

Development of a Standardized Time System in an Aerospace Manufacturing Company

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Summary: This study was conducted in the production area of a manufacturing company where, due to the lack of updated standard times, there is no system for calculating production capacity, resulting in uncertainty in planning, resource allocation, and demand fulfillment. Therefore, the objective was to develop a standardized time study system that would allow for the calculation of production capacity, timely resource allocation, and improved demand fulfillment. The methodology employed consisted of identifying the area under study, classifying product families, conducting time studies using stopwatches, and finally calculating production capacity based on required and available hours. The results allowed for the identification and standardization of process operations. With the acquisition of reliable standard times for each product family, a capacity calculation model based on hours was established, providing objective information for production planning and personnel allocation. It is concluded that the implementation of the system improves the reliability of decision-making, reduces dependence on empirical estimates, strengthens the management of productive capacity, and contributes to meeting demand, optimizing resources, and increasing operational efficiency in the area of connectors.

Keywords: Standardization, processes, and capacity.

Introduction

The term industry encompasses all economic activities dedicated to transforming resources into goods and services, adding value, generating employment, and fostering economic growth (Krugman, 1991). It comprises production systems that combine capital, labor, technology, and management to achieve operational efficiency and competitiveness (Chandler, 1990). Industry is classified into the service, commercial, and manufacturing sectors, with the latter standing out for transforming raw materials into finished products through standardized processes, innovation, and continuous improvement (Porter, 1985).

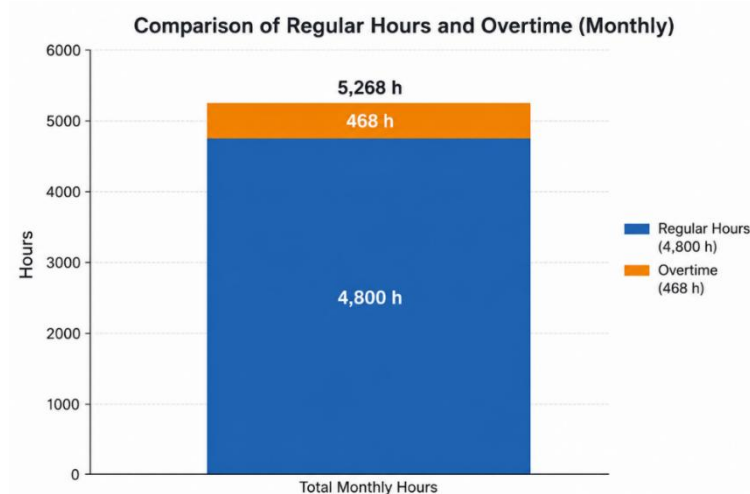
Within the manufacturing sector, the automotive, electronics, and aerospace industries stand out, characterized by their high technological specialization, integration into global supply chains, and high quality standards (Gereffi, 2001). The automotive industry is distinguished by lean production, process standardization, and waste reduction, factors that increase productivity and quality (Womack et al., 1992). Meanwhile, the aerospace industry requires strict quality controls, high precision, and regulatory compliance, with technological innovation being an essential element for its competitiveness (Casalet, 2010).

Globally, the aerospace industry is one of the highest value-added manufacturing sectors, with sales approaching \$995 billion in 2024, driven by investment in research, automation, and advanced materials (Association, 2024). In Mexico, this sector is strategic due to its integration into global supply chains and foreign investment, with its main operations concentrated in Baja California, Sonora, Chihuahua, Nuevo León, and Querétaro. Sonora, in particular, has established itself as a major aerospace manufacturing hub, hosting international companies dedicated to the production of components, propulsion systems, heat treatments, and aerostructures (Sonora Global, 2025).

The company under study is part of this ecosystem, specializing in the design and manufacture of electrical interconnection solutions for the aerospace industry. Its plant in Sonora produces connectors, coaxial cables, fiber optic systems, and antennas, adhering to strict international quality and traceability standards. The study focuses specifically on one of its production areas, which employs 25 workers and currently experiences frequent overtime use (see Figure 1).

According to Figure 1, approximately 4,800 regular work hours are generated per month. However, to meet production demand, an average of 468 overtime hours per month are required. Despite this additional effort, the demand fulfillment rate remains around 86%, indicating a greater risk of non-compliance in the event of significant variations in production volumes.

