

Improving Labor Scheduling at South Chicago DC While Considering Cost

Project Definition

We are looking to improve dock labor scheduling at the South Chicago service center to maximize employee efficiency and profitability. Improving labor scheduling at the DC will not only cut operating expenses, but also help ABF better serve their current customers and potentially attract new customers. Labor scheduling is crucial to a distribution center because if there are too many employees on the dock, employee efficiency decreases and the dock becomes oversaturated. Employee idleness may occur, and ABF incurs a greater labor expense cost than expected. However, if there are not enough employees present, DC bottlenecks, missed appointments, and upset customers may result.

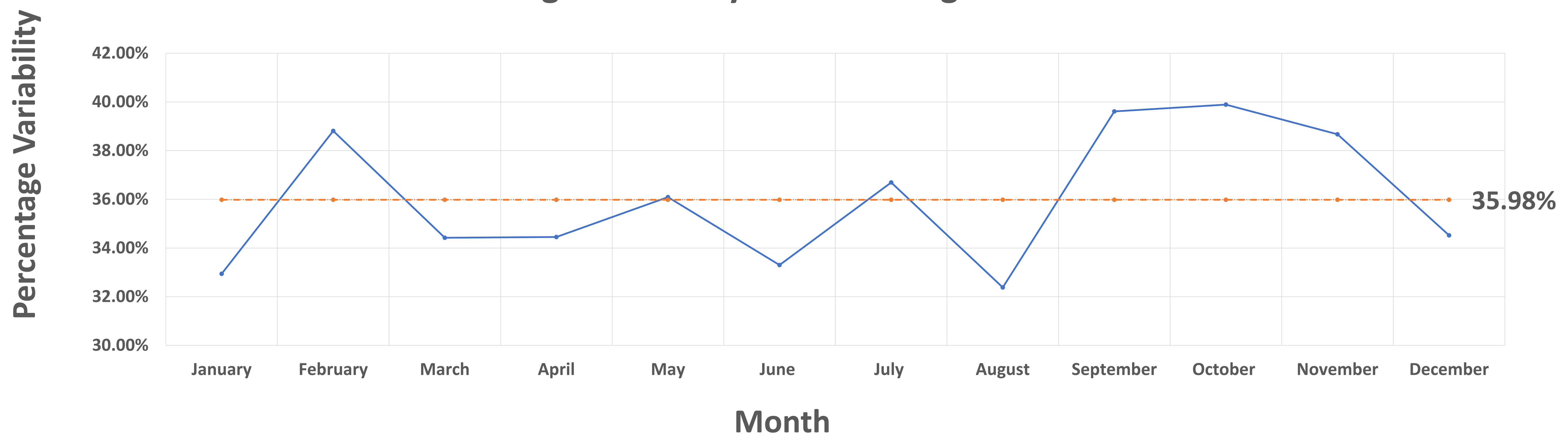
We have developed a labor scheduling deliverable based on forecasted incoming and outgoing bills to maximize both employee efficiency and profitability by creating a decision support tool to enhance the bid scheduling process.

