E-ISSN: 2707-4552
P-ISSN: 2707-4544
IJMTME 2020; 1(1): 01-08
Received: 01-11-2019
Accepted: 05-12-2019

Arvin KA
Student, Muthoot Institute of Technology and Science, APJ Abdul Kalam Technological University, Kerala, India

Salvin SAM
Student, Muthoot Institute of Technology and Science, APJ Abdul Kalam Technological University, Kerala, India

Muhammed Faizel
Student, Muthoot Institute of Technology and Science, APJ Abdul Kalam Technological University, Kerala, India

Ajay Joshy
Student, Muthoot Institute of Technology and Science, APJ Abdul Kalam Technological University, Kerala, India

Dr. Pradeepmon TG
Associate Professor, Mechanical Engineering Department, Muthoot Institute of Technology and Science, Kerala, India

Corresponding Author:
Arvin KA
Student, Muthoot Institute of Technology and Science, APJ Abdul Kalam Technological University, Kerala, India

Impact of overall equipment effectiveness and man power utilization on assembly line

Arvin KA, Salvin SAM, Muhammed Faizel, Ajay Joshy and Dr. Pradeepmon TG

Abstract
Kerala Agro Machinery Corporation limited, (KAMCO) is a major producer of power tiller in Kerala which is of high demand in the market due to its quality and reliability. At KAMCO Kalamassery they are assembling the engines for power tiller which is done with the help of different departments, namely assembly department, purchase department, finishing department and inspection & quality control. Overall equipment effectiveness is calculated considering various sub components like availability, performance and quality of the production line and represents the overall performance of the firm. Manpower utilization is defined as the business concept which describes how a firm effectively utilize its employees in business operation and also to evaluate the output in relation to labour costs. This work is a case study of overall equipment effectiveness and man power utilization of KAMCO.

Keywords: Psychiatric disorders, suicide, suicide attempt

1. Introduction
Kerala Agro Machinery Corporation Ltd. (KAMCO) was established in the year 1973 as a wholly owned subsidiary of Kerala Agro Industries Corporation Ltd. (KAIC), Trivandrum, for manufacture of agricultural machinery specifically Power Tillers and Diesel Engines. Subsequently KAMCO became a separate Govt. of Kerala undertaking in 1986. Paid up capital is Rs.161 lakh Present Net Worth of the Company is Rs.6014.14 lakh. Total work force at present is 567 Certified for ISO 9001 - 2000 version from September 2002.
At present, KAMCO has five units located at Athani and Kalamassery in Ernakulum District, at Kanjikode in Palakkad District, at Mala in Trichur dist. and at Valiyavelicham in Kannur District. With the present work force KAMCO can produce 8400 Power Tillers & 1200 Power Reapers per annum.

Scope
Primary objective
- To understand the overall equipment effectiveness and man power utilization in the production department at kamco Kalamassery.

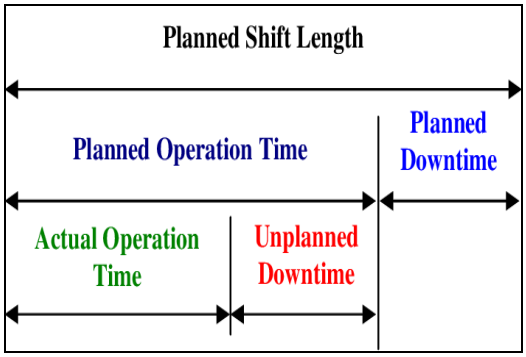
Secondary objective
- To know whether employees are satisfied or not
- To find out the impact of under utilization of manpower, To suggest a solution for under utilization of manpower.

2. Literature review
What is overall equipment effectiveness?
When it comes to manufacturing process, machineries is a very common word in industry especially for higher rate of production output. Since the investment in machineries is high, industries try to maximize their usage in the shortest time possible. Even the management in industries around the world strives towards the optimization of machineries yet this is not to their concern when targets are met. The awareness on true data on machine efficiency is neglected and the results are unwanted purchases of machines. These could be avoided if only the true, data is analyzed and counter measures are taken by the responsible personnel.

