

I4 – Identity Card Printing Process Improvement

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Background

- HID Global is a worldwide manufacturer of secure identity solutions such as photo ID badges, contactless / contact smart card readers and card printers.
- HID Global has designed specific printing card machines in which they mainly use to produce their products.
- The Card Provisioning Machine is the main machine of focus, it requires a large amount of capitol to keep up and running as well as the labor demand for the machine is extremely high causing a spike in overtime hours and shifts.
- In finding an optimal number of Card Provisioning Machine, this would help HID Global to more effectively meet demand while minimizing unorganized labor shifts.



Objective

- The capstone team was to recommend an amount of machines to be purchased within the card programming department so that overtime hours and labor costs are reduced.
- In doing so, the team was to create a discrete capacity-based scheduling methodology to produce a more effective way in estimate how the department's processes and people can meet customer demand.
- With the optimal number of machines to implement, the capstone team will make layout revision recommendations.



Problem Statement

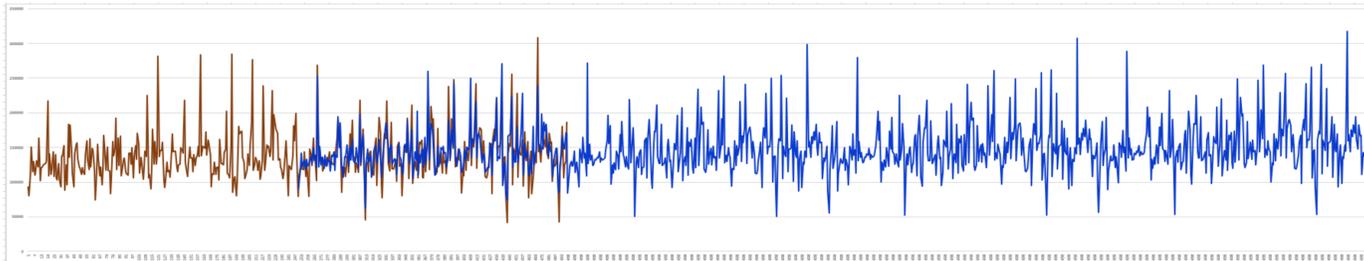
- HID runs a surplus of overtime throughout the Card Provisioning Area and due to a lack of planning, more specifically, they cannot forecast the labor requirements given the variation in demand
- HID Global is acquiring further knowledge on the utilization and the optimization of the Card Provisioning Machine process in order to reduce the number of shifts

Defining the Data

- Using data HID Global has collected over the last 2 years, we were able to filter through over 90,000 data points to find production data specific to the card programming machines in Austin
- After filtering, we were able to compile individual orders into a complete sum of that day giving us the demand for that day

Data Collection

Production Forecast 2018 - 2021

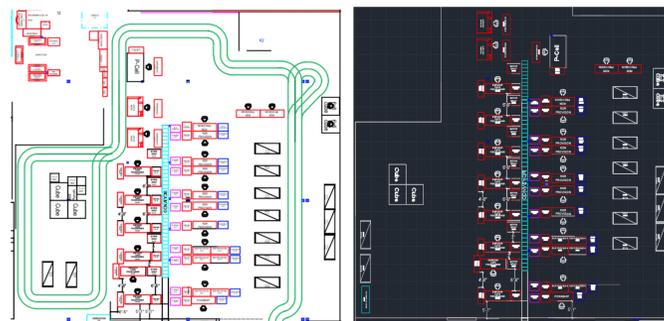


- Using Holt-Winters method, we were able to come up with a 2019 forecast
- By minimizing the error between 2018 and the forecasted 2019, we were able to make the forecast more accurate
- We noticed a 3.1% increase between each year
- To forecast 2020 and further years, we shifted the 2019 forecast up 3.1% each year
- This allows us to have a relatively accurate forecast to the trend while still capturing the peaks that are necessary for an accurate assessment

Methodology

Facility Layout Revisions

- Data collected from the forecasted demand as well as the linear programming problem produce an optimal amount of 8 Emperor machines.
- HID's card programming printing department currently has 6 machines.
- To more effectively manage labor, 2 additional Emperor machines should be added.
- Given the limited space constraint, we have multiple recommendations for implementing 2 machines.