System Boundary

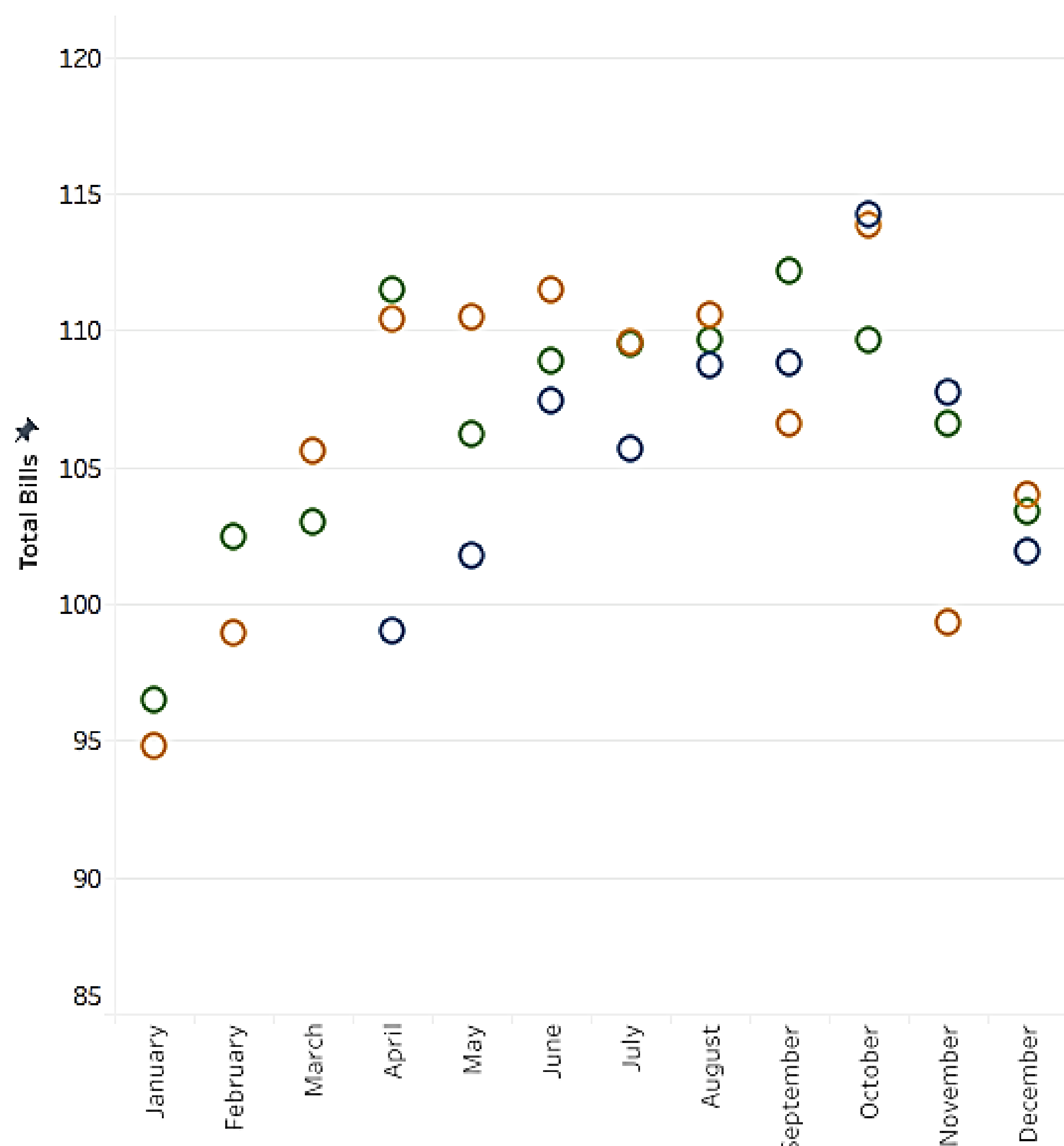


Data Analysis

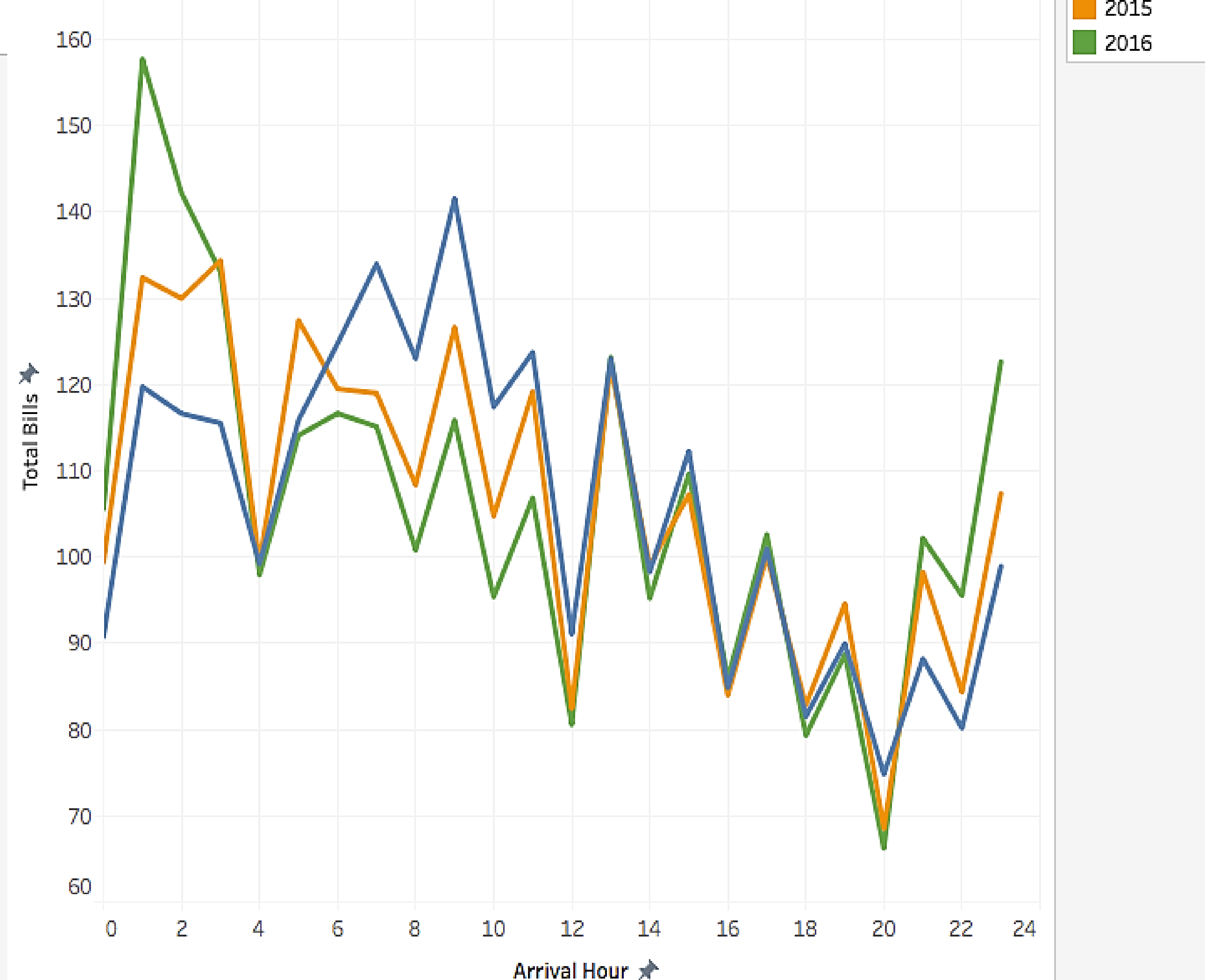
Percentage Variability in Scheduling Labor in 2016



