

Benchmarking Report

- (1) “Factory flow benchmarking report” – Please see enclosed report
- (2) The report:

The enclosed report is part of a 68-page publication called the “Factory Flow benchmarking report” prepared by the Lean Aircraft Initiative at the Massachusetts Institute of Technology, as part of the “Lean Aircraft Initiative report series”. The Lean Aircraft Initiative benchmarked representative part fabrications and some assembly operations within its member companies of the defense aircraft industry. This benchmarking report was chosen for addressing here because of a distinctive feature in the benchmarking methodology. A unique efficiency metric has been proposed and used in the methodology called the “flow efficiency”. Flow efficiency has been defined, in this report, as the ratio of the fabrication time to the cycle time. In addition, this report explores the major components of the cycle time: fabrication time, lot process delay, storage delay, and transportation delay. The report concludes that the major portion of the cycle time in this industry is storage delay and points out the opportunity to improve cycle time drastically by reducing the amount of storage delay being experienced in the fabrication of products.

Benchmarking objectives:

The goals of this effort were to achieve greater affordability of systems, increase efficiency, attain higher quality, enhance technological superiority and build a stronger U. S. defense aircraft industrial base. The product cycle is the time it takes to produce a product. The product cycle time has two parts – the development cycle time and the production cycle time. This benchmarking report focuses primarily on the production cycle time and the competitiveness of a company based on a low production cycle time. Effectively, the benchmarking process characterizes the flow of products in a fabrication process.

Type of benchmarking – Competitive benchmarking, as the comparison and analysis were made among competitors in the same industry

The procedure

Member companies were divided into three sectors - airframe, electronic and engine. The member companies determined the method of accomplishing this research and the data that could be collected. The members picked parts that were representative of the sector. Although information on part differences was collected, it was found that the average time spent on part fabrication or assembly time was less than 15 percent of the cycle time for all parts and less than 5 percent for most parts and hence had a very small impact on the benchmarking process. A questionnaire was developed to gather the data. There were 17 respondents to the questionnaire from all sectors. Initial data reduction indicated data inconsistencies that required an extensive data verification effort. Telephone interviews and on-site verification of data was used to resolve the data inconsistencies. Once a consistent set of data was obtained, an analysis was completed. In the questionnaire, several other areas were collected: router queuing time, process control methods, quality information, equipment uptime, worker training, operator inspection, employee suggestions, facility data and in the electronic sector time to create/modify work instructions.

What was benchmarked?

Three separate benchmarking efforts would be necessary. In each of the three efforts, the questionnaire was designed to obtain data on parts or assemblies that were similar (within the

sector) as agreed by the sector members. Therefore, each sector needed to choose the part/s that would be representative of the fabrication/assembly operations in their sector. The parts representative of each sector has been detailed in the enclosed report.

Data collected for benchmarking

The information gathered was very similar across all three sectors. It included

- Manufacturing data
- Engineering data
- Facilities and maintenance data
- Manpower data
- Quality data

For the specific data that was collected under each category, please refer to the enclosed report. The enclosed report contains the results of the Airframe sector, as an illustration. This sector involved a benchmarking among member companies including McDonnell Douglas, Lockheed Marietta and Boeing. The results include graphical plots which show the components of cycle time including waiting time, number of touch labor hours and router queuing time.

Difficulties in the benchmarking process

There were some problems encountered when the benchmarking process was done. This included many of the survey questions not being completed, either because the data was not available, or because there was a misunderstanding of the question. It can be concluded that the questionnaire method is not always accurate in a benchmarking process, because the questions and the responses can be subjective at times. Other difficulties included inaccurate estimates, unavailability of data conforming to the category specified, non-uniformity in quality data representation. For an entire list, please refer to the enclosed report.

Flow efficiency

As mentioned earlier, the term flow efficiency has been used and defined as the ratio between the fabrication time and the cycle time. One of the objectives from this benchmarking effort was to gain an understanding of the efficiency of the production system. This parameter is an excellent indicator of the same. Other equivalent definitions of the term have been made, and the flow efficiencies for the airframe sector have been plotted graphically for the three categories of parts that were benchmarked.

Conclusion

The competitive benchmarking process of firms in the defense aircraft industry has proposed the measurement of a new metric called “flow efficiency” across three different sectors. The main measurement method used was questionnaires. The results of the benchmark process and the problems encountered are detailed in the enclosed report.