5	200	25.0	25.5	5.3	For Individual operation
3	FINAL FORMING &EXTRUTION	75T	8	0.5	200	25.0	25.5	8.0	
					TOTAL PLT			8.0	
PART NAME : GESTAMP			PART NUMBER : 765656113R				MODEL : H-79		
S.NO	SEQUENCE OF OPERATION	MACHINE	OUTPUT/ Hrs	TOOL SETTING TIME (in Hrs)	BATCH QTY/LOT	LEAD TIME IN Hrs	TOTAL LEAD TIME PRODUCTION	CUMULATIVE IN Hrs	REMARKS
1	BLANKING	110T	8	0.5	150	18.8	19.3	2.0	
2	FORMING	75T	8	0.5	150	18.8	19.3	4.0	For Individual operation
3	PIERCING	75T	8	0.5	150	18.8	19.3	6.0	
4	SIZING & LETTERING	100T	8	0.5	150	18.8	19.3	8.0	
					TOTAL PLT			8.0	
						PLT in Days / Shift		1	

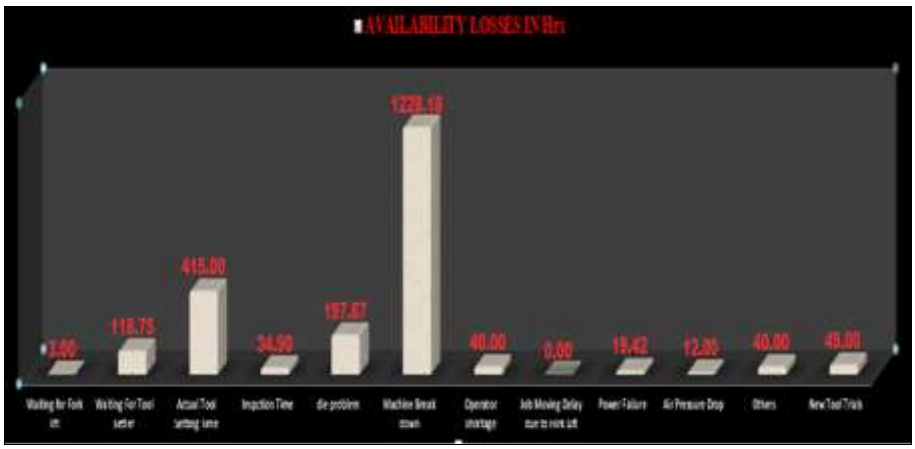

Fig 5: OEE loss spreadsheet

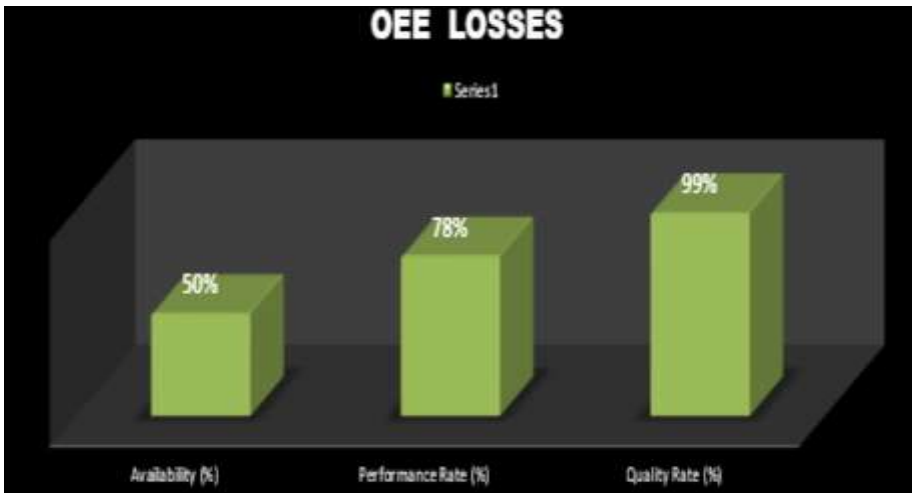

Fig 6: OEE analysis spreadsheet

The manufacturing inventory management excel template to automatically calculate the current raw material stock as well as determining how many units of each product you can make using the raw materials available. OEE (Overall Equipment Effectiveness) is the gold standard for measuring manufacturing productivity. It identifies the percentage of manufacturing time that is truly productive. An OEE score of 100% means you are manufacturing only Good Parts, as fast as possible, with no Stop Time. In the language of OEE that means 100% Quality (only Good Parts), 100% Performance (as fast as possible), and 100% Availability (no Stop Time). Measuring OEE (fig.6) is a manufacturing best practice. By measuring OEE and the underlying losses. OEE is the single best metric for identifying losses, Bench marking progress, and improving the productivity of manufacturing equipment and eliminating waste.

