

Enhancing Productivity and Safety in an Engineering System Using 5S: Sinter Plant Store of ASCL as a Case Study

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Abstract: The store of Sinter plant, one of the Subsidiaries of Ajaokuta Steel Company Limited (ASCL), was in a shady and untidy condition. Only the storekeeper could retrieve a spare part or tool from the store after a strenuous search for 15-20 min. This most often, led to delay in production and/or mix-up in materials when a spare part or tool (component) was urgently needed on the production/process line. A 5S programme focuses on having a visual order, organization, cleanliness and standardization. 5S Pillars which include; sorting (seiri), systematic arrangement (seiton), shining (seiso), standardizing (seiketsu) and self-Discipline (sustaining) (shitsuke) were employed to the store of sinter plant. The store was compartmentalized with the tools, spare parts, equipment, consumables, etc. arranged according to functions, sections and usage. Labeling and colour coded storage locations were used in achieving this. Atheistically, the store looks very beautiful. Sorting and retrieval of spare, tools, etc can now be carried out not only by the store-keeper but by any staff in <3 min. The overall result is an improved productivity, efficiency, service and safety in the Sinter Plant store of ASCL.

Key words: Safety, productivity, 5S, sinter plant store, engineering system, ASCL

INTRODUCTION

A visit to sinter plant store before the implementation of 5S programme showed a dirty, unkept, unorganized and untidy place. Tools, spare parts, equipment, consumables, containers of different materials, etc. were littered all over the store. This made sorting and retrieval of materials a difficult task. Movement through the store in search of needed materials was also not easy as one must be careful not to be wounded by the littered materials. This is due to the unorganized and/or poorly arranged materials in the store. All these affected productivity as a lot of time was spent on sorting and retrieval of materials required on the production line.

One of the objectives of this research is reclaim valuable floor/work space by properly arranging needful spare parts, tools, consumables, etc. and consciously eliminating spoilt (bad), broken tools and excess materials from the store. This will drastically decrease the potential of accidents within the store. This research also aims at ensuring that sorting and retrieval of materials is achieved at the minimum possible time there by improving productivity.

The condition of sinter plant store of ASCL before the implementation of 5S was not peculiar to sinter plant

store alone. Most offices, workshops, shades, factories in most of the developing countries are faced with the same condition. This research by extension intends to initiate a systematic and gradual implementation of 5S programme in Nigeria with FUT, Minna taking the lead.

A 5S is a basic, fundamental, systematic approach used for productivity, quality and safety improvement in all types of businesses. Simply put, a 5S is a method for organizing a workplace, especially a shared workplace (like a shop floor or an office space) and keeping it organized. It's sometimes referred to as a housekeeping methodology, however, this conception can be misleading because organizing a workplace goes beyond house keeping. A 5S is a system used to reduce waste and optimize productivity through maintaining an orderly workplace and using visual cues to achieve more consistent operational results. Implementation of this method cleans up and organizes, the workplace basically in its existing configuration and it is typically the first lean method, which organizations implement.

A 5S was invented in Japan and stands for 5 Japanese words that start with S, seiri, seiton, seiso, seiketsu and shitsuke. Equivalent sets of 5 'S' words in English have likewise been adopted by many to preserve the 5S acronym in English usage. These are sort, set (in place), shine, standardize and sustain.

The key targets of the 5S are workplace morale and efficiency. The assertion of the 5S is, by assigning everything a location so that time is not wasted by looking for things. Additionally, it is quickly obvious when something is missing from its designated location. The 5S advocates believe the benefits of this methodology come from deciding what should be kept, where it should be kept and how it should be stored. This decision making process usually comes from a dialog about standardization which builds a clear understanding, between employees, of how research should be done. It also instills ownership of the process in each employee.

The 5S pillars, provide a methodology for organizing, cleaning, developing and sustaining a productive work environment. In the daily research of a company, the routines that maintain organization and orderliness are essential to a smooth and efficient flow of activities. This lean method encourages workers to improve their working conditions and helps them to learn to reduce waste, unplanned downtime and in-process inventory.

