

# Daily Waste Management Practices in Service Sector Enterprises

Joohi Chaturvedi<sup>1</sup>, Abhinav Chaturvedi<sup>2</sup>, Dr. Renu Chaturvedi<sup>3</sup>

<sup>1</sup>Senior Quality-HR Manager, Abhinav Arts NATA Academy,  
Research Scholar-IIS University, Jaipur, Rajasthan, India

<sup>2</sup>Additional Principal – NIMS University Jaipur,  
Research Scholar-Manipal University, Jaipur, Rajasthan, India

<sup>3</sup>Retired Associate Professor, Government College, Bundi, Rajasthan, India

## ABSTRACT

Every organization works for a purpose and has to undergo large number of processes and process is nothing but a conversion of inputs to outputs. During this conversion some input and output wastes are unavoidable but tangible wastes are useful inputs if used for recycling or for making different products. **Here in this paper the emphasis is on some Waste Management Practices based on the case studies done at an Automotive Service Center, NATA Coaching Academy and a Passport Service Provider.** These case studies were selected based on the fact that in service sector human element is more important and these were easily accessible. The main recommendation is that Waste Management is a way of life and it is to be lived and practiced daily to reach the apex. Wastes can also be classified as tangible and intangible wastes and the focus is also on the elimination of LEAN wastes like overproduction, over processing, inventory, waiting, transportation, defects, motion in Service Sector industries. The emphasis is on creating a Waste Management System which will help us in reaching the optimum in terms of efficiency and effectiveness of processes. **The methodology has been simple to first diagnose the process inputs and outputs and identify wastes (solid wastes & lean wastes) and measure waste level and analyze causes for same. The introduced measures were like defining the clearance frequency of records, consumable wastes, e-wastes either to reduce, recycle, reuse the wastes in daily routine. The ZED (Zero Defect Zero Effect) Certification scheme questionnaire was studied which is introduced by Quality Council of India, National Productivity Council and Ministry of Micro, Small and Medium enterprises and applied for above service sector enterprises.** The questionnaire is not yet applied for service sector enterprises. **It's feasibility was checked and some improvements were suggested.** The conclusion is that Value stream mapping (used in Passport Seva Kendra and Automotive Service Center) and waste management assessment questionnaire of ZED scheme can bring impeccable improvements even in service sector enterprises.

**How to cite this paper:** Joohi Chaturvedi | Abhinav Chaturvedi | Dr. Renu Chaturvedi "Daily Waste Management Practices in Service Sector Enterprises" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-3, April 2020, pp.826-845, URL: [www.ijtsrd.com/papers/ijtsrd30725.pdf](http://www.ijtsrd.com/papers/ijtsrd30725.pdf)



IJTSRD30725

Copyright © 2020 by author(s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



**KEYWORDS:** Waste Management, Value Stream Mapping, Lean wastes, Tangible and intangible wastes, ZED Certification scheme questionnaire

## 1. INTRODUCTION

There are 3 types of industries Primary, Secondary and Tertiary. There is variation in the type and amount of waste generated in all these three sectors and their contribution to GDP is also different. The contribution of Services (42.48-48.93% from 2007-2017) (statista.com, 2018) is on the rise and the contribution of Primary and Secondary sectors is on a fall.

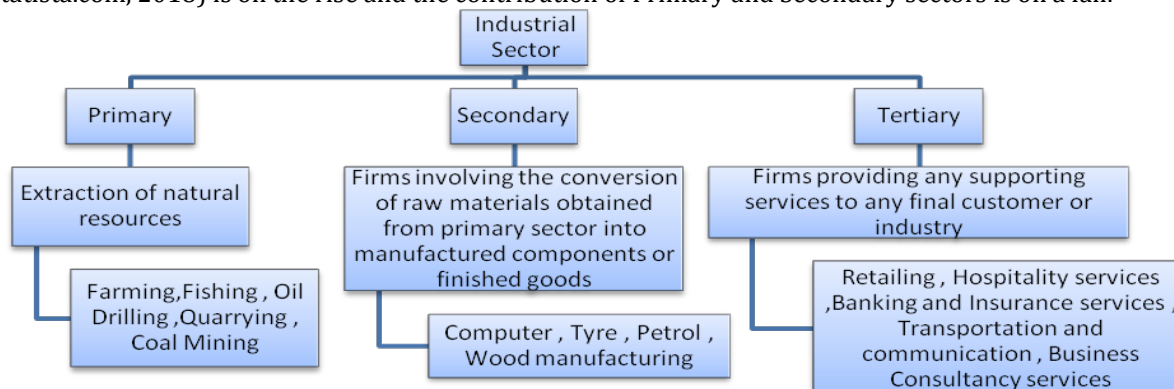
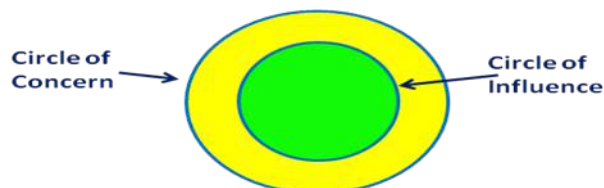
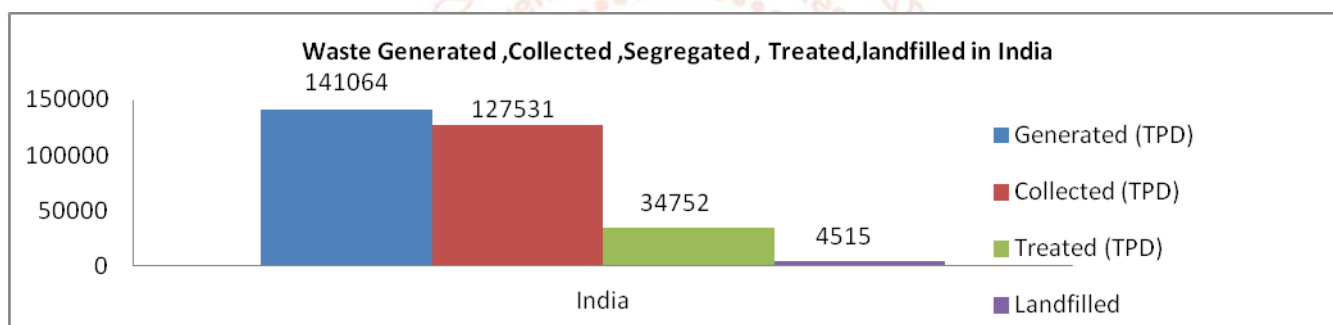


