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Operations Analytics

Tutorial #1

Processes

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Exercise 1: Instant Dolls Co.

Instant Dolls specializes in manufacturing dolls. Their business process consists on the following activities, which must be conducted in the sequence described below¹:

Activity 1: Get the specifications of the doll from the customer, get the payment and submit the order to the production line. (8 minutes)

Activity 2: Assemble the main body of the doll (10 minutes)

Activity 3: Add hair and paint. (12 minutes)

Activity 4: Dress the doll (7 minutes)

Activity 5: Package the doll (3 minutes)

The whole process is conducted by three workers (W). The assignment of tasks to workers is the following: W1 does Activity 1; W2 does Activities 2 and 3; W3 does Activities 4 and 5.

1a) What is the bottleneck of the process?

1b) How much time will it take to produce 250 units? (assume that the process starts with an empty production line)

1c) What is the utilization of Worker 3?

1d) What is the average labor utilization of the workers? Assume the process operates at its capacity and there are no empty system effects.

1e) To increase the production rate, Instant Dolls is considering to hire a new worker to help any of the workers without changing the tasks performed by each worker. Where would you assign the new employee?

¹The time required for each activity is shown in parenthesis.

Exercise 2: Improving operations at the Sugar plant

After a hectic but fun year at TCD, you ditched a career in consulting to become the MD of the Sugar plant. You are looking forward to apply your extensive knowledge of Operations principles to this plant.

On your first visit to the sugar producing facility, you learn the following. Sugar production has basically three steps: Purification of Molasses, followed by Superheating of the purified molasses, and finally Crystallization. The facility has three extremely reliable continuous processing machines for the three process steps. To ensure the freshness of sugar, at no point in the process, can one build work in process inventories. The performance of the individual processing machines is described below.

Step 1, Purification: Capacity: 100 Tons/hour (T/hr); Yield: 90% (in other words, if 100 Tons of input are introduced in the machine, only 90 tons are available for the next step)

Step 2, Superheating: Capacity: 80 Tons/hour; Yield: 80%

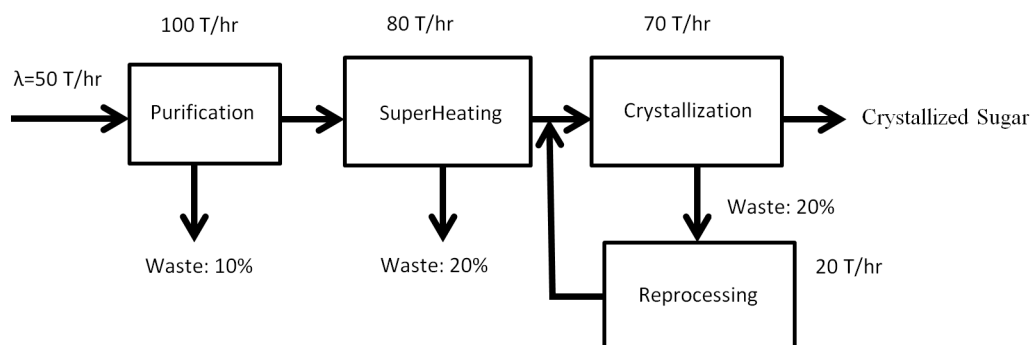
Step 3, Crystallization: Capacity: 70 Tons/hour; Yield: 80%

2a.i) Draw the process flow diagram assuming 50 T/hr of molasses are introduced into the Purification stage.

2a.ii) What would be the utilization of each of the stages? What stage is the bottleneck? What is the capacity of this plant (in Tons of crystallized sugar per hour)? What is the input required at the Purification stage to reach plant's capacity?

2b) After analyzing the plant, you feel a little frustrated by the high yield losses. You contact Tommy Tierman, a TCD Alum who is now the leading process improvement consultant for the sugar industry. He mentions a new technology available that can re-process the losses from the Crystallization stage. This could improve the efficiency of the plant, increasing its total capacity.

Assume we take the losses from the crystallization stage and convert them to superheated liquid, which must be again re-introduced into the crystallization stage. We introduce a "Re-processing machine" with a capacity of 20 T/Hr. The process flow diagram is illustrated below.



What would be the utilization of each of the stages? What stage is the bottleneck here? What is the new capacity of the plant? What is the input required at the Purification stage to reach plant's capacity?