Everyone and all types of businesses benefit from having a 5S program. Manufacturing and industrial plants come to mind first, as those are the business that can realize the greatest benefits. However, any type of business, from a retail store, a power plant, hospitals, television stations to all types of businesses and all areas within a business, will realize benefits from implementing a 5S program.

The precipices underlying a 5S program at first appear to be simple, obvious common sense of which they are. Not until the advent of 5S programs many businesses ignored these basic principles. However, a typical 5S implementation would result in significant reductions in the square footage of space needed for existing operations. It also would result in the organization of tools and materials into labeled and color coded storage locations, as well as kits that contain just what is needed to perform a task. All employees participate in perfect 5S promotion activities. It targets to reform the consciousness and raise the awareness of each employee.

IMPLEMENTATION OF 5S PROGRAMME

The 5S program focuses on having visual order, organization, cleanliness and standardization. It is a cyclical methodology, which is a progressive use of 5S pillars; sort, systematic arrangement, shine, standardize and sustain.

Sort (seiri): Sort, the 1st S, focuses on eliminating unnecessary items from the workplace that are not needed

for current production operations. An effective visual method to identify these unneeded items is called red tagging, which involves evaluating the necessity of each item in a work area and dealing with it appropriately. A red tag is placed on all items that are not important for operations or that are not in the proper location or quantity. Once, the red tag items are identified, these items are then moved to a central holding area for subsequent disposal, recycling, or reassignment. Sorting is an excellent way to free up valuable floor space and eliminate such things as broken tools, obsolete jigs and fixtures, scrap and excess raw material. The Sort process also helps prevent the JIC job mentality (Just In Case.) Keep only what is necessary. Don't keep things around just because they might be used, someday. Sorting is the 1st step in making a work area tidy. It makes it easier to find the things you need and frees up additional space (Imai and Masaaki, 1986).

Systematic arrangement (seiton): This is the 2nd S in a 5S programme and it focuses on creating efficient and effective storage methods to arrange items so that they are easy to use and to label them so that they are easy to find and put away. This step is to organize, arrange and identify everything in a work area for the most efficient and effective retrieval and return to its proper place.

The commonly used tools should be readily available. Storage areas, cabinets and shelves should be properly labeled. Clean and paint floors to make it easier to spot dirt, waste materials and dropped parts and tools. Outline areas on the floor to identify work areas, movement lanes, storage areas, finished product areas, etc. Put shadows on tool boards, making it easy to quickly see where each tool belongs. In an office, provide bookshelves for frequently used manuals, books and catalogs. Label the shelves and books so that they are easy to identify and return to their proper place.

The objective in this step is: A place for everything and everything in it's place, with everything properly identified and labeled. This means there are 2 important parts to Systematic Organization-putting everything in its proper place and setting up a system so that it is easy to return each item to its proper place. The 2nd part is where good labeling and identification practices are important.

Shine (seiso): This is the 3rd S in the 5S programme. Once you have eliminated the clutter and junk that has been clogging your work areas and identified and located the necessary items, the next step is to thoroughly clean the work area. Daily follow-up cleaning is necessary in order to sustain this improvement. This could also be thought of as inspecting. While, cleaning it's easy to also inspect the machines, tools, equipment and supplies you work with.

Regular cleaning and inspection makes it easy to spot lubricant leaks, equipment misalignment, breakage, missing tools and low levels of supplies. Problems can be identified and fixed when they are small. If these minor problems are not addressed while small, they could lead to equipment failure, unplanned outages or long-unproductive-waits while new supplies are delivered. When done on a regular, frequent basis, cleaning and inspecting generally will not take a lot of time and in the long run will most likely save time.

Standardize (seiketsu): To ensure that the first 3 steps in your 5S program continue to be effective, the 4th step is to simplify and standardize. Standardization, creates a consistent approach with which tasks and procedures are done. The good practices developed in steps 1 through 3 should be standardized and made easy to accomplish. This is achieved by developing a work structure that will support the new practices and make them into habits. As you learn more, update and modify the standards to make the process simpler and easier.

