



BENG MANUFACTURING SYSTEMS

Lecturers: Andrew Thorn and Kelvin Lake

Module Code: M6X00417

Major Project:

Dissertation Questions – VIVA Replacement

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Executive Summary

This paper is a replacement for a VIVA presentation following the submission of my final project which could not be completed due to the Covid-19 pandemic. The paper covers questions relating to project after assessment from Andrew Thorn and Kelvin Lake.

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Question 1

As you say, simply plotting downtime per day (as you have done in Fig. 7), could be misleading if the downtime is caused by start-up and the machines run continuously throughout certain days. What would you think may have been a better way to display and analyse this data?

Question 1 Response (Maximum 200 words)

To improve clarity, displaying specific downtime solely from Monday start-up after the weekend stoppage could provide more accurate representation when start-up related downtime is the focus. Furthermore, a specified period of downtime could have been established in order to recognise what signals a “start-up” of production. This would allow data from other days to be highlighted when breakdowns have prevented the line from operating for longer periods, effectively a breakdown could result in creating a start-up in the middle of a shift, midweek. This downtime specific period could then be compared to the total downtime experienced in order to create a highlighted difference between the two which could be analysed further, i.e similar to the logic behind the Ford Constraint Process.

Using the Ford Constraint Process, removing all downtime losses would give a more useful insight of performance or losses. As focusing time lost to start up, this logic could be reversed by ignoring performance losses.

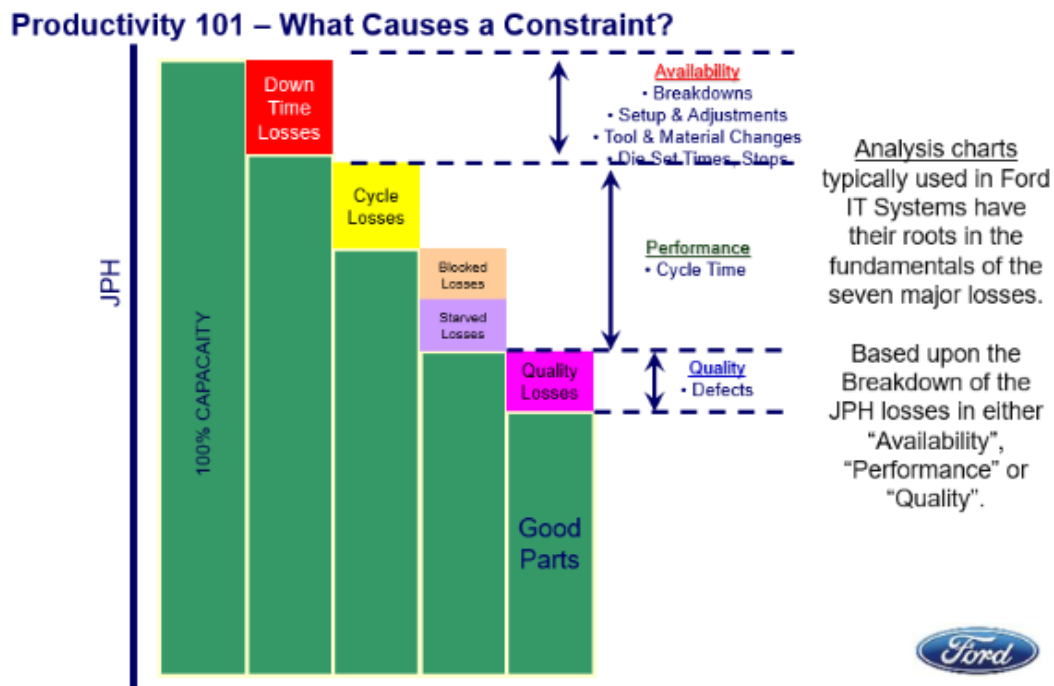


Figure 1 - Ford Constraint Process

Question 2

You have calculated the operator labour cost needed to run a skeleton crew, what other costs would the company see?