Overall Equipment Effectiveness (OEE) is a preeminent practice for monitoring and improving efficiency of the manufacturing processes such as machines, cells, assembly lines and etc. OEE is simple and practical yet a powerful calculation tool. It takes the most common sources of manufacturing productivity losses and places them into three understandable categories which are Availability, Performance and Quality. By doing so, it distills complex production data into simple understandable metrics that provide a gauge for measuring true manufacturing efficiency. It also forms the foundation for tools that help to improve productivity.

Production breakdown

Some industries operate in two 12 hours shifts or operate in three 8 hours shifts a day. The planned shift length can be divided into two, which is the Planned Downtime and Planned Operation Time. Planned downtime is a duration of time where the management has decided to stop the production process due to certain commitments such as preventive maintenances, improvement projects, low in production order and etc. Planned operation time is the proposed time for production process by the management. Generally the planned operation time can be divided into two which is actual operation time and unplanned downtime. Both these factors are the major concern for the management when it comes to measuring machine efficiency and man power utilization. Industries try to maximize the actual operation time and minimize the unplanned downtime to improve their capacity in all means . The production duration can be categorized as shown in fig.



Components of OEE measurement

Availability

Availability takes into account downtime loss, several minutes long enough to log as a traceable event. This includes equipment failures, material shortages and changeover time. Change over time is included in OEE analysis, since it is a form of downtime. While it may not be possible to eliminate changeover time, in most cases it can be reduced. The remaining available time is called actual operation time. Availability is the ratio of operation time which is simply planned operation time less downtime to planned operation time and accounts for downtime loss.

$$Availability = \frac{ACtual\ operation\ time}{planned\ operation\ time}$$

Performance

Performance takes into account speed loss which includes any factors that cause the process to operate at less than the maximum possible speed or rated speed when running. This includes machine wear, substandard materials, misfeeds and operator inefficiency. The remaining available time is called actual operation time. So performance is the ratio of actual operation time to planned operating time, and accounts for speed loss. Machine Ideal cycle time is the minimum cycle time that the process can be expected to achieve under optimal conditions for a given part. Therefore when it is multiplied by total pieces the result is actual operation time. Machine Ideal cycle time is sometimes called design cycle time or nameplate capacity. Since rate is the reciprocal of cycle time, Performance is calculated as,

$$Performance = \frac{(\text{operator ideal cycle time} \times \text{total piece produce})}{\text{planned operation time}}$$

Quality

Quality takes into account quality loss which accounts for produced pieces that do not meet quality standards including pieces that require rework. The remaining time is called actual productive time. The ultimate goal is to maximize actual productive time. Quality is the ratio of actual productive time (time for good pieces produced) to planned operation time (time for total pieces). Quality is calculated

$$Quality = \frac{Good\ piece\ produce}{total\ piece\ produce}$$

OEE = Availability ✕ Performance ✕ Quality

3. What is man power utilization

Manpower utilization is a business concept that describes how effectively a business uses its manpower or employees. Businesses commonly use the concept of manpower utilization to evaluate output in relation to labor costs. Additionally, businesses use this concept to find new ways to more effectively harness the output of labor.

Why it is important?

In business, the employees are an important contributing factor to the organization and also one of the most expensive contributing factors. Not only does a company pay wages to its employees, but it typically invests in employees by paying for their training and benefits, such as health and life insurance and retirement accounts. Thus, for a company to maximize its chances of success, it needs not only to understand its manpower utilization but also to work toward achieving optimal use of its workforce.

Operator or worker utlization

Operators or workers utilization falls under man power utilization which includes any factors that cause the production process to operate at less than the maximum possible speed base on the time study or cycle time. The major factor on measuring the performance of human workers is the operator's inefficiency. Base on fig 6 the man power utilization is measured from the duration of actual operation time. For manual process lines, man power utilization is the ratio of actual production output to target production output as

$$Man\ power\ utilization = \frac{Actual\ production\ output}{Target\ production\ output}$$

Steps in manpower utilization

- Analyze the current manpower resource
- Reviewing the employee utilization
- Forecasting the demand for employees
- Forecasting supply

Data analysis interpretation

This deals with the analysis and interpretation that we collected through survey. The survey is conducted in Kamco Kalamassery, where the total no of respondents where 18 the details of analysis is.