The 3 steps in this process are assigning 5S (Sort, Set in Order, Shine) job responsibilities, integrating 5S duties into regular work duties and checking on the maintenance of 5S. Some of the tools used in standardizing the 5S procedures are: job cycle charts, visual cues (e.g., signs, placards, display scoreboards), scheduling of 5 min 5S periods and check lists.

One of the hardest steps is avoiding old work habits. It's easy to slip back into what you've been doing for years. That's what everyone is familiar with. It feels comfortable. Use standards to help people work into new habits that are a part of your 5S program. Any easy way to make people aware of and remind them about the standards is to use labels, signs, posters and banners.

Sustain (shitsuke): This is by far the most difficult S to implement and achieve. Human nature is to resist change and more than a few organizations have found themselves with a dirty cluttered shop a few months following their attempt to implement 5S. He tendency is often to return to the status quo and the comfort zone of the old way of doing things. Sustain focuses on defining a new status quo and standard of work place organization. Without the Sustain pillar the achievements of the other pillars will not last long.

Tools for sustaining 5S include signs and posters, newsletters, pocket manuals, team and management check-ins, performance reviews and department tours.

Organizations typically seek to reinforce 5S messages in multiple formats until it becomes the way things are done. Once fully implemented, the 5S process can increase moral, create positive impressions on customers and increase efficiency and organization. Not only will employees feel better about where they work, the effect on continuous improvement can lead to less waste, better quality and faster lead times. Any of which will make your organization more profitable and competitive in the market place (http://en.wikipedia.org/wiki/5S_%28methodology%29).

5S in a business context, the 5S methodology has been adopted into a variety of organizations from small business to fortune 500 companies. All implement the 5S's in the hope to improve productivity and performance. Such organizations and their achievements include:

Hewlett-packard support center:

- Improved levels of quality communication and information sharing
- Reduced training cycle for new employees
- Reduced call backs
- Reduced call time per customer

Boise cascade:

- Reduced stored parts inventory at one facility by \$300,000
- Incident rate division wide reduced by 1.5%
- Reduced machine downtime
- Office and plant space made available

Boeing:

- Improved productivity
- Improved morale
- Increased levels of product quality
- Improved safety (Emiliani *et al.*, 2007)

Sinter plant of ASCL: The Sinter Plant is one of the Raw Material Handling and Preparation Plant of ASCL. Its major function is to fully satisfy the Iron Making and Steel Making Plants of ASCL with quality Fluxed Sinter which amounts to about 2.6 MT/year. The main raw materials for the preparation/production of quality Sinter are: Iron Ore Concentrate; Metal Bearing Waste; Maganses Ore; Limestone; Lime Screenings; Dolomite Ore, Coke Breeze (Fuel); Sinter Returns; Blast Furnace Dust; Scales; Losses etc. The actual balance of materials for high quality Sinter Production is as shown in Table 1. Sinter Plant of ASCL was operated between June to August 2006 at a production capacity of about 15-20%. With the

Table 1: Actual balance of sintering process

Component	(%)	T/Hr	Thou.T/year
Iron ore concentrate	39.00	253.10	2005.00
Scales	0.70	4.70	37.00
Blast furnace (flue) dust	0.30	2.00	16.00
Iron bearing sludge	1.20	7.70	61.00
Maganese ore	1.50	9.60	76.00
Limestone	7.60	49.20	390.00
Lime screenings from lime shop	0.20	2.30	10.00
Dolomite	4.60	29.70	235.00
Coke breeze	4.60	30.30	240.00
Sinter screenings from iron making plant	3.30	21.50	170.00
Sinter plant returns	30.00	194.80	1543.00
Stock materials moisture	7.00	45.50	360.00
Total	100.00	649.00	5143.00

implementation of 5S at three strategic areas of the Plant, namely the Sinter Plant Store, the stock bins building and the the Sinter building the production capacity increased to between 45-55% (ASCL, PP and C Monthly Records 2006).

