

MEMORANDUM

Date: April 4, 2007(*Revised 04/23/07*)

Subject: Positrol Customer Orders Schedule

To: Matt Ford

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Introduction

As requested, the comparison has been made between the current sequencing rule using first come, first served (FCFS) basis to two other shortest processing times (SPT) and earliest due date (EDD) schedule work rules. The focus of the comparison was on determining the best sequencing rule for scheduling Positrol customer orders. Following is the finding.

Conclusion

- The best sequencing rule for scheduling Positrol customer orders is shortest processing time (SPT) due to the lowest average flow time (11.4 days) and average lateness (-3.8) compared with other two sequencing rules.
- A larger work sample would be more representative of actual circumstances, which could result in a change in determining the best sequencing rule.

Analysis

Method. Job scheduling data provided by Positrol director of operations is listed below in table 1:

Table 1: Job Scheduling Data

Job	Date Order Received	Operating Time	Due Date
XC	Mar 3	5.1	12
EFF	Mar 20	3.2	20
ABC	Feb 2	4.5	10
RBP	Feb11	6.0	16
SDS	Mar 8	2.9	18

The effectiveness of the current FCFS rule and two alternative sequencing rules, SPT and EDD is judged by the average job flow time and the average job lateness. The lowest average flow time and the average lateness, the better effectiveness the rule has. The

average flow time for a group of jobs is equal to the total flow time for the jobs divided by the number of jobs. The average lateness for a group of jobs is equal to the total lateness for the jobs divided by the number of jobs. Job flow time includes both actual processing time and any time waiting to be processed. Job lateness is the difference between the job flow time and the due date. We assume the data provided by the director of operations were reasonable and reliable, the set of jobs is known, and due date are not often upper-most in manager's mind.

FCFS (First Come, First Served). FCFS sequencing rule is that “jobs are processed in the order in which they arrive at a machine or work center.”¹ This is the sequencing rule that Positrol is currently using. Job flow time, lateness, and each average are showed in table 2. Notice that job ABC and RBP shows a negative lateness number, it means that both jobs were completed before the due date under FCFS basis. The average flow time is 14.16 days and the average lateness is -1.04 days.

Table 2. First Come, First Served (FCFS)

FCFS	1	2	1-2
Job Sequence	Flow Time	Due Date	Lateness
ABC	4.5	10	-5.5
RBP	10.5	16	-5.5
XC	15.6	12	3.6
SDS	18.5	18	0.5
EFF	21.7	20	1.7
Totals	70.8		-5.2

Average Flow Time: $70.8/5 = 14.16$ days

Average Lateness: $-5.2/5 = -1.04$ days

SPT (Shortest Processing Time). SPT sequencing rule is that the job takes the shortest time to process is first to complete. Table 3 shows that job ABC, XC, and RBP were not completed before the due date under the SPT basis. The average flow time is 11.4 days and the average lateness is -3.8 days.

Table 3. Short Processing Time (SPT)

	1	2	1-2
Job Sequence	Flow Time	Due Date	Lateness
SDS	2.9	18	-15.1
EFF	6.1	20	-13.9
ABC	10.6	10	0.6
XC	15.7	12	3.7
RBP	21.7	16	5.7
Totals	57		-19

¹ Stevenson, William J. (2005). *Operation management*. 8th ed. New York: McGraw-Hill.

Average Flow Time: $57/5 = 11.4$ days
 Average Lateness: $-19/5 = -3.8$ days

EDD (Earliest Due Date). EDD sequencing rule is that “jobs are processed according to the due date, earliest due date first.”² Table 4 shows that both SDS and EFF were not completed before the due date under EDD rule. The average flow time is 13.98 days and the average lateness is -1.22 days.

Table 4. Earliest Due Date (EDD)

	1	2	1-2
Job Sequence	Flow Time	Due Date	Lateness
ABC	4.5	10	-5.5
XC	9.6	12	-2.4
RBP	15.6	16	-0.4
SDS	18.5	18	0.5
EFF	21.7	20	1.7
Totals	69.9		-6.1

Average Flow Time: $69.9/5 = 13.98$ days
 Average Lateness: $-6.1/5 = -1.22$

Comparison among three rules. In table 5, we can easily tell that SPT sequencing rule has the lowest average flow time and average lateness compared to the average numbers FCFS and EDD have. Therefore, the SPT rule is the best basis for scheduling customer orders. Why the lower the average numbers are, the much effective the rule is? The reason is the lower average flow time can result in lower in-process inventories. And the lower average lateness can result in better customer service levels. In this case, FCFS rule and EDD rule turn out to be the least effective of the rules.

Table 5. Comparison of the three rules

Rule	Average Flow Time (days)	Average Lateness (days)
FCFS	14.16	-1.04
SPT	11.4	-3.8
EDD	13.98	-1.22

Limitations. In the real world of business, there is a chance that new jobs could arrive any time after processing begins, or one of the five current jobs has been canceled. There could be certain interruptions in processing such as machine breakdowns, accidents, or worker illness. Processing times could be variable instead of deterministic. Another limitation is the small sample size in this analysis. A larger work sample would be more

² Stevenson, William J (2005). *Operations Management*. 8th. New York: McGraw-Hill.

representative of actual circumstances. Either one of these limitations would influence our conclusion and may lead us to another sequencing rule.