Table 1: Do you work overtime when it is essential?

Response	no of respondents	% of respondents
Yes	15	84%
No	3	16%

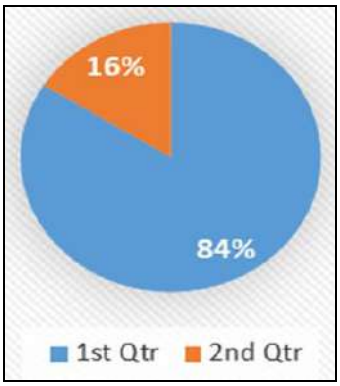


Fig 1

Table 2: Are you satisfied with your job in the organization?

Response	No of Respondents	% Of Respondents
Yes	17	**95**
No	1	**5**

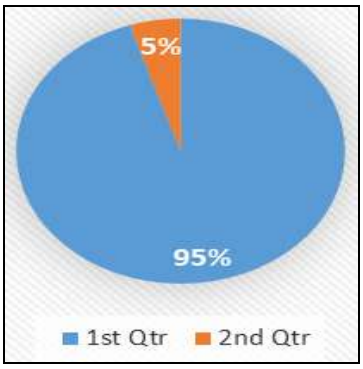


Fig 2

Table 3: Whether your organization conducts any kind of training programs to improve your performance?

Response	no of Respondents	% of Respondents
yes	20	100
no	0	0

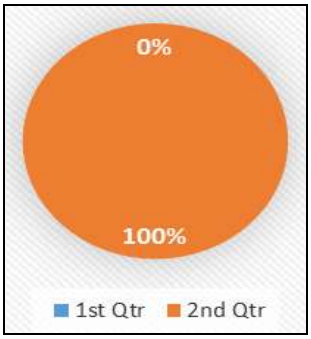


Fig 3

Table 4: If yes, are you satisfied with those programs

Response	no of Respondents	% of Respondents
Yes	16	**88**
No	2	**12**

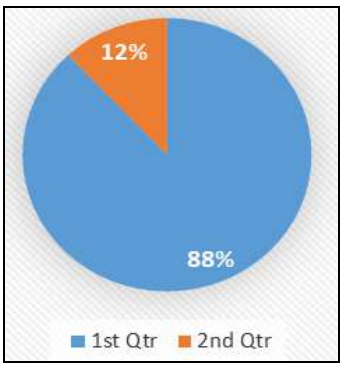


Fig 4

Table 5: Does your performance reach up to the expectations of your superior?

Response	no of Respondents	% of Respondents
Yes	8	57
No	6	43

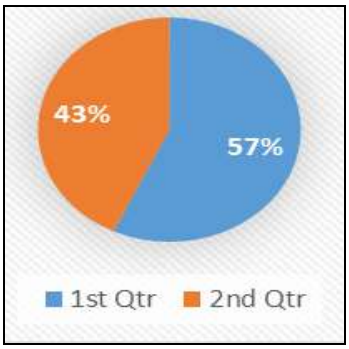


Fig 5

Table 6: Whether your organization has manpower planning?

Response	no of Respondents	%of Respondents
Yes	17	94
No	1	6

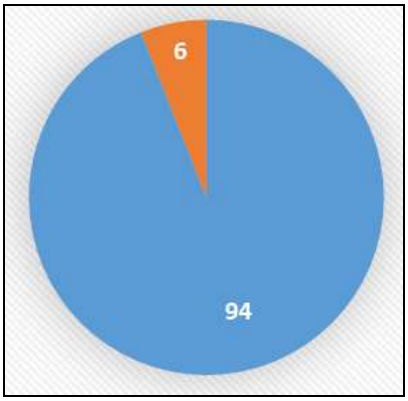


Fig 6

Table 7: Whether your organization has positive working atmosphere?

Response	No of respondents	% of respondents
Yes	18	100
No	0	0

Fig 7

Table 8: Have you ever feel that your work is beyond your limit?

