

Memorandum

Date: November 17, 2004
Subject: Scheduling; Job Shop Sequencing
To: Director of Operations
From: Nancy Brown and Natalie Heist
CC: Matt Ford

Introduction

Positrol Workholding currently schedules customer orders on a first come first served basis (FCFS), but is this the best system to be using? As a part of our internship duties we have been asked to consider the shortest processing time (SPT) and earliest due date (EDD) sequencing to see if perhaps they would be more efficient than FCFS. To evaluate the “goodness” of the alternatives we will focus on the average flow time, the number of late jobs, and the average lateness that result with each rule.

Key Points

- When catering to customer service choose the earliest due date because it has the lowest average tardiness results at .55 days
- When focusing on the lowest cost for the company choose the shortest processing time because it has the lowest average flow time which means your can work your employees less hours and save money

Analysis

The following data was collected based upon the specified sequencing strategy. The Job, Job Time, and Due Date were given. In order to calculate the Flow Time we first had to arrange the jobs in the proper sequence. For example the FCFS data is arranged from A to F alphabetically. Then we took the sum of all previous job times plus the current job time to find the current job flow time.

Table 1: First Come First Serve (FCFS) Data

Job	Job Time	Flow Time	Due Date	# Days Late
A	4.5	4.5	10	0
B	6.0	10.5	17	0
C	5.2	15.7	12	0
D	1.6	17.3	27	0
E	2.8	20.1	18	2.1
F	3.3	23.4	19	4.4

* Note all data is in days

When preparing the EDD data we arranged the jobs according to due date placing the job with the earliest due date first and the job with the latest due date last.

Table 2: Earliest Due Date (EDD) Data

Job	Job Time	Flow Time	Due Date	# Days Late
A	4.5	4.5	10	0
C	5.2	9.7	12	0
B	6.0	15.7	17	0
E	2.8	18.5	18	.5
F	3.3	21.8	19	2.8
D	1.6	23.4	27	0

* Note all data is in days

When preparing the SPT data the jobs were arranged according to job time. Those with the shortest job time were placed first and subsequently those with the longest job time were placed last.

Table 3: Shortest Processing Time (SPT) Data

Job	Job Time	Flow Time	Due Date	# Days Late
D	1.6	1.6	27	0
E	2.8	4.4	18	0
F	3.3	7.7	19	0
A	4.5	12.2	10	2.2
C	5.2	17.4	12	5.4
B	6.0	23.4	17	0

* Note all data is in days

In order to analyze the “goodness” of each sequencing strategy we focused on minimizing three criteria:

- Average Flow Time : This figure tells on average how long it takes for Positrol Workholding to complete a job using a particular sequencing strategy. To determine this number take the sum of all flow times and divide by the number of jobs
- Average Tardiness: This figure shows on average how late a job could be when using any particular sequencing strategy. To determine this number take the sum of late days and divide by the number of jobs

- Average Number of Late Jobs: This figure illustrates the number of jobs that will be late using a particular sequencing strategy. To determine this number take the difference between the Due Date and the Flow Time

Table 4: Average Results

	Average Flow Time	Average Tardiness	Average Number of Late Jobs
FCFS	15.25	1.08	2
EDD	15.60	.55	2
SPT	11.12	1.27	2

Summary of Findings

Table 4 summarizes the results of the scheduling analysis. After considering the results for the different sequencing methods we discovered that the FCFS is not the most productive strategy for Positrol Workholding. In fact, the SPT method produced the fastest Average Flow Time, which means that the company can either reduce their work hours to save money or increase productivity by operating within their current work hours under the SPT method.

We also discovered that the EDD method produced the lowest Average Tardiness. This means that if the company needs to improve customer service then they should focus on this method rather than the other two.

The Average Number of Late Jobs is the same for all methods and therefore has no effect regarding this decision.

Limitations

The obstacle that presents itself in this problem is that no one strategy provides the best results in each of the three categories. While most companies tend to favor a particular heuristic, a mixture of sequencing techniques is often employed to achieve operational objectives.

Another limitation is the small number of jobs considered in this analysis. A larger work sample would improve the generalizeability of these findings.