

4.Implementation

During the implementation process each of the tabulated steps was implemented in various stages. Feedback from each stage was evaluated by audit and necessary corrective actions were taken to improve further upon. . This results in continual improvement to attain the required level for each step. Table 3 shows the statistics of Training program and the results of on-line tests conducted. Table 4,5,and 6 provide checklist for audit and evaluation.

Table 3 Training and Awareness Details

Category	Number of Participants	Scored 75% and Above	Scored less than 75%	Pass Percent (%)	Cumulative Pass Percent (%)	Remarks
Teaching Staff First attempt	320	214	106	67	67	Those scored less than minimum marks are suggested to attend the retest after one more awareness program.
Second attempt		106	98	92	97.5	Results after Second attempt
Non-Teaching Staff First attempt	110	64	46	58	58	First attempt
second attempt		46	37	80	92	Those scored less than minimum marks are suggested to attend the retest after one more awareness program
Rest of the staff						Scored the minimum pass percentage in the third attempt

Table 4 Audit Check List on 1S

SORT	Unacceptable	Poor	Good	Excellent	World Class
Sort out items that are required and not required. The items not required and not being used should be removed from all work places					
1. Items/supplies on surfaces in office /staff rooms have been sorted, as needed and not needed	1	2	3	4	5
	Details:				
2. Items/supplies in bookcases or on shelves have been sorted, as needed and not needed.	1	2	3	4	5
	Details:				
3. Items in cupboards, drawers , desk and file drawers have been sorted, as needed and not needed	1	2	3	4	5
	Details:				
4. Items on floors have been sorted, as needed and not needed.	1	2	3	4	5
	Details:				
5. Items required frequently are placed close to work place for better ergonomics.	1	2	3	4	5
	Details:				
6. Unwanted items have been removed from the work place.	1	2	3	4	5
	Details:				
7. Work agreements for the above are documented and all staff know where to find the agreements.	1	2	3	4	5
	Details				

Legends:

Unacceptable: No Evidence shown

Poor Quality: Evidence at random

Good: Applied and mostly evident

Excellent: Thoroughly evident and fully applied

World class: Continuously looking for ways to make more improvements

Table 5 Audit Check List on 2S

SET IN ORDER A place for everything and everything in its place so it should be easy to find	Unacceptable	Poor	Good	Excellent	World Class
1. List of items required at the workplace with location and quantity are available.	1	2	3	4	5
Details:					
2. Items needed are labeled and are kept in identified locations	1	2	3	4	5
Details:					
3. Frequently used items are kept very close to the work place and items required rarely are kept away.	1	2	3	4	5
Details:					
4. Visual controls and indicators are established (Floor marking tapes, name boards, direction signs, safety signs etc.)	1	2	3	4	5
Details:					
5. System to ensure reorder level on critical items	1	2	3	4	5
Details:					
6. Contents of drawers and cupboards are labelled and indexed	1	2	3	4	5
Details:					

Table 6 Audit Check List on 3S

SHINE All work places should be cleaned regularly and maintained in ready to use condition.	Unacceptable	Poor	Good	Excellent	World Class
1. Work areas and equipment are cleaned and organized consistently as per schedules.	1	2	3	4	5
Details:					
2. All team members ensure maintenance	1	2	3	4	5
Details:					
3. Any deviation from schedule are to be documented for analysis and corrective action	1	2	3	4	5
Details:					
4. Surfaces of all equipment and work places are cleaned without debris and dusts.	1	2	3	4	5
Details:					
5. Monitor activities of ongoing Shine duties as in Check lists and update the status.	1	2	3	4	5
Details:					

5. Results and Discussions

5.1 Sort (1S): All items in work places are sorted as:

1. Damaged and cannot be used
2. Items that are working but not required at the work place
3. Items that are working but not required at the work place
4. Items that are working and needed at the workplace

Pictures before and after Sort are taken (Figure 3)



Before

After

Figure.3. Sorting

The objective is elimination of items that are not required at the workplace. Items mentioned under 5.1 1), 2), and 3) are pinned with “Red tag” (Figure 4). These items stored in a local Red Tag Area for a specific period of time and disposal actions are initiated as per Disposal Procedure. Outcome of sort action is gain in space.