Response	No Of Respondents	% of Respondents
Yes	17	94
No	1	6

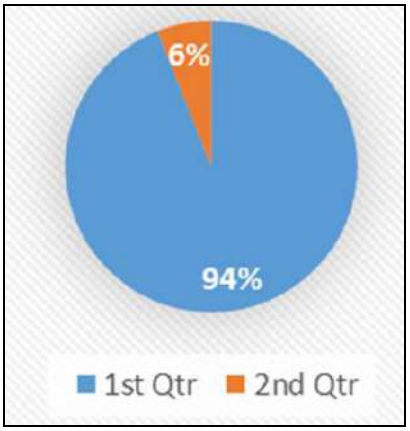


Fig 8

Table 9: Are you constantly scolded by the superior for not completing the work on time?

Response	No of Respondents	% of Respondents
Yes	8	44
No	10	56

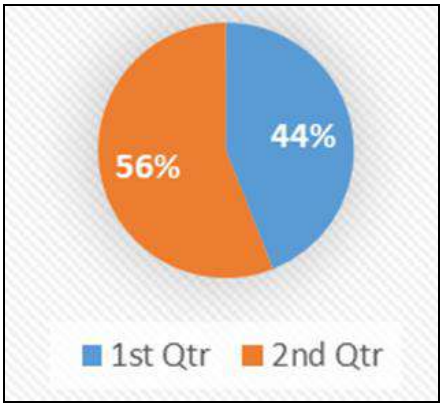


Fig 9

Table 10: Do you think that the time allotted to close up a task is enough or not?

Response	No of respondents	% of respondents
Yes	15	83
No	3	17

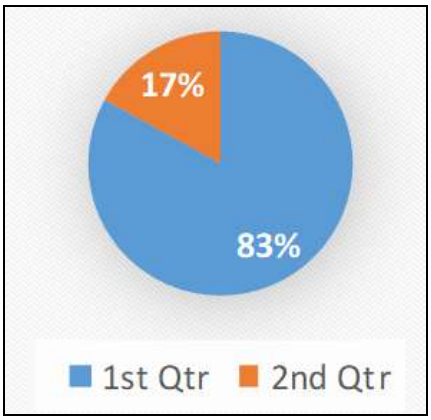


Fig 10

Table 11: Does your organization provide employee counselling?

Response	No Of Respondents	%Of Respondents
Yes	18	100
No	0	0

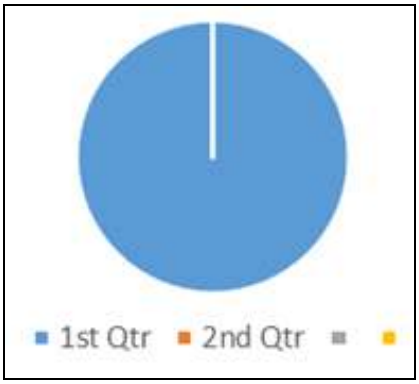


Fig 11

Table 12: Whether the intervals provided by the company is sufficient or not?

Response	No of respondents	% of respondents
Yes	13	72
No	5	28

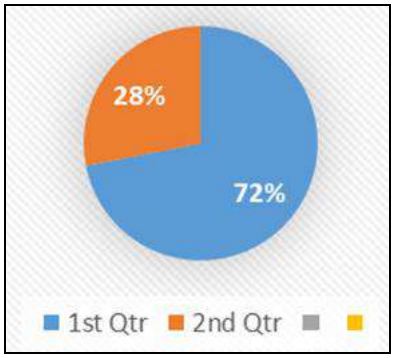


Fig 12

Table 13: Are you satisfied with your superior guidance?

Response	No of Respondents	% Of Respondents
Yes	14	77
No	4	23

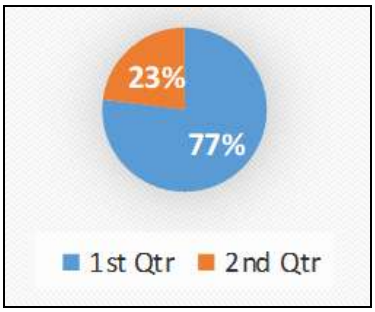


Fig 13

14. Could you please suggest some measures to improve your performance if necessary?

- Provide proper training
- Give proper respect to the worker
- Create good organizational climate
- Modify interval schedule

