CHAPTER 7

RESULTS AND DISCUSSION

7.1 INTRODUCTION

The logic behind the practice of 6-S principles at the workplace is that these principles are the basic requirements for high efficiency in producing better quality products and services with little waste. Waste may be defined as any action, process or product that causes additional cost, without adding value as perceived by the customer (William 2001; Rhyne 1990). The objective of this chapter is to explain the results obtained from implementation of 6-S during this research work in HAL, Bangalore, India.

To implement other improvement tools such as standardized work, visual inventory replenishment systems, Total Productive Maintenance, setup reduction and mistake proofing, an organization would require addressing the workplace issues that perpetuate waste. In a disorganized work environment, the lack of a robust system would render these tools ineffective (Chris and Rick 2007; Larry and Madelyn 1999; Peter and Dennis 2001).

6-S is also a crucial part of Total Productive Maintenance. Simultaneously while cleaning the operators should inspect the equipment –

listen and keep a watch for anomalies and take action before a breakdown occurs. With implementation of visual inventory replenishment systems such as Kanban, pull systems etc, 6-S would aid in organizing and simplifying the management of the physical inventory. Proper organization would ensure minimal material handling by using 'Point of use' storage with applicable and visual replenishment signals (Bicheno 2004; David Mann 2005; Lu 1989; Womack et al 1990).

7.2 RESULTS OBTAINED IN SHOP FLOOR

Document reality (Before implementation of 6-S principles):

- Parts are stored together irrespective of types
- Traceability of parts are very difficult
- Identification of parts not prominently visible
- Parts of different kits are jumbled up
- Unwanted items are lying on the shop floor
- Packing materials are scattered in racks
- Untagged items exist in the work place
- Machines/Tools are not properly identified
- Man & Material movements are excessive

Table 7.1 Results obtained in Shop floor

Impact measures	Before 6-S activity	After 6-S activity
Average man movement per part	13.2m	1.6m
Average part movement per assembly	6.1m	0.8m
Average searching time per part	15 min	2 min
Average untagged parts in the racks	12	Nil
Average number of personnel undergone first aid treatment due to workplace accidents	22	2

Table 7.1 clearly depicts the benefits obtained in Shop floor after the implementation of 6-S in HAL. The results helped imparting realization that 6-S implementation helps reduce the transport, motion, waiting, defects and extra processing.

7.3 RESULTS OBTAINED IN STORES

Document reality (Before implementation of 6-S principles):

- Identification labels are not present in the bins
- Parts are not arranged according to frequency of use
- Time for issuing parts to shop floor varies from 5 to 30 minutes
- Two Bin system does not exist
- Parts are stored in two different locations
- Same Bin contains different parts/items
- Some Bins are empty
- Current inventory not available

Table 7.2 Results obtained in Stores

Impact measures	Before 6-S activity	After 6-S activity
Average Man movement per shift	400 m	50 m
Average Cycle time for issuing parts	20 min	3 min
Average Number of Hands off	2	1
Inventory	More	Less/JIT
Average number of personnel undergone first aid treatment due to workplace accidents	15	1

Table 7.2 shows the enhanced efficiency obtained in Stores after the implementation 6-S in HAL. The results depicted that 6-S implementation helps to reduce the issuing time, inventory, hands off and workplace accidents.

7.4 RESULTS OBTAINED IN OFFICE

Document reality (Before implementation of 6-S principles):

- Office items are not arranged properly on the work tables
- Files and documents are not arranged for proper traceability
- Filing cabinets do not have index list
- Unwanted items are lying on file racks
- Door range marks and corner marks are not shown
- Updated list of important phone numbers and name boards are not displayed
- Unused table and chairs are kept in the room
- Files are scattered on the computer tables
- Unused typewriters are lying in the office

Table 7.3 Results obtained in Office

Impact measures	Before 6-S activity	After 6-S activity
Average man movement per day	125 m	75 m
Average cycle time for getting a file	15 min	2 min
Average number of hands off	2	1
Average number of outdated files	12	Nil
Average number of personnel undergone first aid treatment due to workplace accidents	1	Nil

Table 7.3 projects higher efficiency obtained in office after the implementation of 6-S in HAL. The results depict that 6-S implementation helps to reduce the motion, file retrieval lead time and defects (out dated files).

7.5 RESULTS OBTAINED THROUGH '6S-SAFETY HOUSE'

The following benefits were identified while using '6S-SAFETY HOUSE' during the 6-S audit:

- Zero standard deviation in the 6-S audit score because of the checklist
- Customization of the audit sheet enabled by the software
- Covering of all aspects ensured by the checklist
- Computerization reduced the time required for completion of the audit
- Storability of the audit score in the database for analyzing the improvements

- Revision of the audit sheet allowed for input of new ideas
- Good acceptability and visibility of audit scores

7.6 RESULTS OBTAINED THROUGH A3 REPORT

The following benefits were identified on implementation of A3 reports in 6-S during the implementation study at HAL:

- Improvement in 6-S scores at a faster rate
- Involvement of personnel in identification and solving of problems is more
- Focus is on the root cause of the problem rather than jumping into action
- Sharing of responsibility for bringing about improvement in their work
- Improvement/betterment in 6-S process

Table 7.4 Results obtained from A3 reports

Implemented Area	Rate of increase in 6-S score	
	Before A3 report	After A3 report
Tool crib, LCA Production Group, HAL, Bangalore	2.81 (Table 6.2)	4.96 (Table 6.3)

Table 7.4 shows improvements at Tool crib after the implementation A3 reports in 6-S activities. The results readily exhibit that A3 report implementation helps increase 6-S score at a higher rate.

7.7 CONCLUSION

The results project the benefits of 6-S which enormously reduced searching, man and part movement, down time, safety hazards, along with improved flow, fewer mistakes, and better utilization of space. These daily benefits add up to tremendous yearly improvements in productivity, quality, cost effectiveness, delivery, safety and morale. The computational 6-S auditing methodology helps in implementing and sustaining the 6-S principles. This auditing system improved safety in working environment along with reduction in wastes. The results of implementation study clearly illustrate that computational based 6-S auditing help drastically improving the 6-S implementation and its sustenance.

The success of 6-S implementation depends on the employees' involvement, which is driven by motivation. A3 Reports help improve the 6-S performance and communication among employees which is one of the major motivation factors. Results of the implementation study show that A3 reports play an important role in 6-S activity improvement.