

CHAPTER IV

CHEETAH 18 TRADITIONAL PERFORMANCE

4.1 Line Balancing Analysis

4.1.1 Introduction

Base on the existing line balancing of Cheetah18 product, the highest line loading that can be obtained is equal to 9.9 KDGR which this number is calculated by basing on 21 working hour per day, 72.22% cumulative yield and 90% utilization as illustrated in Table 4.1

In order to increase the line loading capacity, the bottleneck operations have been investigated by considering on the percent sampling and UPH of each operation. It is obviously that Spot cleaning operation, Tail tacking operation and space limitation are the constraints.

4.1.2 Spot Cleaning Operation Analysis

The existing capacity of Spot cleaning operation is only 9,895 units/day which is calculated from:

$$\begin{aligned}\text{Capacity by operation} &= \frac{\text{Capacity at operation (Unit/day)}}{\text{Percent Sampling}} \times 100 \\ &= \frac{12,474 \times 100}{126.06} \\ &= 9,895 \text{ units/day}\end{aligned}$$

In addition, the percent sampling is equal to 126.06% which it means that the current capacity is overloading by comparing to the number of operators. The problem of this is due to the high percentage of fast rework contamination at the backend line which is about 44%.

The high percentage of backend line contamination is caused by the hidden factory in Cheetah 18 manufacturing line such as spot cleaning effectiveness, specification, Blower location, etc. In order to obtain higher capacity at this operation, all of hidden factories must be minimized or eliminated. Therefore, the Six sigma is the concept that is selected for solving this problem, which it is basically composed of four phases which are Measure, Analyze, Improve and Control phase. The details will be illustrated in Chapter of the Backend Line Contamination Reduction.

In addition, time study has been performed at this operation in order to observe the bottleneck elements which is illustrated in Table 4.2.

4.1.3 Space Limitation and Autogrammer Operation Analysis

Base on the obtained Line balancing, we have seen that the spacing is limited at 40 cm., so, there is no opportunity to add an extra operators in order to obtain more loading capacity.

However, we have seen an opportunity to increase manufacturing line loading capacity at Autogrammer operation. The reason is that Autogrammer operation is like a rework operation, most of incoming parts are required to adjust at this operation which it is non-value added process. The first yield of this operation is only 24% which it means that only 24 out of 100 parts are pass and no need for adjustment. So, If the first yield is improved (percent no adjusted increase), the number of autogrammeters can be reduced. The more space can be obtained. Beside, the bending elements at autogrammer has been pulled of from the database which is provided in Table 4.3

The problem of this low yield is also due to the hidden factory at Front line operation such as the epoxy application procedure at FOS bond operation, incoming

preload of raw flexure, FOS vendor, etc. Six sigma is selected method to minimize or eliminate these hidden factories which the details will be shown in Chapter of Improve of HGA Preload First Yield.

4.1.4 Tail Tacking operation analysis

Base on an existing Cheetah 18 line balancing, 9.9 KDGR, Tail Tacking operation is not a bottleneck operation but it will after other operations capacities are improved. The current capacity of this operation is equal to 10,093 units/day.

However, due to the design constraints on Cheetah 18 product, we can not change the current tail tack process because it has improved the reliability of product at Drive level.

If the autogrammer first yield is improved, the more space will be gained from the reduction of autogrammer. In consequently, an additional operator can be added to this operation in order to increase the capacity.

4.2 Actual Cheetah 18 Input/ Output (Appendix C)

The actual Cheetah 18 Input and Output, before improvement, have been passive from the database which it is illustrated in Table 4.4. The Output is calculated by basing on 72.22% cumulative yield.



- An actual loading capacity by cell by day can be calculated as below:

$$\begin{aligned}
 \text{Average Loading by cell/ day} &= \frac{\text{Total Loading}}{\text{Total working day x Number of cells}} \\
 &= \frac{1,241,307}{7 \times 18} \\
 &= 9,852 \text{ HGAs by cell/ day}
 \end{aligned}$$

- An actual output by cell by day can be calculated as below:

$$\begin{aligned}
 \text{Average Output by cell/ day} &= \frac{\text{Total Output}}{\text{Total working day x Number of cells}} \\
 &= \frac{896,472}{7 \times 18} \\
 &= 7,115 \text{ HGAs by cell/day}
 \end{aligned}$$