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Date:	Red Tag No:
REASON	
1. Obsolete	5. Unnecessary
2. Defective	6. Mix up
3. Retention Period Over	7. Unidentifiable
4. Scrap	8. Others
ACTION	
1. Move to scrap area	4. Rectify
2. Locate properly	5. Return to Supplier
3. Segregate	6. Others
Target Date:	
Remarks	
Responsibility	

Figure.4.Red Tag



Fig.5.

Fig.6.

Fig 5&6. Set in order

5.2 Set in order (2S):

Items under category 4 are the needed items in the workplace. These items are labelled and stocked under marked locations (Fig 5&6). List of these items with locations are documented such that they are easy to locate for usage. Every item in a work place are provided with a specified location, thereby retrieval of any item is made easy. While arranging, care is to be taken to keep items frequently used at the point of use and rarely used items shall be kept off the work place. Mark locations by creating addresses. Applying label, with quantity. Use color codes where required (Fig 7). Setting in Order is important because it enhances the required activities in day to day operations and also saves time. Photos are taken before and after implementation. By set in order, retrieval time is faster which results in improving efficiency and effectiveness of individual and the system as a whole.

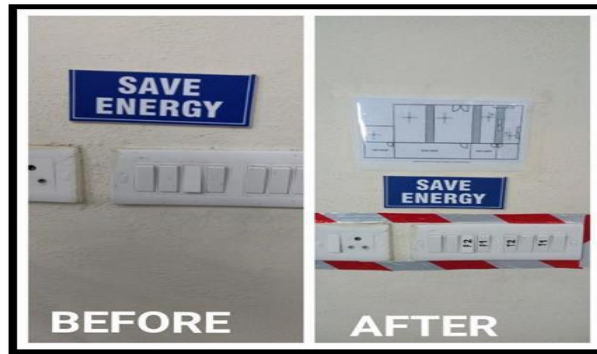


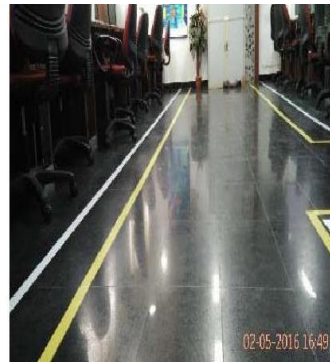
Figure 7 Switches in the class room labeled for identification

5.3 Shine (3S):

The objective of shine is to keep entire workplace neat and clean. The working environment should be a clean and bright place which is a motivation factor for everyone to enjoy his work. Practice of cleaning should become a part of daily work habits, so that work areas, equipment, and tools are ready for use at all the times. .By systematic cleaning and inspection, one can easily identify inconsistencies, problems and opportunity for improvement in the system.^[5] Representation of Laboratory floor with floor mark to ensure free aisle space is shown in Fig 8(a) &8(b). Fig 9 shows visual representation of unsafe area (back side of door opening). Fig 10 shows motivational slogans on staircases to inspire the minds of everyone in the workplace. Fig 11(a) shows unsafe area with electrical wires hanging and to ensure safety, corrective action is shown in Fig. 11(b). 5S Corner in working area is provided to create awareness and used as a communication board to display the progress.



(a) Before



(b) After

Figure.8. Shine with visual management



Figure.9 Safety sign indicating unsafe area



Figure.10 Staircase steps showing the slogans



Figure 11 Safety a concern (Before & After)






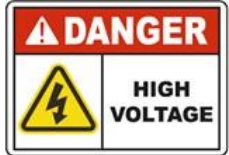

5.4 Standardize (4S):

The objective of Standardization is to ensure a clutter free, clean and organized workplace through integration of the first three activities namely sort, set in order and shine. This is accomplished by assigning responsibilities for various 5S activities. Standard operating procedures for equipment, checklists for various activities, templates are developed. In order to make this implementation effective, weekly, monthly, half yearly, annual events are scheduled in addition to daily 5S Tasks. Periodical audits are planned to monitor the effectiveness of implementation. During this phase, team identifies ways to establish the improved workplace practice like visual management. List of standard color codes and safety signs are given in Table 7 as per IS 9457/2005 standard ^[13]

5.5 Sustain (5S)

Self-discipline and training are the two important factors to sustain the 5S implementation. Internal and external audits are scheduled periodically to monitor the system effectiveness and continuous improvement. Periodical walk around the campus are made to ensure litter free campus and to observe any deficiency/scope for improvement. Good efforts taken to sustain 5S implementation are recognized and rewarded. 5S initiative is a part of orientation program to both newly recruited staff and newly joined students