Figure 1: Record of regular hours and overtime



In addition to the above, the company lacks a defined production capacity in terms of available hours, as performance evaluation is based solely on the number of pieces produced. This situation limits the accuracy of production planning and control, as there is no indicator to relate demand to the resources and time actually required to meet it. In this context, the following research question arises: *What time system will allow the company under study to calculate its production capacity in hours to meet demand on time?*

Therefore, the objective was set to: Develop a standardized time system that allows the production area of the company under study to calculate production capacity, allocate resources in a timely manner, and meet demand.

Materials and Methods

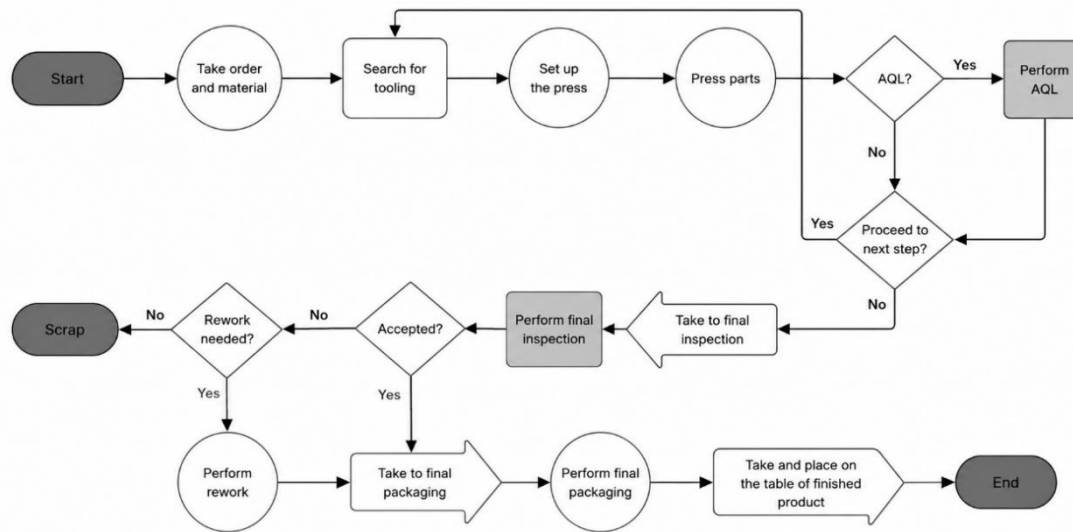
The study was conducted in the connector production area of an aerospace company, where six product families are manufactured: J, Q, K, N, L, and O. The research followed a quantitative approach based on work study and time measurement techniques proposed by Niebel and Freivalds (2009), Barnes (1997), and Maynard (2001). Data collection instruments included observation sheets, a stopwatch for recording operation times, and Google Sheets for data processing and analysis.

The methodological procedure comprised five stages: (1) recognition of the production process and identification of the area's operations using operation diagrams; (2) classification of part numbers into six product families with similar manufacturing characteristics; (3) time study using continuous timing in multiple cycles of each operation; (4) updating of standard times based on the observed average time, operator performance evaluation using the Westinghouse system, and application of allowances for fatigue, personal needs, and unavoidable delays, in accordance with the recommendations of the International Labour Organization (ILO); and (5) determination of production capacity in hours by relating demand, standard time, and available time, which allowed for comparison of installed capacity with the workload required for each product family and identification of deviations in production planning.

Results and Their Discussion

The analysis of the connector area allowed for the identification of the sequence of operations, inspections, and transports that make up the production process, establishing a basis for measuring and standardizing activities. The products were classified into families according to their manufacturing characteristics and sequence of operations (see Figure 2), facilitating time studies and information organization.

Figure 2. Operations diagram of the production area under study



Time studies were conducted to obtain records of the cyclical and periodic operations for each product family. Subsequently, the observed times were adjusted by evaluating operator performance using the Westinghouse system and applying allowances recommended by the International Labour Organization (ILO), allowing the calculation of representative standard times for each product family (see Table 1).

