Model Description:

1. Problem Analysis

Given the time for each part in the tanks, and the requirement that each rack only grasps one part, each processed part is sequentially carried out according to the given processing steps, that is, prime dip - top coat tank-offload. To make the total processing time the shortest, the working time of each rack is continuous. The total time is the time from when the first rack starts going into the prime dip tank to when the last rack goes out of the top coat tank.

2. Model assumption

2.1 Line 1 and 2 work normally, without failure and do not need to be maintained in the middle.

2.2 Each part must go through two stages, namely dipping in two tanks and offload, and the sequence is not allowed to be disturbed.

2.3 Each machine/person can only process one rack at a time. When waiting for the next machine to process, it will be processed in the original order, and the racks that are queued behind are not allowed to "jump in the queue".

2.4 All machine setup times (neglected) are zero, i.e., all production parts go into machine immediately.

3. Symbols Explanation

|  |  |
| --- | --- |
| Symbol | Meaning |
|  | The optimized time required for the jth process of the ith processed rack |
|  | The optimized moment when the ith processed rack starts the jth process |
|  | The time required for the jth process of the ith rack |
|  | The moment when the ith processed rack starts the jth process |
|  |  |
| T | Total time |
|  | The time utilization efficiency of 4 sublines of the L2 |

Model1

Given the set of parts {1, 2, …, n} and procedures {26, 27, 28, 46,47,48}, with n=79, isthe processing time required for the jth process of the ith rack, is the completion time when the ith processed rack ends the jth process， is the sequence (permutation) formed by parts processed in a certain order, a typical example of could be 53214 if n=5, which means the ordering of all the parts is the first is part 5, 2nd is part 3, etc.. Let

then

the objective function is

min()

constraints:

(1)

, (2)

(3)

(4)

(5)

(6)

(7)

(8)

(9)

(10)

, (11)

constrains (1)- (4) guarantee that each part only appears once in the permutation , (5), (6), (8) and (9) is the completion time of the 1st, 2nd, 21st, 22nd part on the prime tank respectively. (7) and (10) guarantee one part can’t be processed by multiple tanks, and one rack can only grasp one part. (11) restricts that all completion time in each procedure must be greater than 0.

Model 2

There are 79 parts with 79! possible orderings. Construct a 7979 0-1 matrix, each row and each column has only one element as 1, and the rest of the elements are 0, there are 79! kinds of matrices in total. Assume that the optimal solution has been found, that is, the working number of the ith production is i.

Questions:

1. Could One rack contains one PartID with different HandID? If so, the same PartID with different HandID may have different time in the two tanks. Ex.

|  |  |  |
| --- | --- | --- |
|  | Prime time | Top coat time |
| 588FR(588102) | 277 | 217 |
| 588RL(588103) | 203 | 230 |

2.

s.t.

with n=, =