Overall satisfication of employess

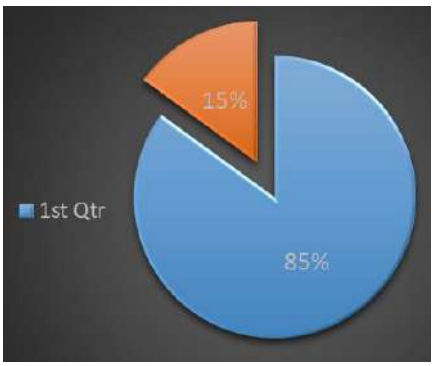


Fig 14

85% of the people are satisfied with their job the rest 15%are unsatisfied with their job

4. Data collected from the Kamco production department

Due to company confidential reason we get only the information from October to January. Total no of people that each hold in the given department in respective month

Department	October	November	December	January
E1	5	6	5	6
E2	5	5	6	5
E Testing	2	2	2	2
E Finishing	4	4	4	4
Total	16	17	17	17

Planned shift length= 8:15-5:00 pm=525 minutes
Planned downtime=1 hr=60minute
Planned operation time= 525-60=465minutes

Standard product that the worker should produce from the planned operation time

E1	4Product
E2	4product
Etesting	12product
E Finishing	6product

Ideal time of worker

Ideal time is the minimum time required to produced one unit

E1	80minute/product
E2	80minute/product
Etesting	45minute/product
E Finishing	50minute/product

5. Calculation of OEE

Availability

No of working days=2
Total no of worker=16
Total no of workers and absent during the month of October

E1	92	21
E2	89	18
E Testing	38	2
E Finishng	78	26

Total no of present =396
Actual operation time=376-76=320*465
Planned operation time =396*465

Availability =81%

November

No of working days=**25**
Total no of worker=**17**
Total no of present and absent during the month of November

E1	137	44
E2	107	19
E Testing	36	4
E Finishing	75	10
RF	73	9

Total no of present = 428
Actual operation time = 342*465
Planned operation time = 428*465
Availability =80%

December

No of working days=22
Total no of workers=17

Total no of present and absent during the month of December

E1	114	27
E2	107	11
Etesting	37	3
Efinishing	67	6
RF	52	11

Total no of present=377
Availability = 85%

January
No of working days = 2
Total no of worker = 17
Total no of present and absent during the month of January

E1	138	30
E2	150	18
Etesting	52	2
Efinishing	110	15

Total no of present = 546
Availability = 82**%**

Quality

$$Quality = \frac{Good\ piece\ produce}{total\ piece\ produce}$$

October
390/430 = 91%

November
330/430 = 77%

December
360/380 = 95%

January
377/440 **=** 86%

Performance

$$Performance = \frac{(operator\ ideal\ cycle\ time \times total\ piece\ produce)}{planned\ operation\ time}$$

October
Operator ideal cyclic time = 80+80+45+50 = 255
Total piece produce = 390
Planned operation time = 396*465
= 255*390/396*465 = 54.00%

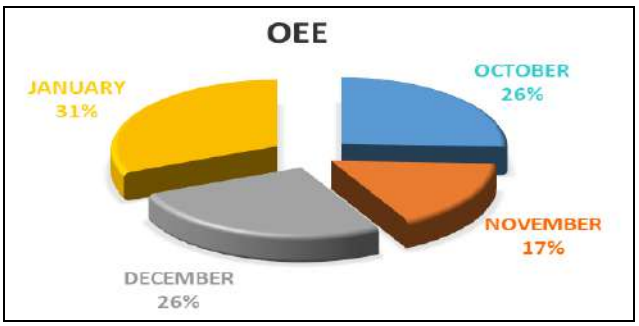
November
Performance = 255*330/428*465 = 42%

December
Performance= 255*360/377*465 = 52%

January
Performance=255*377/546*255=69%

OEE
OEE = Availability * Performance * Quality

October	81% × 91% × 54%	40%
November	80% × 77% × 42%	26%
December	82% × 95% × 52%	41%
January	82% × 86% × 69%	49%



6. Manpower utilization

$$Manpower\ utilization = \frac{Actual\ production\ output}{Target\ production\ output}$$

October
E1 department
Total no of product = 441product
Pending product on September = 34
Actual production output = 441-34 = 407
Target production output = 430
MPU = 407/430
= 95%