• HID Current Programming Dept. Layout • Revised Card Programming Dept. Layout

Discrete Capacity-based tool

- The objective function of our tool is to minimize labor and investment costs to find an optimal number of machines to implement within the department.
- The factors taken into consideration when developing the methodology application were as follows:
 - Salary management costs
 - Hourly labor costs and fixed costs
 - Emperor machine start-up costs
 - Forecasted hourly demand

Overtime Optimization Application

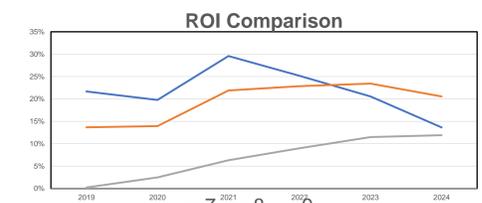
Day	Demand	Start 1	Shift 1	Level 1	Level 2	Sum Hours	Min Cost	Max Cost	OT Cost	Level Number	Level OT	Peak Total	Fixed Cost	Wait	Conveyor	Grand Total
1	100	1	1	1	1	100	100	100	0	1	0	100	0	0	0	100
2	150	1	1	1	1	150	150	150	0	1	0	150	0	0	0	150
3	200	1	1	1	1	200	200	200	0	1	0	200	0	0	0	200
4	250	1	1	1	1	250	250	250	0	1	0	250	0	0	0	250
5	300	1	1	1	1	300	300	300	0	1	0	300	0	0	0	300
6	350	1	1	1	1	350	350	350	0	1	0	350	0	0	0	350
7	400	1	1	1	1	400	400	400	0	1	0	400	0	0	0	400
8	450	1	1	1	1	450	450	450	0	1	0	450	0	0	0	450
9	500	1	1	1	1	500	500	500	0	1	0	500	0	0	0	500
10	550	1	1	1	1	550	550	550	0	1	0	550	0	0	0	550
11	600	1	1	1	1	600	600	600	0	1	0	600	0	0	0	600
12	650	1	1	1	1	650	650	650	0	1	0	650	0	0	0	650
13	700	1	1	1	1	700	700	700	0	1	0	700	0	0	0	700
14	750	1	1	1	1	750	750	750	0	1	0	750	0	0	0	750
15	800	1	1	1	1	800	800	800	0	1	0	800	0	0	0	800
16	850	1	1	1	1	850	850	850	0	1	0	850	0	0	0	850
17	900	1	1	1	1	900	900	900	0	1	0	900	0	0	0	900
18	950	1	1	1	1	950	950	950	0	1	0	950	0	0	0	950
19	1000	1	1	1	1	1000	1000	1000	0	1	0	1000	0	0	0	1000
20	1050	1	1	1	1	1050	1050	1050	0	1	0	1050	0	0	0	1050
21	1100	1	1	1	1	1100	1100	1100	0	1	0	1100	0	0	0	1100
22	1150	1	1	1	1	1150	1150	1150	0	1	0	1150	0	0	0	1150
23	1200	1	1	1	1	1200	1200	1200	0	1	0	1200	0	0	0	1200
24	1250	1	1	1	1	1250	1250	1250	0	1	0	1250	0	0	0	1250
25	1300	1	1	1	1	1300	1300	1300	0	1	0	1300	0	0	0	1300
26	1350	1	1	1	1	1350	1350	1350	0	1	0	1350	0	0	0	1350
27	1400	1	1	1	1	1400	1400	1400	0	1	0	1400	0	0	0	1400
28	1450	1	1	1	1	1450	1450	1450	0	1	0	1450	0	0	0	1450
29	1500	1	1	1	1	1500	1500	1500	0	1	0	1500	0	0	0	1500
30	1550	1	1	1	1	1550	1550	1550	0	1	0	1550	0	0	0	1550
31	1600	1	1	1	1	1600	1600	1600	0	1	0	1600	0	0	0	1600
32	1650	1	1	1	1	1650	1650	1650	0	1	0	1650	0	0	0	1650
33	1700	1	1	1	1	1700	1700	1700	0	1	0	1700	0	0	0	1700
34	1750	1	1	1	1	1750	1750	1750	0	1	0	1750	0	0	0	1750
35	1800	1	1	1	1	1800	1800	1800	0	1	0	1800	0	0	0	1800
36	1850	1	1	1	1	1850	1850	1850	0	1	0	1850	0	0	0	1850
37	1900	1	1	1	1	1900	1900	1900	0	1	0	1900	0	0	0	1900
38	1950	1	1	1	1	1950	1950	1950	0	1	0	1950	0	0	0	1950
39	2000	1	1	1	1	2000	2000	2000	0	1	0	2000	0	0	0	2000
40	2050	1	1	1	1	2050	2050	2050	0	1	0	2050	0	0	0	2050
41	2100	1	1	1	1	2100	2100	2100	0	1	0	2100	0	0	0	2100
42	2150	1	1	1	1	2150	2150	2150	0	1	0	2150	0	0	0	2150
43	2200	1	1	1	1	2200	2200	2200	0	1	0	2200	0	0	0	2200
44	2250	1	1	1	1	2250	2250	2250	0	1	0	2250	0	0	0	2250
45	2300	1	1	1	1	2300	2300	2300	0	1	0	2300	0	0	0	2300
46	2350	1	1	1	1	2350	2350	2350	0	1	0	2350	0	0	0	2350
47	2400	1	1	1	1	2400	2400	2400	0	1	0	2400	0	0	0	2400
48	2450	1	1	1	1	2450	2450	2450	0	1	0	2450	0	0	0	2450
49	2500	1	1	1	1	2500	2500	2500	0	1	0	2500	0	0	0	2500
50	2550	1	1	1	1	2550	2550	2550	0	1	0	2550	0	0	0	2550

