

CHAPTER 9

DISCUSSION AND CONCLUSION

9.1 Discussion & Conclusion

The objective of this research is to increase productivity by reduce lost time in machining line. After improvement, lost time in line reduced from 17.6% to 14% of total working time. Because of 14% increasing in productivity, the labor productivity increase from 9.4 pieces / hour to 10.7 pieces/hour .

Lost time reduction in machining line was considered in 2 cases

- Line balancing losses:

The operation losses were reduced by reduction of air cut time 26.4 seconds and 25.6 seconds reduction of cutting time with different type of cutting tool. Consequently, total time was reduced by 51 seconds/pieces. Line efficiency was improved by 18 %.

- Down time losses:

80% of lost time in machining line are lost time from inspection, adjustment and change cutting tool,. These three causes were selected to improve.

- Inspection time was reduced from 6.87% to 3.35% by change measuring instrument and line leader responsible for check if the capacity of line is not enough.

- Lost time from adjustment was reduced by improve the problem solving system. Because the main problem of adjustment is chronic cause, which can not be solved. The root cause elimination need the time to collect data and knowledge skill of problem solver.

- Tool change time was reduced by 3 main approach.

- The first is to improve tooling life. There are 2 categories to improve tool life.

1. Use a longer life tool: In this pilot line boring cutter was changed form carbide insert to diamond insert.
2. Adjust cutting condition include external environment such as type of coolant, machine or clamping rigidity, etc.

- The second approach is to set spare tool before changing time. Not all type of tool set a spare because of high investment. The high frequency to set tool was selected to prepare a spare.

- The third approach is to introduce supplier to inspect tool before delivery to reduce problem of special tool.

9.2 Suggestion

- Inspection frequency should be reduced if process is in control.
- The usage of special measuring instrument can be reduce inspection time , such as
 - Air gage: it will check dimension by gage head. Gage head has a hole through which pressurized air supplied by a constant pressure.
 - Electronic gage: As shown in figure 9.1. Electronic gage is similar with air gage but check by electronic. It is easily for use and can be applied for measurement data collection and SPC calculation. However, cost is very expensive.

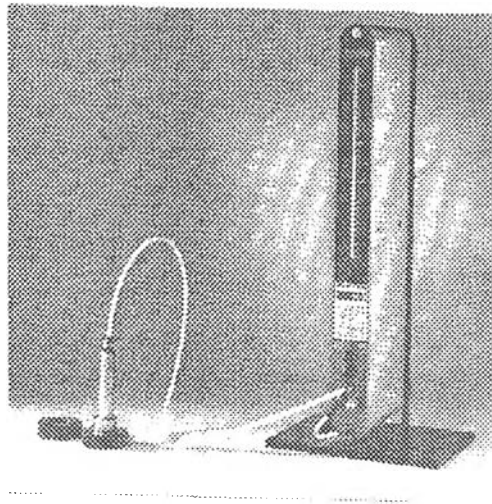


Figure 9.1 Electronic gage for check inside diameter (Source: Marposs Co., Ltd.)

- Special cylinder gage (figure 9.2): It was combined between plug gage and cylinder gage. Checking head is same as plug gage for easy use.

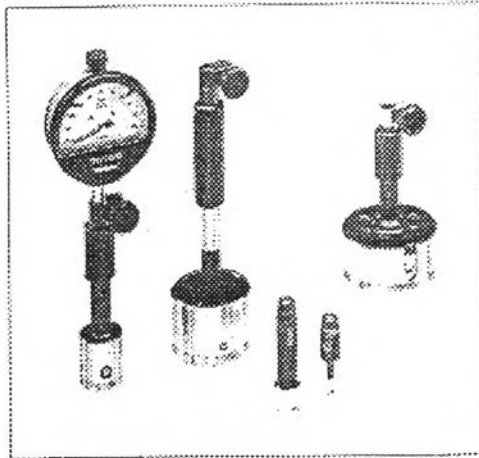


Figure 9.2 Cylinder gage for check inside diameter

- The main problem of tool change is short tool life. Tooling life was affected by various factors, such as machine, coolant, clamp rigidity. To reduce the frequency of tool change is to solve the external cause of tool.
- Use of a long life tool is one of alternative to reduce frequency of tool changing but cost of tool will be higher.
- Bottleneck for machining operation is machine time. To improve productivity can be down by improve machine such as
 - Reduce ATC (Automatic tool change) time
 - Using high speed cutting tool
 - Using high performance machine
 - Design special machine.