

Memorandum

Date: November 26, 2006(Revised from Nov. 13)

Subject: Job Shop Sequencing Schedule

To: Matt Ford

From: Jennifer Pille

Introduction

As requested, a prospective schedule for customers orders at Positrol Workholding. The focus of the schedule was to determine which sequencing rule works best for the customer's orders. Findings are based on first come first serve (FCFS), shortest processing time (SPT), and earliest due date (EDD)

Findings

The best schedule sequencing rule for customer's orders is shortest processing time (SPT) because the average of flow time is 11.2 minutes and the average lateness of jobs is -6.05.

Discussion

Method. In order to determine which sequencing rule best suits the company, two different sequencing rules were given by the director of operations. Shortest processing time (SPT) and earliest due date (EDD) were compared to first come first serve (FCFS). To allow Positrol Workholding to utilize the SPT rule they sequence the jobs so that the job that takes the shortest time to process is first to be completed. To utilize the EDD rule they sequence the jobs so that the job that has the earliest due date is first to be completed. To utilize the FCFS rule they sequence the jobs starting with the current time period and working forward.

Determining which sequencing rule best suits the company is to focus on the average flow time, the number of late jobs, and the average lateness that results with each rule. Average flow time is the time it takes for all of the jobs to be completed divided by the number of jobs. Average lateness is each jobs flow time divided by the number of jobs. Figure 1 shows the data that was given by the director of operations in order to compare the sequencing rules.

Figure 1. FCFS sequencing data

Job	Job Time	Due Date	Operations Remaining
a	4.5	10	3
b	6.0	17	4
c	5.2	12	3
d	1.6	27	5
e	2.8	18	3
f	3.3	19	1

Flow time is the time it takes for the process/job to be complete. Lateness is the number of jobs that will not meet their due date. In Figure 2, first come first serve (FCFS) sequencing rule was the rule that the company is currently following and through testing the data was rated as “better” compared to the other two sequencing rules.

Figure 2. First Come First Serve (FCFS)

Sequence	Flow Time	Due Date	Lateness
a	4.5	10	$4.5 - 10 = -5.5$
b	$4.5 + 6 = 10.5$	17	$10.5 - 17 = -6.5$
c	$10.5 + 5.2 = 15.7$	12	$15.7 - 12 = 3.7$
d	$15.7 + 1.6 = 17.3$	27	$17.3 - 27 = -9.7$
e	$17.3 + 2.8 = 20.1$	18	$20.1 - 18 = 2.1$
f	$20.1 + 3.3 = 23.4$	19	$23.4 - 19 = 4.4$
	<u>*Avg. = 15.25</u>		<u>**Avg. = -1.92</u>

*avg. flow time=all of the jobs flow time/# of jobs

**avg. lateness=each jobs flow time/# of jobs

In Figure 3, earliest due date (EDD) sequencing rule was one of the rules that the company wanted to test to see how this rule compared to first come first serve (FCFS). Through testing the data this rule was rated as “good” compared to the other two sequencing rules.

Figure 3. Earliest Due Date (EDD)

Sequence	Flow Time	Due Date	Lateness
a	4.5	10	4.5 - 10= -5.5
c	5.2 + 4.5= 9.7	12	9.7 - 12= -2.3
b	6.0 + 9.7= 15.7	17	15.7 - 17= -1.3
e	2.8 + 15.7= 18.5	18	18.5 - 18= -.5
f	3.3 + 18.5= 21.8	19	21.8 - 19= 2.8
d	<u>1.6 + 21.8= 23.4</u>	27	<u>23.4 - 27= -3.6</u>
	*Avg.=15.6		**Avg.= -1.57

*avg. flow time=all of the jobs flow time/# of jobs

**avg. lateness=each jobs flow time/# of jobs

In Figure 4, shortest processing time (SPT) sequencing rule was the other rule that they company wanted to test to see how this rule compared to first come first serve (FCFS). Through testing the data this rule was rated the “best” compared to the other two sequencing rules.

Figure 4. Shortest Processing Time (SPT)

Sequence	Flow Time	Due Date	Lateness
d	1.6	27	1.6 - 27= -25.4
e	1.6 + 2.8= 4.4	18	4.4 - 18= -13.6
f	3.3 + 4.4= 7.7	19	7.7 - 19= -11.3
a	4.5 + 7.7= 12.2	10	12.2 - 10= 2.2
c	5.2 + 12.2= 17.4	12	17.4 - 12= 5.4
b	<u>6.0 + 17.4= 23.4</u>	17	<u>23.4 - 17= 6.4</u>
	*Avg.= 11.12		**Avg.= -6.05

*avg. flow time=all of the jobs flow time/# of jobs

**avg. lateness=each jobs flow time/# of jobs

In Figure 5, the average flow time and average lateness of the shortest processing time (SPT) sequencing rule was the least among the three compared sequence rules. Therefore, this is the sequencing rule that is recommended for Positrol Workholding.

Figure 5. Findings of Scheduling Data

	<u>FCFS</u>	<u>SPT</u>	<u>EED</u>
Avg. Flow Time(min.)*	15.25	11.2	15.6
# of Late Jobs**	-11.5	-36.3	-9.4
Avg. Lateness***	-1.92	-6.05	-1.57
Rating	better	best	good

*avg. flow time=all of the jobs flow time/# of jobs

**# of late jobs=flow time - due date

***avg. lateness=each jobs flow time/# of jobs

Limitations. Only two sequencing rules, SPT and EDD, were compared to FCFS. Therefore, other sequencing rules may best suit Positrol Workholding practices. If the company has few loyal customers and they were to change the due date or quantity of their order, this could change the data to process their order. The batch size (n) is also small limiting the “ideal” batch size stating “small batch sizes, more often.” Therefore, SPT sequencing rule may not be best suited for that order and not taking this into account could have a negative effect on the company.