DECISION ELEMENTS IN THE DESIGN OF A CONSUMER ELECTRONICS ASSEMBLY PLANT

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Abstract

This thesis is the result of a six-month internship at Celestica, Inc, an electronics contract manufacturer. The internship period covered the entire design and construction process for a new personal computer final assembly plant.

The main purpose of this thesis is to document the process that was followed at Celestica. Factors affecting the major decisions that were made will be discussed, as well as how they are affected by the product and the manufacturing process, and their effect on the design of the factory.

The design process at Celestica consisted of six steps: Benchmarking and research, design concept development, design guideline development, detailed design process, material and personnel requirements development, and procedure definition. This design process enabled the use of a cross-functional team to make decisions on factors which affected different functions of the plant, and provide guidance that allowed individual team members to work on design elements that would be compatible with the rest of the design. The key to this design method was the development of design guidelines, within which team members could work individually.

One of the primary decisions the team made was that the assembly process would be done in parallel. This decision was based on the variation of the process, dependencies between process steps, the length of the process, expected workforce skills and training, required assembly equipment, demand variability and individual product demand volume.

A kitting system was designed to present material to assembly. This was based on the security requirements and risk of component part obsolescence, and the reduced inventory costs, increased process control, and high degree of product flexibility that the kitting system provided.

Finally, the plant layout and personnel requirements were designed to balance the flow of material, not capacity. The assembly process was the desired system constraint. Other steps in the overall process provided capacity and inventory buffers that ensure the assembly process wouldn't be blocked or starved. The throughput of the plant is aligned as closely as possible to the theoretical capacity of the assembly bottleneck.

This design process led to a factory that is flexible enough to adapt to rapidly changing demand and product mix, while keeping costs at a minimum. Further research in the design of capacity and inventory buffers is recommended to enable future plant design efforts to more easily identify optimal design characteristics.

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