

Capstone Proposal

Three years ago, I worked as an industrial engineer in a manufacturing company in Puerto Rico. Part of my job consisted of assessing production lines, performing time studies, and identifying improvement opportunities. The company constantly faced problems completing their daily manufacturing goals. One of the main reasons for this problem was the availability of fixtures. A fixture is a piece of equipment installed on both sides of the unit. It has two functions: dock the unit inside the machines and protect the unit from getting contaminated. The units always need to have a fixture attached, and the type of fixture varies between stations. Figure 2 shows a diagram for the production line.

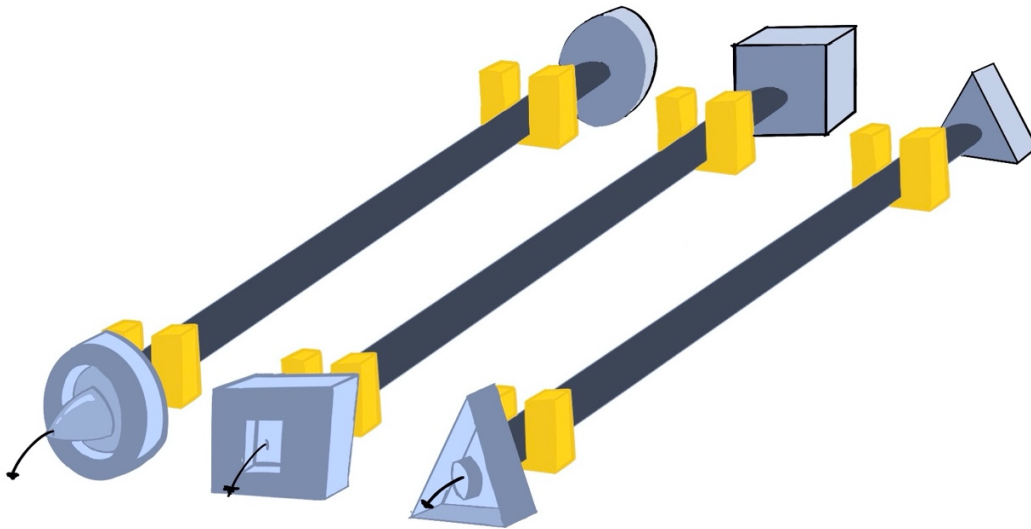


Figure 1: Fixture (light gray) illustration

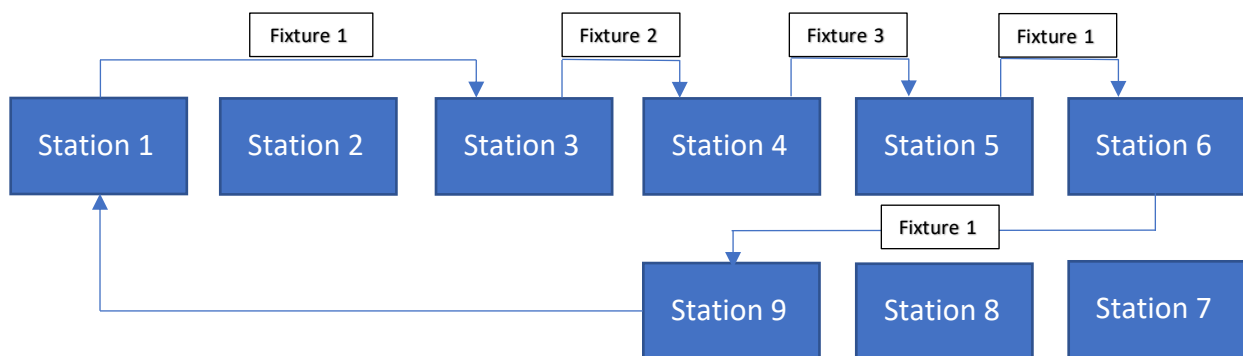


Figure 2: Process flow chart of the production line

The production line experienced some process flow problems, and one of those problems is the station's downtime. Downtimes occur because system recalibrations (due to quality failures) or reboots (caused by the system crashes). Downtimes constantly affect fixtures' availability for the next station, causing the entire production lines to stop. The team is trying to find an optimal number of backup fixtures to decrease the number of downtimes caused by the lack of available backup fixtures.

The “production_time_study_data”, “downtime_freq” and “downtime_time” raw data in excel format will be used for this study. The “production_time_study_data” contain the 52 stations of the manufacturing area, the task of each station, classification of manual or machine time, the identification number of the production line and 100 cycle times samples.

area_py	task_number	manual_time	machine_time	production_line	Sample #1	Sample #100
station 1	task 1	1	2	1	115.00	123.00
station 1	task 2	1	0	1	167.00	163.00
station 1	task 3	0	2	1	110.00	106.00
station 1	task 4	1	0	1	45.00	48.00
station 1	task 5	1	0	1	44.00	46.00
station 2	task 6	1	2	1	23.00	26.00
station 2	task 7	1	2	1	24.00	24.00
station 2	task 8	0	2	1	25.00	22.00
station 2	task 9	1	0	1	10.00	8.00

The “downtime_freq” raw data contain the quantity of downtime occurred per month for the past 24 months of each station.

station	month 1	month 2	month 3	month 4	month 5	month 24
station 1	8	10	8	8	7	6
station 2	5	8	8	7	10	10
station 3	5	5	6	6	6	4
station 4	5	5	7	6	8	6
station 5	5	6	5	8	7	8
station 6	11	8	12	13	10	12
station 7	4	12	6	4	6	6
station 8	6	5	14	11	7	10
station 9	9	9	11	7	12	7
station 10	5	6	7	9	7	7

The “downtime_time” raw data contain 100 cycle time of downtimes of each station.

station	sample 1	sample 2	sample 3	sample 4	sample 5	sample 100
station 1	2942	2671	2625	1364	2949	2701
station 2	605	1113	559	1037	404	728
station 3	717	1319	592	1718	1195	1568
station 4	1014	1705	1322	1013	1789	1035
station 5	1743	1419	1849	1248	2133	1392
station 6	1584	1524	3097	823	1177	733
station 7	1240	1713	1854	1793	1164	1303
station 8	2290	1072	2173	1344	865	2316
station 9	877	751	1553	1166	2041	2676
station 10	2193	2443	1071	865	2560	1578