So, these numbers will be used as base line for comparing between before and after implement the improvement activities.

| OPERATION | % SAMPLING | % YIELD | Revised | | | | | Returned Unit |
|---------------------------|--------------------|--------------------|----------------|--------------|------------------|-------------------|----------------|---------------|
| | | | 9.9 K | | | | | |
| | | | UPH | H/C | Capacity | Space Requirement | Total | |
| MRB SCREEN | | | | | | | 60 | |
| PRETRIM | 100.00% | 100.00% | 662 | 1 | 12512 | 70 | 70 | |
| LOAD HEAD | 100.00% | 100.00% | 340 | 2 | 12852 | 70 | 140 | |
| GIMBAL BOND | 100.00% | 100.00% | 195 | 3 | 11057 | 70 | 210 | |
| FLEX BOND | 100.00% | 100.00% | 204 | 3 | 11567 | 75 | 225 | |
| FLEX LEAD BOND | 100.00% | 100.00% | 195 | 3 | 11057 | 80 | 240 | |
| SERVILANCE # 1 (Sampling) | 25.00% | 100.00% | 160 | 1 | 3024 | 60 | 60 | |
| SPC BOND PULL | 3.53% | 100.00% | | | | | | |
| COAT LEAD | 100.00% | 100.00% | 372 | 2 | 14062 | 60 | 120 | |
| TAIL TACKING | 100.00% | 100.00% | 267 | 2 | 10093 | 60 | 120 | |
| THERMAL OVEN | | | | | | | 366 | |
| UNLOAD HGA FROM JIT TOOL | 100.00% | 100.00% | 382 | 2 | 14440 | 70 | 140 | |
| LOAD IAT TEST ARM | 123.26% | 100.00% | 372 | 2 | 14062 | 70 | 140 | |
| SERVILANCE # 2 (Sampling) | 25.00% | 100.00% | 160 | 1 | 3024 | 60 | 60 | |
| SPOT CLEANING | 126.06% | 100.00% | 165 | 4 | 12474 | 60 | 240 | 26.06% |
| HEAD SETTER | 100.00% | 100.00% | 585 | 1 | 11057 | 60 | 60 | |
| PRELOAD | 100.00% | 100.00% | 159 | 4 | 12036 | 80 | 320 | |
| STATIC ATTITUDE ADJUST | 126.06% | 100.00% | 225 | 3 | 12758 | 110 | 330 | |
| REMOVE PRE-SHUNT | 100.00% | 100.00% | 870 | 1 | 16443 | 70 | 70 | |
| MRE | 100.00% | 96.00% | 293 | 2 | 11075 | 110 | 220 | |
| ELECTRICAL TESTER | 100.00% | 81.25% | 95.0 | 5.5 | 9900 | | | 2.80% |
| FLY TESTER | 100.00% | 100.00% | | 0.13 | | | | |
| SPC ALIGNMENT | | 100.00% | | 0 | | | | |
| SPC GIMBAL BOND | | 100.00% | | 0 | | | | |
| AUTO SHUNT WIRE | 100.00% | 100.00% | 437 | 1 | 8259 | 75 | 75 | |
| FLAPPER | 50.00% | 100.00% | 250 | 1 | 4725 | 60 | 60 | |
| UNLOAD TEST ARM | 123.26% | 100.00% | 327 | 2 | 12361 | 75 | 150 | |
| FINAL INSPECTION | 137.92% | 99.00% | 128 | 5 | 12096 | 70 | 350 | 14.00% |
| QC | 10.00% | 100.00% | 128 | 1 | 2419 | 60 | 60 | |
| PACK | 100.00% | 100.00% | 1500 | 1 | 28350 | 100 | 100 | |
| SPC | | | | 1 | | | | |
| MH | | | | 2 | | | | |
| LEAD GIRL | | | | 1 | | | | |
| TOTAL HEAD COUNT | | | | 57.93 | | | | |
| HEAD COUNT IN LINE | | | | 49 | | | | |

| Space Requirement | |
|------------------------------|------|
| Front line Space available | |
| Space Requirement front line | 1245 |
| Back line Space available | 2781 |
| Back line Space Requirement | 2741 |
| Total space requirement | 3986 |