Sinter plant store: The sinter plant store is one of the many sectional stores in ASCL. It is a sub-store meant for the storage of spare parts, tools, equipments, consumables etc which are for immediate use at the plant. This is to avoid frequent visit to the Central Equiplent Store whenever any of these components is/are required during production or maintenance at the plant. Most often requests for these components are made and collected from the Central Store and kept at this Sinter plant store for easy and quick retrieval when needed.

The Sinter Plant store is centrally located within the sinter plant. This makes it very accesible from every/any section of the sinter plant. It is a room of about 2.5 m width and 6 m long. It is made up of 5 racks with 3-4 shelves each. The implementation of 5S at this store helped employee understanding of proper waste handling and mamagement procedures as well as workshop harzards and appropriate emergency response procedures.

MATERIALS AND METHODS

This resaerch was carried out at the sinter plant store of Ajaokuta Steel Company Limited (ASCL), Ajaokuta. ASCL is the biggest integrated Iron and Steel Plant in Nigeria. The Plant is located in Kogi state and it is designed to produce 3.4 million tons of liquid steel in the firsrt phase and 6.5 million tons in the second phase.

The implementation of 5S programme does not in any way interfer nor take the place of the normal duty of a staff. It is most often implemented in between and as part of the normal official duty. It is a progressive and continious which is expected to be inculcated and developed by staff as part of their regular official

assignment. This maked 5S programme a gradual, systematic, continious and progressive activities. Thus, this resaerch by the nature of 5S spanned for about one year (September 2006 to August 2007). Before launching into 5S activities, the 1st thing to do is to take photographs arround workplace. These will be useful for comparisim purposes when 5S is in full swing (hrdc@satyam.net.in.).

5S awareness course/training: All employees participated in 5S activities. This was to reform the consciousness and raise the awareness of each employee. Thus the first step was to train internal facilitator whose function is to organize and lead other staff of Sinter Plant in 5S activities. Organizing 5S awareness course for all the staff followed this. The entire staff were grouped in batches and trained. Thorough 5S education is provided since no significant results from 5S can be expected unless all employees act with great awareness. This leads to the development of self-directed employees. Team base activity results in improved pride and ownership within the workshop with the accompanying increase in performance (5S and Visual Control, 2007).

Declaration of manager model area: The Sinter Plant Store was chosen and declared a manager model area. By this declaration a lot of attention was focused on it. Tuesdays of every week was also devoted as 5S Days. Boundary was demarcated, defined and called Manager Model Zone. Zonal Members were nominated and a zonal leader appointed. These members, regardless of their official duty post, spend 30-60 min performing 5S activities at the store on 5S Days (Tuesdays). The roles and responsibilities of the zonal leader and every member were spelt out. The zonal leader ensures that every member understands and performs his/her roles as assigned for that day.

Construction of activity board: 5S Activity Board was constructed. On this board every activity carried out in this store was recorded and pasted each 5S day. Seven racks of 6 shelves each were equally constructed and painted for stacking of spares parts, tools, equipments, consumables, etc.

Creation of red tag area: An area beside the store was marked for the disposal of unnecessary materials. This area is called the Red tag Area. This area was demarcated with a red ribbon. At this area, all the items that are not necessary were kept for subsequent disposal, recycling or reassignment as the case may be. The area was further divided into subunits, the subunits hold different items

like mechanical, electrical, instrumentation, project materials, etc. A red tag sign-board was constructed and placed at the area. On the red tag sign-board, all the items kept at the red tag area are systematically recorded.

Implementation of sorting (1S): Three pictures were taken from different but marked positions. These pictures show, the initial conditions/situation of the store. A lot of activities were done under 1S such as sorting and evaluating the necessity of all the items in the store. The unwanted items were removed to the red tag area. This was closely followed by identification of all spares parts, tools, equipment and consumables. An inventory of these items was compiled/made. At the end of this exercise the store was audited 1S.