Question 2 Response (Maximum 200 words)

When operating a skeleton crew, further costs would include:

- Utilities – The plant would experience higher usage of electricity, fuel for hot test, pneumatics for assembly processes and an inhouse requirement of at least one food supply facility such as a canteen requiring opening and kettles/hot-water spouts)
- Supporting staff – Due to running production, estate services would require coverage. They monitor the plants facilities and supplies, boiler house operation, air driers for pneumatic supply and any maintenance requirement on the waste management systems in place. Canteen staff would be required, as would logistics staff for supplying the line with parts. When the line is operating, it is at risk of part failure on the machines, therefore there is a requirement for tinsmith cover.
- Increased staff numbers for logistics and store coverage to keep the line supply sufficient and flowing.
- Increased part requirement for builds therefore further costs for parts.
- Potential for increased maintenance costs due to increased operational hours and further wear on the line i.e. Tool breakages
- Potential costs of breakdowns during shift if operating production cycles
- Start-up losses i.e. ramp up, quality checks, calibration, and torque checks
- Reduced cycle times, machines running slower, not broke-down but reduced performance metrics

Question 3

Based on the data in Table 22 discuss what issues could have caused low OEE values

Question 3 Response (Maximum 200 words)

The largest average contributor to low OEE values in Table 22 is the Quality metric. Considering this, and the low FTT % of OP400 specifically with the rework created from this process alone, would have a substantial impact. Repair loops in the production line are common, they can often fill due to the unavailability of the operator responsible for identifying a rework issue and address promptly, thus creating more rework and waste which could have been reduced if reaction times were quicker. To confirm this, data could be collected from repair loop's including what work was carried out to complete the rework.

The performance metric average is above 100% some weeks, but inconsistencies in latter weeks indicates room for improvement on reliability. Optimising planned maintenance and increased standardisation to reduce low performance issues and utilising condition-based maintenance to prevent them entirely would look to provide reliability and consistency in this area. along with reducing/increasing cycle times of OP's for all to fall in line and reduce blocked and starved situations.

Availability (96.55%) was damaged by the final week reading anomaly of 72.05%. Without this, the average score would have been 98.3%. Planned maintenance would provide reliability for machine availability too.

Question 4

What additional data could you have collected to help analyse the problem better and how would it have been beneficial to your project?

Question 4 Response (Maximum 200 words)

Data could have been collected from other production lines, both locally and nationally for comparison. This would have indicated any similar issues of which may have been addressed successfully. Possibility to collect similar data from assembly lines of a similar age and condition, modern lines with new machines and technological advancements would realistically operate at a higher consistency in this specific environment, therefore comparable data would not be completely accurate.

Instead of data being collected at the 'Buy-Off' to assess the lines starting time for production, data could have been collected from each individual OP. This would highlight possibilities to target the weakest OP's starting up, the biggest contributors to setting up the line for the first production run of the day and manual data would need to be supplemented in on the OP's where automatic POSMON data is not available. Data from each OP would also highlight the specific reason for the downtime and the frequency at which each issue is hurting the line. All of this data could be boxplot initially to see potential high hurters.

Question 5

Based on the findings of your project are there any changes needed to current maintenance strategies and if so why?

Question 5 Response (Maximum 200 words)

Weekend maintenance cover would provide continuous cover and an opportunity to address larger maintenance requirements without affecting production. The potential for a separate maintenance team specifically aimed at targeting scheduled maintenance tasks allowing on shift maintenance to focus on reactive maintenance activities such as breakdowns and the production of any nonconformity.

Due to the utility of labour around the site as numbers reduce approaching closure, autonomous maintenance (second pillar of TPM) would involve increasing the skill levels of maintenance personnel so that they can better understand, manage and improve the machine capability and production process. Eventually, the goal would be to change their reactive maintenance approach to a more proactive way of working on the SIGMA line.

The level of quality maintenance could be improved, accurate recording of what fails and how often, could aid organising maintenance priorities on more critical areas. It would highlight the more common machining defects and instigate potential improvement drives to reduce and correct those issues.