Results and Discussion

After applying tools and technique collect data for month of May 2022 as shown in figure 7. This collection of data includes breakdown report of two month (March 2022 - April 2022) and Production Report. The data will help us to know how much improvement (fig.8) done in this company based on applied tools and technique. Data collected and after implementation of integrated capacity assessment spreadsheet, in that data we found that because of implementation of this two pillars our machine rate and availability rate increases. We use that availability rate and calculate OEE and generate the graph with considering the rate of quality and performance.

Fig 7: After Implementation of OEE

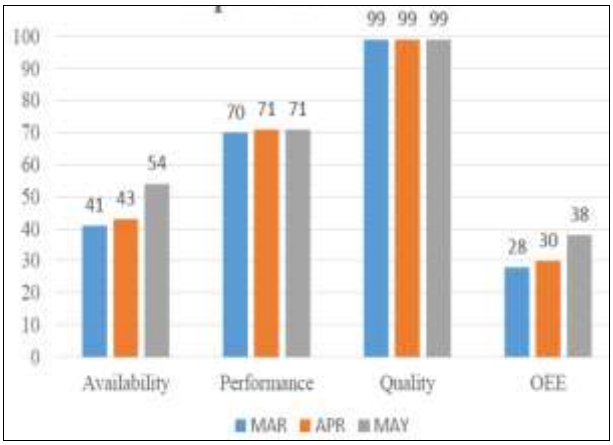

Fig 8: Improvement of OEE

Figure 9 represented as before and after implementation of OEE and are comparing the overall Equipment effectiveness results which was found out that after the implementation possible to improving the machines availability rate and performance and possible reduction in the losses which affect the availability time. By improving the machine availability, we are getting improvement in OEE is 30% to 38% so approximately increase of 8%.

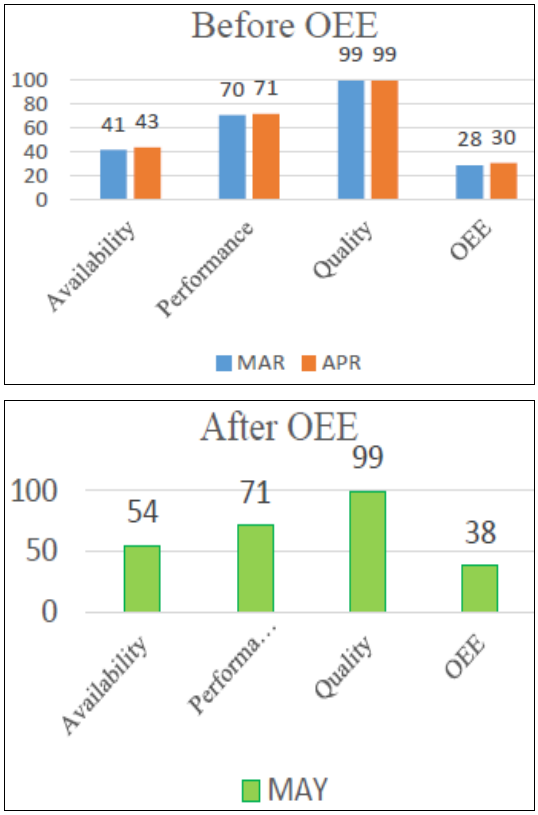

Fig 9: Before and after implementation of OEE

Conclusion

In the best engineering and stamping technologies industry, OEE is competitive. Overall Equipment Effectiveness yet powerful performance measurement tools, so it is recommended for implementation by the company. The real-time Overall Equipment Effectiveness measurement provided clear daily information about the machine's level of effectiveness. It is critical for the company to collect real-time data to expedite corrective action. OEE data also provides continuous line notification and control to the operator. So that actions can be taken ahead of time to prevent downtime, poor machine availability, and revenue loss. When a production department achieves a high OEE rating, it is an excellent indicator of highly productive processes; however, ongoing optimization is required to realize long-term value. By improving the machine availability we are getting improvement in OEE from 30% to 38.14%.

Scope for future work

The current project aims to improve overall equipment effectiveness through the design of integrated data collection sheets. Based on the implementation of OEE, it is concluded that availability is lower than the OEE levels. It would be advantageous for future researchers to use time study and method study to find the root cause of all machines in order to improve machine availability and performance. OEE is deficient in the concept of machine

profitability and costing. It would be beneficial to the company if new Overall Equipment Effectiveness was developed and a new software was designed. The final result of implementing the continuous improvement of approach may reach the world class 85% overall Equipment Effectiveness.

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