Implementation of systematic arrangement (2S): The sorted and separated items were grouped into 3 broad sections-mechanical, electrical and other materials for proper stacking. The racks constructed were placed in positions in the store. All the items in the store were therefore repositioned on the racks to reflect the three zones (grouping). All the items were systematically arranged. By this, each item has a definite position and if removed for any purpose, it will be returned to that definite position. The FIFO (1st in 1st out) order of stacking V-belts was adopted. Further training of staff on 2S was made. The store was then audited for 2S audit.

Implementation of shinning step (3S): The racks were cleaned, painted and labeled. Thoroughly cleaned also were the floor, walls and windows of the store. All the items were cleaned; demarcated with a solo tape (items by items and groups by groups) and labeled. Regular cleaning of the entire store in order to sustain these improvements is very necessary.

Implementation of standardization (4S): A direction board that shows the rack (s)/shelves and the group (s)/item (s) stored on them was made and placed in front of the store. With this board every staff can comfortably locate and retrieve any item from the store at a very minimum time. Three colours lines of about 100 mm thick/width were also drawn from the door to racks containing the items as grouped-Mechanical, Electrical and Others. All items in the store were made to conform to the laid down standard. The 4S audit was then conducted and 3 pictures taken from the same positions as that of the initial pictures.

Implementation of self discipline, sustainance (5S): This is the most difficult S to implement and achieve. Human

nature is to resist change. The tendency is often to return to the status quo and the comfort zone of the 'old ways' of doing things. Thus a monthly auditing method was instituted as a measure to resist this. Regular cleaning (on daily basis) by the storekeeper is yet another means of sustaining these improvement.

RESULTS AND DISCUSSION

The results of this study are presented in Fig. 1-4 and Table 2-6, respectively. Plate 1 shows the activity board. Figure 2a-c shows the 3 initial pictures of the situation of the store before starting 5S activities. Figure 3a-c shows the 3 final pictures taken from the same positions as the 1st 3 initial pictures, while Fig. 4 the overall view of the store after 5S.

Progressive data collection, recording and analyses is very useful in all the steps of 5S implementation. Thus the need for a recording format termed Audit sheet. These audit were prepared to suit the 5 S activities in sinter plant store using the checklist from Distance Training Programme (DTP) Manual on 5S and Kaizen Course materials, Human Resources Development Center, Iajpat Nagar-1, New Dehli-110035. The audit sheets for 1S, 2S, 3S and 4S are shown in Table 2-5, respectively.

Table 6 is the cumulative/overall progressive improvements recorded during the 4 stages of auditing conducted by this study. Table 1 shows that the sinter plant store, based on the parameters on the audit sheets as shown in Table 2-5, has an initial assessment (before 5S implementation) of 2%. The implementation of 5S gave a progressive improvement from 18.50% during 1S auditing to 20.75, 61 and 84% during 2S, 3S and 4S audits respectively. These improvements are evident as shown in Fig. 2a-c and 3a-c, which compare the conditions of the store before and after 5S implementation.

In the same manner, sorting and retrieval of spare parts, tools, etc. that originally required a minimum of 15 min is now being achieved within 3 min. This gives a saving in time of about 12 min.

The 1st step was to train internal facilitator whose function is to organize and lead other staff of Sinter Plant in 5S activities. This was followed by organizing 5S awareness course for all the staff. This gives thorough 5S training and makes all employee act with great awareness. Without this no significant results from 5S can be expected (5S and Visual Control, 2007) Sorting, identification, evaluating and removal of unneeded items helps to reclaim valuable floor space and elimination of such things as broken tools, excess materials etc. It also decreases the potential of accident within the work place. This is made more effective by the understanding of

