Littlefield Game 2 Strategy

ISyE 3232: Stochastic Manufacturing & Service Systems

Team #7: Mike Wiggins, Ford Croft, Drew Wright

Final Rank: 1st
Final Cash Balance: $2,965,869.

The first thing we noticed upon starting the game was that utilizations at Station 1 and Station 3 were way too high. We decided our first move should be to buy a machine at one of those stations. Due to the amount of cash we had on hand, we knew we would have to choose one or the other. We also noticed that the reorder quantity was quite high and was tying up too much money with every order. Although this reorder quantity did result in a lower cost per unit because we weren't paying the fixed ordering cost very often, we decided to lower it to free up some cash to buy a machine. We knew we could always raise the reorder quantity later once our utilizations came down or if we started having more orders.

Day 66: We changed the reorder quantity to 3000 parts to free up enough cash to purchase another machine at Station 1. We still had to wait a few days to purchase another machine because we had just placed an order of parts.

Day 70: Utilization at Station 1 had flatlined at 1 so we purchased another machine there to eliminate a bottleneck and bring down lead times. We also changed lot sizes to 2 lots of 30 to facilitate a better flow through the system.

Day 81: After purchasing another machine at Station 1 and splitting up the lot size, our utilization at Station 1 seemed to be averaging around .75 and our lead times had dropped to .7 days. To capitalize on this improvement we went ahead and changed to Contract 2 so we would be getting the extra $250 per lot and hopefully save up enough money for another machine at Station 3 faster. We definitely needed another machine at Station 3 as soon as possible because utilization was still at 1, indicating that it was a bottleneck.

At this point we decided that our long term strategy should be to buy another machine at either Station 3 or Station 1, then change our contracts to 3, and lastly up our reorder quantity so we aren't losing the $1000 fixed ordering cost every time we placed an order. We decided we should buy another machine at Station 3 because the current inflated job arrivals were probably effecting Station 1 the most. So although

utilization at Station 1 and 3 were quite high, we determined that the utilization at Station 1 was artificially/temporarily inflated making it a bottleneck and the rest of the system was running normally. We figured that job arrivals were likely to decrease soon which would reduce utilization at Station 1 and then we would benefit most from another machine at Station 3.

Day 96: We finally reached the point where we had enough money to purchase another machine at Station 3 so we did so and then changed to contract 3. We knew that we would need to monitor the game closely after this because the job arrivals were currently low and if they started going up then our lead time would also increase which would result in lost revenue. If job arrivals started going up we will purchase another machine at Station 1. At this point we started thinking we should increase our ordering quantity so we would not be paying the $1000 fixed ordering cost quite as often. We decided to wait to increase our ordering quantity until we had more cash on hand. We didn't want to get into a situation where we needed to buy another machine at Station 1 but could not afford to because all our cash was tied up in inventory. A few days after this the job arrivals stayed abnormally high and we lost about 50k in potential revenues due to our lead times going above .5 days.

Day 105: We had about $104k in cash. We came up with the idea that if we temporarily decreased our reordering quantity to zero, we could purchase another machine at Station 1. We could have just waited, but we didn't know if job arrivals would spike again soon in which case we would lose more potential revenue. We knew that as soon as we processed our current inventory and the inventory due to arrive in 1.5 days that we would have around 130k in cash and would be able to purchase more inventory. This strategy ended up working out but it was a little unnecessary because job arrivals were unusually low after day 105. Still, we think it was a cool move to make and if job arrivals had gone up then we would have definitely been prepared to capitalize on it. At this point the only thing left for us to do is keep increasing the reorder quantity so we could avoid paying the fixed ordering cost as often.

Days 105 - 139: At this point, we knew that we needed to increase order quantity. We wanted to find the best order quantity to balance our loss of cash to fixed cost and the interest we would be losing out on by buying inventory in bulk. Using the equation to find the optimal ordering quantity, we found that the optimal quantity was around 370 batches of 60. Rounding up, we knew that we wanted to eventually reach around 400 batches of 60 as our ordering quantity. At day 105, we did not have the cash on hand to make this change. From day 105 to day 139, we gradually increased our order quantity as we had more cash on hand. We wanted to make sure that an

order of inventory would not drop our cash low enough to the point where we would risk bankruptcy and have to take out a loan. By day 139, we were able to safely set our reorder point where we wanted it, 400 batches of 60.

Day 381(Exit Strategy) - At day 381, we were 5 simulated days before we knew we would lose control of the simulation. We wanted to avoid an order of inventory in the last 100 days because a last minute order would cost a lot and the game would end before we could generate any revenue on it. Keeping this in mind, we decided to order enough inventory on day 381 to last us until the game ended on day 486. We bumped up the reorder point to our current level of inventory to make sure the order would happen immediately. Knowing our current inventory at that time (123 kits) and the fact that on average 12 orders are receive per simulated day, we estimated that we would use 1284 kits by the time the simulation would end so we needed to order 1161 kits to last us until day 486. After our order was placed, we immediately switched both our reorder point and quantity to 0, so that we would definitely not place another order. This strategy was undoubtedly very effective as it catapulted us to first place, ahead of the second place team by about $130,000. It worked out because the incoming orders were not higher than we expected, so we never ran out of inventory. In fact, we ended with 4,400 units of inventory. While we did make small mistakes over the course of the game our strategy was largely effective and we were able to finish the game in first place. Go jackets.