Table 4.1 Cheetah18 Manufacturing Line Loading Capacity

| ELEMENT | QTY. | % | STANDARD TEST TIME | SUMMATION TIME | AVERAGE TEST TIME |
|-------------------------|------|--------|--------------------|----------------|-------------------|
| LOAD TEST ARM TO TRAY | | | 2 | 2 | 2 |
| TOTAL IN | 2897 | | | | |
| NOT BEND | 702 | 24.23% | 6.6 | 6.60 | 1.60 |
| BEND1 | 1198 | 41.35% | 14 | 14.00 | 5.79 |
| BEND2 | 636 | 21.95% | 21.8 | 21.80 | 4.79 |
| BEND3 | 280 | 9.67% | 29.60 | 29.60 | 2.86 |
| BEND4 | 61 | 2.11% | 35.70 | 35.70 | 0.75 |
| BEND5 | 8 | 0.28% | 41.8 | 41.80 | 0.12 |
| BEND6 | 6 | 0.21% | 47.90 | 47.90 | 0.10 |
| BEND7 | 1 | 0.03% | 53.90 | 53.90 | 0.02 |
| BEND8 | 5 | 0.17% | 59.9 | 59.90 | 0.10 |
| BEND9 | 0 | 0.00% | 65.9 | 65.90 | 0.00 |
| UNLOAD TEST ARM TO TRAY | | | 2 | 2.00 | 2.00 |
| TOTAL | 2897 | 1 | SUMATION TIME | | 20.12 |
| STANDARD TIME(ALLOWA | | | | | 22.611 |
| HOUR PER UNIT | | | | | 0.0063 |
| UPH | | | | | 159.2 |
| CAPACITY PER OPERATIO | | | | | 3009 |

Table 4.2 Spot Cleaning Elements

| ELEMENT | QTY. | % | STANDARD TEST TIME | SUMMATION TIME | AVERAGE TEST TIME |
|-------------------------|-------|--------|--------------------|----------------|-------------------|
| LOAD TEST ARM TO TRAY | | | 2 | 2 | 2 |
| TOTAL IN | 19446 | | | | |
| NOT BEND | 11704 | 60.19% | 6.6 | 6.60 | 3.97 |
| BEND1 | 6866 | 35.31% | 14 | 14.00 | 4.94 |
| BEND2 | 825 | 4.24% | 21.8 | 21.80 | 0.92 |
| BEND3 | 42 | 0.22% | 29.60 | 29.60 | 0.06 |
| BEND4 | 5 | 0.03% | 35.70 | 35.70 | 0.01 |
| BEND5 | 2 | 0.01% | 41.8 | 41.80 | 0.00 |
| BEND6 | 1 | 0.01% | 47.90 | 47.90 | 0.00 |
| BEND7 | 1 | 0.01% | 53.90 | 53.90 | 0.00 |
| BEND8 | 0 | 0.00% | 59.9 | 59.90 | 0.00 |
| BEND9 | 0 | 0.00% | 65.9 | 65.90 | 0.00 |
| UNLOAD TEST ARM TO TRAY | | | 2 | 2.00 | 2.00 |
| TOTAL | 19446 | 1 | SUMATION TIME | | 13.92 |
| STANDARD TIME(ALLOWAN | | | | | 15.644 |
| HOUR PER UNIT | | | | | 0.0043 |
| UPH | | | | | 230.1 |
| CAPACITY PER OPERATIO | | | | | 4349 |

Table 4.3 Autogram Elements

Production Report

Cheetah18 Product

Number of Cells = 1

| | Sat | | Sun | | Mon | | Tue | | Wed | |
|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | Target | Actual | Target | Actual | Target | Actual | Target | Actual | Target | Actual |
| Input | 180,000 | 181,517 | 150,000 | 151,987 | 180,000 | 180,332 | 180,000 | 180,766 | 180,000 | 182,125 |
| Output | 129,996 | 131,092 | 108,330 | 109,765 | 129,996 | 130,236 | 129,996 | 130,549 | 129,996 | 131,531 |

| | Thu | | Fri | | WTD | |
|--------|---------|---------|---------|---------|-----------|-----------|
| | Target | Actual | Target | Actual | Target | Actual |
| Input | 180,000 | 180,827 | 180,000 | 183,753 | 1,250,000 | 1,241,307 |
| Output | 129,996 | 130,593 | 129,996 | 132,706 | 888,306 | 896,472 |

Table 4.4 Summary of Cheetah 18 product daily input/output (Before improvement)