Table 2: 1s audit sheet for sinter plant store

		Marks obtained		
Activity	Marks allotted	(Self audit) L1>90	(Dep. Head) L2>85	(Plant head or initiative cell) L3>80
Preparation for 5S				
Has entire area been devided into zones?	5	5	5	5
Do the Zones have clearly defined boundaries and displayed on 5S Boards?	5	5	5	5
Have Zonal Incharges been identified and their names displayed on 5S Boards?	5	5	5	5
Have Zonal teams been decided and name displayed on 5S board?	5	5	5	4
Are all the team members aware of the concept of 1S?	5	4	4	4
Have the roles and responsibilities of all the team members been defined for 1S activities?	7	6	6	5
Are the people following their roles and responsibilities towards 1S?	8	7	6	6
Sub total	40	37	36	34
Red Tag area				
Has the red tag area been identified for zone and displayed at 5S board?	7	6	6	5
Is there a visual indentification of the red tag area?	8	8	7	7
Are the members aware of the red teg area?	5	5	5	4
Has a custodian been identified for the Red Tag Area and the name displayed on 5S board?	5	5	5	5
Is there ary disposal procedure for all the material lying in the red tag area?	7	6	5	5
Is the disposal system followed?	8	7	6	6
Sub total	40	37	34	32
1S activity				
Has all the unnecessary material been removed from the store?	10	10	9	8
Has all the unnecessary material been removed from area around the sorte?	10	9	8	8
Sub total	20	19	17	16
Grand total	100	93	87	82

Table 3: 2S audit sheet for sinter plant store

Activity	Max. marks allotted	Marks obtained		
		L1>90	L2 >85	L3 >80
Are all the team members aware of the concept of 2S and their role?	10	9	9	9
Are all the team members participating in the activity? (attendance record)	10	9	9	8
Does everything has its place? Is it labeled?	10	9	8	8
Is everything in its place?	10	9	8	7
Is stacking neat and stable?	10	9	8	7
Are all stacked items approachable?	10	10	9	8
Is storage in cupboards and shelves neat and tidy?	10	10	9	9
Are all jigs, tools, accessories etc. clearly grouped? (Homogeneous grouping)	10	9	9	8
Are all jigs, tools, accessories etc visible at a glance?	10	9	9	8
Have floor lines been drawn as per standard?	10	10	9	9
Total	100	93	87	81

Table 4: 3S audit sheet for sinter plant store

Activity	Max. marks allotted	Marks obtained		
		L1>90	L2 >85	L3 >80
Are all the team members aware of the concept of 3S?	10	10	9	9
Are all areas categorized into target areas for cleaning?	10	9	9	8
Is there a cleaning responsibility map?	10	9	8	8
Is the responsibility map clearly displayed on the 5S Board?	10	9	8	7
Is the method of cleaning clearly specified for each area?	10	10	9	8
Are the cleaning materials available?	10	10	9	8
Are the cleaning materials at the site of the cleaning?	10	10	9	9
Are all the storage areas clean?	10	9	8	7
Are all equipment clean?	10	9	9	8
Are all surroundings clean?	10	10	9	9
Total	100	95	87	81

proper waste handling and management procedures as well as workshop hazards and appropriate emergency response procedures gained through 5S implementation).

Putting everything in an assigned place so that it can be accessed or retrieved quickly, as well as returned to

that same place quickly will make work flow become efficient and the worker becomes productive. This will improve productivity, as is the Boise Cascade and Boeing. Before the implementation of 5S, it takes the storekeeper an average of 20 min to respond to a request. This time lag was reduced to 3 min and every staff can retrieve items

Table 5: 4S audit sheet for sinter plant stores

Activity	Marks allotted	Marks obtained		
		Self audit L1 90%	Dep. Head L2 85%	External L3 80%
Have all empty cans, boxes, and general dirt around the store removed?	5	5	5	5
Are items kept in appropriate set?	5	5	5	5
Are storage areas for defective items clearly labeled?	5	5	4	4
Are all defective items labelled and can be seen at a glance?	5	5	5	5
Is storage of products fully organized?	10	9	9	8
Are names or code numbers attached to all items?	10	10	10	10
Are there 3 Keys signs at all storage places?	10	10	9	9
Is it easy to spot items stored in the wrong place?	10	10	10	9
Is the first-in, first-out (FIFO) system being used?	5	5	5	4
Has all dust and dirt been removed from walls, windows and window sills?	5	5	5	5
Has all dust and dirt been removed from lamps and lamp covers?	5	5	5	5
Are all aisles and passages free from obstructions and protruding things?	5	5	5	5
Are all danger signs clear and easily visible?	5	4	4	5
Can all fire extinguishers, sand boxes and their signs be seen from everywhere?	5	5	4	4
Have more than 80% of floor lines been drawn?	10	10	10	9
Total	100	98	95	92