E2 department
Total no of product = 407
Pending product on September = 148
Actual production output = 407-148 = 259
MPU = 259/430
= 60%

E testing
Total no of product=395
Pending product on September =3
Actual production output=392
MPU = 392/430
= 90%

E finishing
Total no of product=390
Pending product on September =0
Actual production output=390
MPU = 390/430
= 91%

November
E1 department
Total no of product=399
Pending product on October =34
Actual production output=399-34=365
MPU =365/430
= 85%

E2 department
Total no of product=351
Pending product on October =12
Actual production output=351-12=339
MPU =339/430
= 79%

E-testing department
Total no of product=333

Pending product on October =5
Actual production output=328
MPU =328/430
= 76%

E finishing
Total no of product=330
Pending product on October =0
Actual production output=330
MPU =330/430
= 77%

December
E1 department
Total no of product=379
Pending product on November =48
Actual production output=331
MPU =331/380
= 88%

E2 department
Total no of product=375
Pending product on November =18
Actual production output=357
MPU =357/380
= 93%

E testing
Total no of product=365
Pending product on November =3
Actual production output=362
MPU=362/380
= 95%

E finishing
Total no of product=360
Pending product on November =0
Actual production output=360
MPU = 360/380
= 95%

January
E1 department
Total no of product=459
Pending product on December=4
Actual production output=454
MPU= 454/460
= 98%

E2 department
Total no of product=413
Pending product on December=10
Actual production output=403
MPU= 403/460
= 88%

ETesting department:
Total no of product=377
Pending product on December=5
Actual production output=372
MPU = 372/460
= 80%

E Finishing department
Total no of product=377
Pending product on December=0
Actual production output=377
MPU= 377/460 = 81%

7. Conclusion

The shortage component occur during respective month is given below and also how much days the components get shortage during their working days is listed below

October	
Total no of working days=**23**	
FLA body	7
Decompress shaft	4
Cover for HL	2
Flywheel	23
Dust cap	1
Fan shaft	16
Eye bolt	2
Balancer idle shaft	4
Circlip 70	2
Idle gear bush	7
Silencer flange	10
Governor spring	8
Radiator cover	6
Balance weight	6
GI pin	2
Fly nut	2
Head lamp cover	1
Fan driving pulley	1
Crank shaft	1

November	
Total no of working days=**25**	
Flywheel	**24**
Label ER90	1
Rocker arm shaft	1
Radiator cover	9
Balance weight	4
Starting shaft	5
Crank shaft	7
Rocker case	1

December	
Total no of working days=23	
Crankshaft	18
Flywheel	**19**
Radiator cover	1
Starting shaft	1
Nozzle holder flange	1

January	
Total no of working days=28	
Nozzle holder flange	7
Flywheel	20
FLA body	3
Rocker arm shaft	3
Starting shaft	4
Ss pin	3
Idle gear bush	3
Balancer idle shaft	2
Rocker arm shaft	1
Exhaust rocker arm	1

From this analyzing of the shortage product during each respective month , it found that Flywheel is the most time shortage occur in each month and it is the highest no of times that occur compared to other shortage products , and these component is responsible for the decreasing the efficiency of man power utilization as well as the overall equipment effectiveness. So if the availability of the flywheel is sufficient enough then the production capacity will increase this can be achieved by ordering this component near to the plant location so we may able to reduce the shortage of the product and also improving the production line efficiency of the firm according to the survey report conducted it found that 85% of the employees are satisfied with their rules and their time scheduling

8. Acknowledgement

We would like to express our gratitude to faculty as well as our guide in kamco, Kalamassery department for their collaboration and support

9. References

1. https://yourbusiness.azcentral.com/manpower-utilization-28368.html".
2. http://www.businessmanagementideas.com/staffing/steps-involved-in-manpower-planning-staffing-management/13188.
3. Siva Kumar, Subramaniam, Siti Huzaimah binti Husin, Yusmarnita binti Yusop, Abdul Hamid bin Hamidon. "The production performance monitoring system".
4. https://www.ats-global.com/storage/downloads/ATS%20Whitepaper%20OEE%20-%20GB.pdf