Schedule

Task	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16
Statement of Work	Jan 20th - 26th	Jan 27th - 2nd	Feb 3rd - 9th	Feb 10th - 16th	Feb 17 - 23rd	Feb 24th - 2nd	Mar 3rd - 9th	Mar 10th - 16nd	Mar 17th - 23rd	Mar 24th - 30th	Mar 31st - 6th	Apr 7th - 13th	Apr 14th - 20th	Apr 21st - 27th	Apr 28th - 4th	May 5th - 11th
SOW		Capstone Team														
SOW Approval					Colton											
Data Collection						Capstone Team										
Spring Break																
Data Analysis																
Determine Formulation Constants								Colton & Haylie								
Compile LP Programming Problem								Colton & Haylie								
Facility Planning																
AutoCAD										Chris & Matt						
Recommendation																
Return On Investment Analysis											Capstone Team					
Poster Construction												Capstone Team				
Final Report													Capstone Team			
Presentation																Capstone Team

Results

- The Graph below represents the ROI for the implementation of additional Card Provisioning Machine.
- At approximately half way through the 2022 production year, the ROI for the 2022 production year becomes the most profitable solution
- The implementation of the two machines will also improve the capable of absorbing the peaks of demand HID experiences through the year.
- In addition to 6 currently printers, the capstone team recommends the purchase to two additional printer machines for the 2020 production
- Not for the sake that the ROI for two machines is greatest initially but for the reason the ROI for two machines will begin to grow in time, while the ROI for one machine will begin to decrease



Conclusion and Recommendations

- In Conclusion the Capstone Team recommend the purchase of 2 Printer Machines for the 2020 Year
- With the current demand, we can confidently say that HID's Card Production is growing at a 3% rate each year.
- With the forecasted growth, and the addition of two machines, HID will be able to produce more cards with less overtime accumulated.

Purchase of 2 Printing Machines

- Provides the capability to fulfill orders at peak demand points
- Improve Production by reducing overtime to 65%
- \$88,575 in Yearly Savings

Acknowledgements

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Affiliations
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