Average Bills Per Hour Per Month Per Year



Average Bills Per Hour Per Year



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OR Model

Model

$$\text{Minimize } \sum_{j \in J} Cx_j \tag{1}$$

Subject to

$$\sum_{j \in J} Q_{jt} P_{jd} X_j W_{t,z} \geq D_{td} \forall t, d, z \tag{2}$$

$$\sum_{j=1}^{168} X_j \geq \sum_{j \in J} B X_j \tag{3}$$

$$\sum_{j=169}^{193} X_j \geq \sum_{j \in J} Y X_j \tag{4}$$

$$\sum_{t \in T} S_t \leq k \tag{5}$$

$$\sum X_j \leq US_0 \forall t, j \text{ shifts that start at 12 am} \tag{6}$$

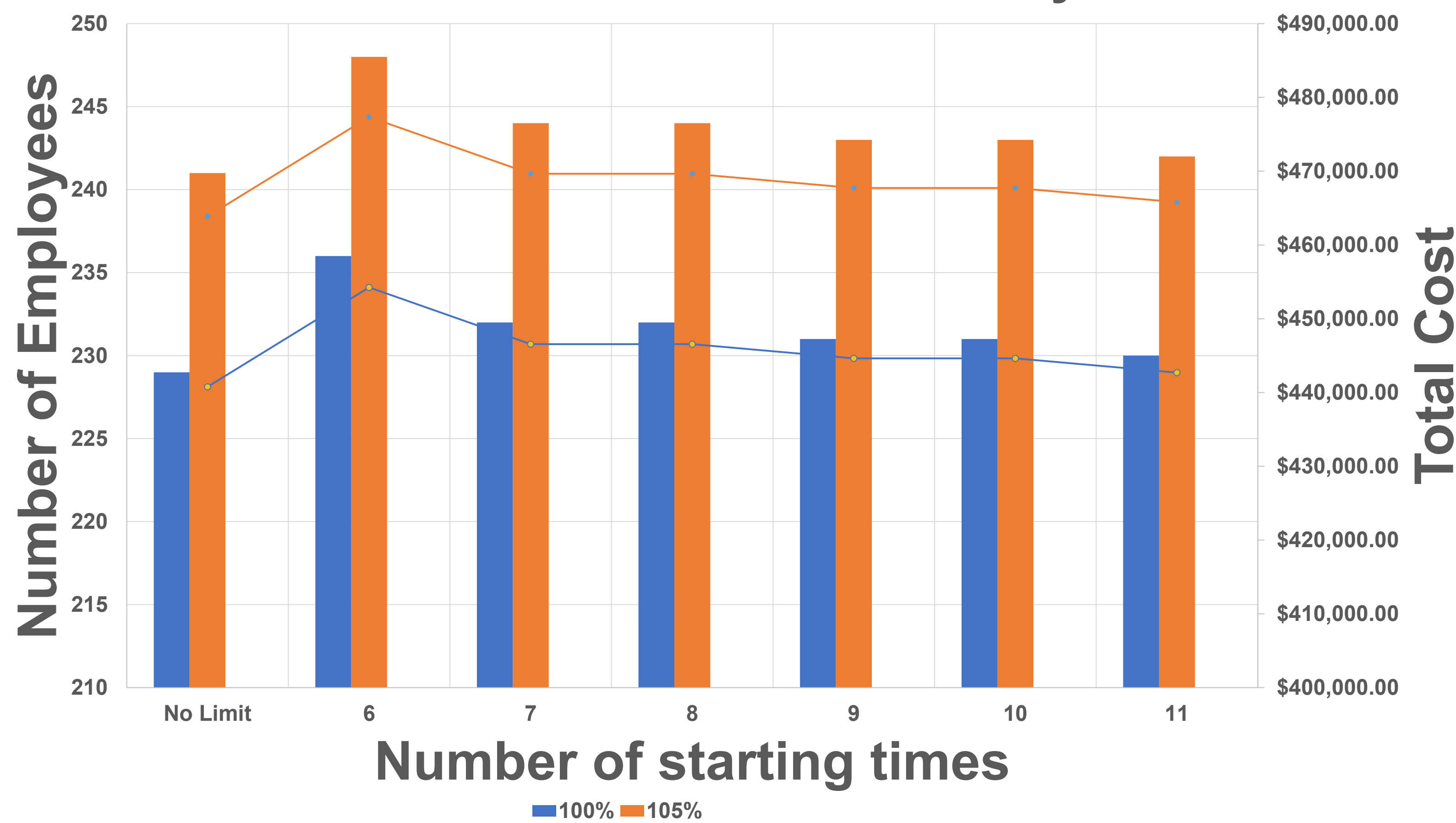
$$\sum X_j \leq US_1 \forall j \text{ shifts that start at 1 am} \tag{7}$$

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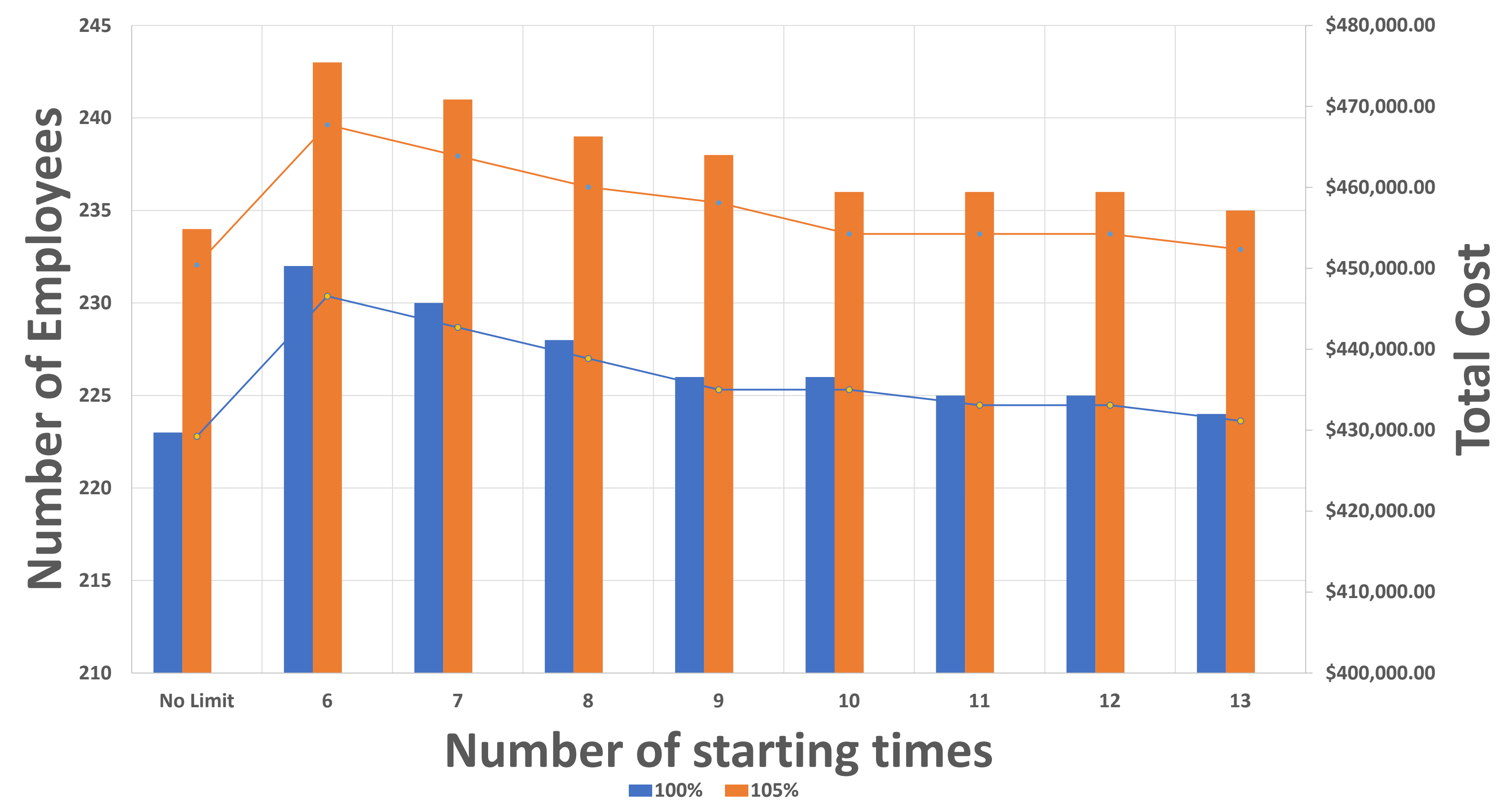
$$\sum X_j \leq US_{23} \forall j \text{ shifts that start at 11 pm} \tag{29}$$