Table 6: Overall progressive improvement records of the auditing

Auditing levels	Initial assesment for each audit level (%)	Improvement	
		Expected (%)	Achieved (%)
1S	2-00	25-00	20-50
2S	20-50	50-00	40-70
3S	40-75	75-00	61-00
4S	60-00	100-00	84-00



Fig. 1: Activity board

with little or no guide. In the same, Boise Cascade Reduced stored parts inventory at one facility by \$300,000 (www.ptadc.com). In like manner, Toyota was able to reduce leadtime and cost using 5S while improving quality at the same time (<http://en.wikipedia.org/wiki/TPS>). Such improvements in productivity from 15-20% (June to August 2006) to 45-55% (September to November 2006) were recorded at sinter plant after 5S implementation (ASCL, PP and C Monthly Records, 2006). Painting of racks and some heavy equipment in the store with light colour and cleaning of the walls and windows decreases energy needs associated with lighting. It also makes it easier to notice probable potential defects on the items in the store. Regular cleaning, as part of the Shine



Fig. 2a-c: 5S in sinter plant store before

pillar, decreases the accumulation of dust, shavings, dirt and other substances that can affect the stored items



Fig. 3 a-c: 5S in sinter plant store after



Fig. 4: Over view after 5S

(particularly electrical/instrumentation items). 5S implementation can significantly reduce the square footage needed for operations by organizing and disposing of unused equipment and supplies. Less storage space decreases energy needed to heat and light the space.

CONCLUSION

The key targets of 5S are workplace morale and efficiency. The assertion of 5S is, by assigning everything a location, time is not wasted by looking for things. Additionally, it is quickly obvious when something is missing from its designated location. 5S advocates believe that the benefits of this methodology come from deciding what should be kept, where it should be kept and how it should be stored.

Once fully implemented, the 5S process can increase moral, create positive impressions on customers and increase efficiency and organization. Not only will employees feel better about where they work, the effect on continuous improvement can lead to less waste, better quality and faster lead times.

Everyone and all types of business benefit from having a 5S program.

At sinter plant Store of ASCL, the benefit of 5S is enormous. These ranged from cleanliness to easy and faster retrieval of needed items both by any body with little or no guide. Before now, only the store keeper could after an elaborate search that took a minimum of 20 min, be able to retrieve an item.

It is a fact that a lot of time, resources and energy are expended in different offices, workshops, stores etc. in trying to sort and retrieve documents, items etc as the case may be. It is also a truism that most offices, workplaces, stores etc. look very un-kept and untidy due to poor organization, arrangement and lack of cleaning.

When one moves along every street in cities, towns and villages, clusters of waste papers, polyethylene materials, broken materials etc. are found littered every where. The negative effects of these wastes on our drainage channels are unquantifiable. The aforementioned backdrops can be effectively eliminated by 5S implementation.

The last Minister of FCT, Abuja, Mallam El-Ruffai started some house keeping (5S) programmes in Abuja. For its sustenance and full benefits a systematic approach using 5S methodology is recommended. In like manners, the present government of Niger State has also started some cleaning activities within the state capital, Minna. His efforts will be futile if the entire citizenry of Minna are not carried along. This programme can only be successful and sustained by 5S philosophy.

RECOMMENDATIONS

The starting point of 5S programme is awareness creation and charity they say start at home, we therefore, recommend that FUT Minna should start a 5S implementation training and coaching programme. This will be followed by 5S implementation in the University. It

is the dream of this study that FUT Minna will initiate and will be a centre for 5S implementation in Nigeria and beyond.

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