Table 7 Standard Codes

Sample color codes			Sample Safety Signs	
	Yellow	Walk path, Work Cell	Prohibited Area	
	Red	Scrap, Defects	Speed Breaker	
	Red stripe with white background	Unsafe zone / Area To keep hazardous items	Danger High Voltage	
	Black stripe with yellow back ground	Caution Zone (Speed Breaker)		

Tables 8, 9 and 10 show the results of implementation of 5S campus wide

Table 8 Details of Suggestions from Stakeholders

S.No.	No. of zones	No. of suggestions	No. of suggestions shortlisted	Short term	Long term	Remarks
1	21	80	20	16	4	All short term goals are completed. Long term goals are in progress

Table 9 List of Short Term Goals and the Status

S.No	Description of Suggestion	Before	After	Remarks
1,	Dust bins required for nearest points	One / floor	One/class room	Completed
2.	Comfortable place to keep duster/marker of white board	Contents falling down often	Redesigned as box structure	Completed
3.	Window lock get stuck often	---	Suitable locks provided in respective places	Completed
4.	Direction boards availability	At few places	At all the blocks and floors	Completed
5.	Damaged electrical switches	At a few damaged locations	Damaged ones replaced and the switches upgraded	Completed
6.	Mix up of components at various places	-	Sorting done as per red tag procedure	Completed
7.	Fire extinguishers operating procedure	Not known to All	Training provided	Completed
8.	Water stagnation in kitchen areas	Found	Rectified	Completed
9.	Damaged tiles at few locations	Found	Replaced	Completed
10.	Loose wires, extra wires in various locations	Found	Rectified	Completed
11.	Wash room cleaning	Not effective	Deep cleaning done & frequency increased	Completed
12.	File management	Retrieval time more	Training provided. Retrieval time significantly reduced	Completed
13.	Open area	Found with litter	Students are trained and campus made litter free	Completed
14.	Cub boards and shelves	Not labeled	Labeled and indexed	Completed
15.	Emergency Exit preparedness	Not significant	Procedure made available at all locations	Completed
16.	Visual management	Not significant	Color coding procedure made as per standards	Completed

Table 10 List of long term goals and the status

S.No.	Description	Before	After	Remarks
1.	Proper Painting for the respective places	Same kind of paint was used in all the areas	Washable distemper paint recommended	On going
2	Respective labs and amenities in same block to minimize motion	Same lab used in common	Planned to have facility school wise	On going
3.	Walking space for pedestrians	No demarcation for pedestrians	Demarcation made completed	Separate platform in future
4.	Leaky floors during heavy rains	Inadequate Weathering course	Updated weathering course in progress	On going

6. Conclusions

Creating awareness and training of all stake holders is a critical step in 5S implementation. All stakeholders Management, Staff, Students, service agencies have equal participation and contribution to make the system efficient and effective. The outcome of 5S implementation has created a clean and orderly environment. Self- discipline of Staff and students have improved considerably. Hindustan Institute of Technology & Science is the first educational institution in India to receive global certification from TuV Rheinland for 5S implementation. This has inspired the minds of all Management staff, Faculty members and Students to excel in a clean, safe and thought- nurturing environment. In future various non -value added activities in the system shall be identified for necessary corrective actions. Also, the monitoring of time management for various activities shall be made which can improve the overall efficiency further.

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Biographies



Mr. Ashok G. Verghese, is the Director of Hindustan Group of Institutions, Chennai that includes several premier institutes of Higher Education. He completed his graduation in Mechanical Engineering & MBA from Madras University. To further hone his managerial skills he pursued an Executive Management Program at Michigan University, USA. He is a member of several Professional organisations namely MMA, IE, IEEE, SAE, ACM, American Institute of Aeronautics- (AIAA) to name a few. He has several accolades to his credit including the IEEE Award for Outstanding Achievements. He has initiated the establishment of 14 Centres of

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Mr. K. Viswanathan has experience in Manufacturing Industries like shock absorbers, signage industries, Bi-metal bearings for more than 25 years and now he is an Associate Professor with School of Mechanical Science, Hindustan University, Chennai. He completed his graduation in Mechanical Engineering & M.E. (Engineering Design) from Madras University. He coordinates 5S implementation activities in Hindustan University and obtained 5S Certification from TuV Rheinland, India. He is currently pursuing his Ph.D degree on Condition Monitoring of Machines. He also coordinates Student Chapter Activities of Condition Monitoring Society of India.



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