Cost Analysis

Actual Demand of 2016 Analysis



Previous Year Demand for 2016 Analysis



Schedule Recommendation

Bid Shift Schedule										
Shift	# of Employees	Days Covered	Starting Time	Ending Time	Shift	# of Employees	Days Covered	Starting Time	Ending Time	
31	1	TWRF	7:00 AM	5:00 PM	182	3	MTWRF	2:00 PM	10:00 PM	
38	1	TWRF	2:00 PM	12:00 AM	185	12	MTWRF	5:00 PM	1:00 AM	
47	3	TWRF	11:00 PM	9:00 AM	190	6	MTWRF	10:00 PM	6:00 AM	
50	3	WRFS	2:00 AM	12:00 PM	192	9	MTWRF	12:00 AM	8:00 AM	
55	1	WRFS	7:00 AM	5:00 PM	193	11	TWRFS	1:00 AM	9:00 AM	
60	4	WRFS	12:00 PM	10:00 PM	201	7	TWRFS	9:00 AM	5:00 PM	
62	1	WRFS	2:00 PM	12:00 AM	209	6	TWRFS	5:00 PM	1:00 AM	
65	2	WRFS	5:00 PM	3:00 AM	214	4	TWRFS	10:00 PM	6:00 AM	
74	6	RFSS	2:00 AM	12:00 PM	217	12	WRFSS	1:00 AM	9:00 AM	
79	3	RFSS	7:00 AM	5:00 PM	223	4	WRFSS	7:00 AM	3:00 PM	
84	7	RFSS	12:00 PM	10:00 PM	225	14	WRFSS	9:00 AM	5:00 PM	
89	6	RFSS	5:00 PM	3:00 AM	228	3	WRFSS	12:00 PM	8:00 PM	
113	6	FSSM	5:00 PM	3:00 AM	233	2	WRFSS	5:00 PM	1:00 AM	
121	1	SSMT	1:00 AM	11:00 AM	238	7	WRFSS	10:00 PM	6:00 AM	
122	9	SSMT	2:00 AM	12:00 PM	265	3	FSSMT	1:00 AM	9:00 AM	
127	5	SSMT	7:00 AM	5:00 PM	271	1	FSSMT	7:00 AM	3:00 PM	
129	2	SSMT	9:00 AM	7:00 PM	289	6	SSMTW	1:00 AM	9:00 AM	
132	6	SSMT	12:00 PM	10:00 PM	297	3	SSMTW	9:00 AM	5:00 PM	
137	2	SSMT	5:00 PM	3:00 AM	300	4	SSMTW	12:00 PM	8:00 PM	
142	2	SSMT	10:00 PM	8:00 AM	302	3	SSMTW	2:00 PM	10:00 PM	
170	9	MTWRF	2:00 AM	10:00 AM	305	3	SSMTW	5:00 PM	1:00 AM	
175	3	MTWRF	7:00 AM	3:00 PM	310	3	SSMTW	10:00 PM	6:00 AM	
177	14	MTWRF	9:00 AM	5:00 PM						