Table 1: Standard Time calculated per family

Family	Time (hours)	TN	TSTD	Family	Time (hours)	TN	TSTD
A	2.15	2.45	3.22	K	226.66	258.39	339.99
B	NA	NA	NA	L	50.66	57.75	75.99
C	7.34	8.36	11.01	LL	23.60	26.90	35.40
D	17.73	20.21	26.59	M	95.92	109.34	143.88
E	6.78	7.72	10.17	N	259.95	296.34	389.92
F	99.54	113.47	149.31	Ñ	179.36	204.47	269.04
G	1.28	1.45	1.92	O	44.71	50.96	67.06
H	8.14	9.27	12.21	P	197.79	225.48	296.68
I	154.04	175.60	231.06	Q			
J	180.33	205.57	270.49				

The standard times obtained for each product family allowed for the establishment of a quantitative benchmark for operational performance within the connector area. Integrating the normal times and corresponding allowances facilitated the determination of more representative values for each product family, providing a technical basis for analyzing production capacity by determining the required hours (see Table 2).

Table 2: Number of hours required based on demand

Family	Demand	%	Hours Required	Family	Demand	%	Hours Required
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A	562	0.46%	2.15	K	15,626	12.86%	226.66
B	59	0.05%	0.00	L	2,878	2.37%	50.66
C	362	0.30%	7.34	LL	3,599	2.96%	23.60
D	939	0.77%	17.73	M	2,110	1.74%	95.92
E	595	0.49%	6.78	N	21,356	17.58%	259.95
F	7,100	5.84%	99.54	Ñ	10,012	8.24%	179.36
G	246	0.20%	1.28	O	3,257	2.68%	44.71
H	951	0.78%	8.14	P	23,806	19.60%	197.79
I	8,454	6.96%	154.04	Q	5,446	4.48%	51.11
J	14,126	11.63%	180.33				

Based on this information, it is possible to identify the overall workload pattern in the area, as well as its impact on the use of available time. This analysis contributes to a better understanding of the distribution of production activities, facilitating decision-making aimed at improving efficiency and resource utilization. Finally, by integrating demand with standard times, it was possible to calculate the hours required per product family and compare them with the area's available capacity. This analysis allowed for quantifying the workload, identifying the product families with the highest production hour consumption, and developing a Playbook that links each part number to its operations, standard times, and required hours, providing a tool for capacity planning, resource allocation, and meeting demand (see Figure 3).

Figure 3: Playbook

Family	Demand	Demand (%)	Time (sec)	Operations
J	200	0.16%	13.9	Install insulator (13.9)
Q	9	0.01%	27	Install insulator (18.7) Preparation (8.8)
K	200	0.16%	29	Perform subassembly (11.3) Preparation (17.7)
N	5,000	4.11%	25.1	Install contact (13.1) Pneumatic winding (12)
L	49	0.04%	26	Install insulator (13.4) Pneumatic winding (12.6)
O	225	0.19%	26	Install insulator (10.2) Pneumatic winding (15.8)

The records obtained allowed for the integration of operational information for each part number in families J, Q, K, N, L, and O, making it possible to integrate demand, percentage of participation, and the times required for manufacturing operations. It was observed that the families exhibit differences in both the sequence of operations and the duration of activities, indicating varying levels of process complexity.

Although some products require similar operation times (between 25 and 29 seconds), the workload in hours depends primarily on the volume of demand. For example, one particular product family with a demand of 5,000 pieces (4.11%) accounts for 34.86 hours of work, representing one of the highest workloads in the analyzed set. In contrast, another product family, with a demand of only 9 pieces, requires only 0.07 hours.

These results show that integrating standard times with demand using Playbook is an effective tool for estimating workload, planning production capacity, and allocating resources according to actual production needs, facilitating manufacturing scheduling and decision-making.

Conclusions and Recommendations

The study enabled the development of a standardized time system to calculate the production capacity of the connectors area, transforming the demand for parts into the hours required for production. Updating the standard times and classifying the product families provided a more accurate estimate of workload and operational performance. Furthermore, integrating the information into the Playbook facilitated the organization of operations, times, and demand by part number, strengthening production planning and resource allocation. Overall, the results provide an objective basis for evaluating production capacity, optimizing resource utilization, and improving decision-making aimed at meeting demand on time.

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