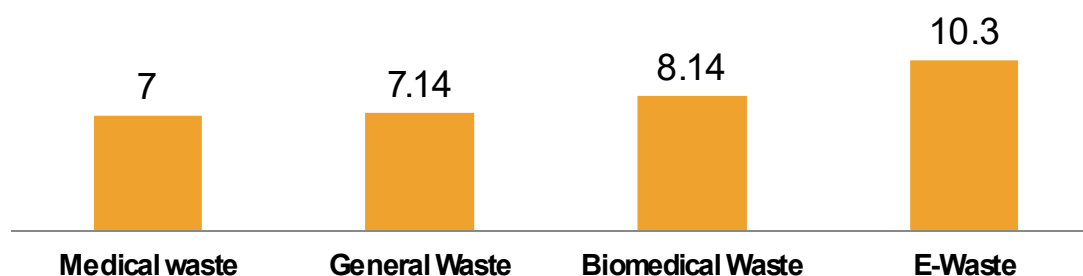
Figure1 Types of Industrial Sectors (Seet, 2016)

**1.1. Target Deployment Matrix****Figure 2 Circle of concern and influence and levels for which targets are defined (R.Covey)**

The target deployment is not transparent stage wise from India to Rajasthan to Jaipur to Sanganer ward and Mansarover Locality as data for waste generation, collection, treatment and land filling is not thorough at each stage. There are some ambiguities in present data which are questionable.

**Figure 3 Waste Generations, Collection, Segregation, Treatment in India (S. Patel, 5th Feb 2015)**

The state wise waste generation ,collection ,treatment and land filling data is given in (S. Patel, 5th Feb 2015) where Andhra Pradesh data of treated waste (4760) tones per day was more than generated waste (6402) tones per day. The top 5 states where wastes generated are more are – Maharashtra, Uttar Pradesh ,Tamil Nadu ,Gujarat, West Bengal.

**Expected increase in % in 2 years****Figure 3: Forecasted increase in % of Waste (Rajasthan Patrika, 2018)****1.2. Research Methodology**

The multi stage sampling is used as at first stage Rajasthan state and 2<sup>nd</sup> stage Jaipur district and at 3<sup>rd</sup> stage Tertiary sector is selected. Then sampling used is non random sampling (Quota Sampling) as samples were selected based on the convenience of the researcher belonging to tertiary sector. Research design is descriptive and conclusive as it is used to describe the types of lean wastes and other wastes and concludes whether Lean wastes and other wastes exist in realistic samples. The samples are assessed through ZED Certification Scheme Questionnaire and conclusion is drawn. The aim was to find out the lean and other wastes in all 3 types of samples and propose solutions

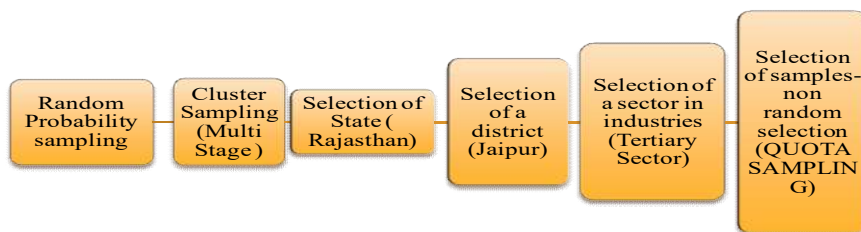


Figure 4: Sampling Scheme used (Kumar, 2011)

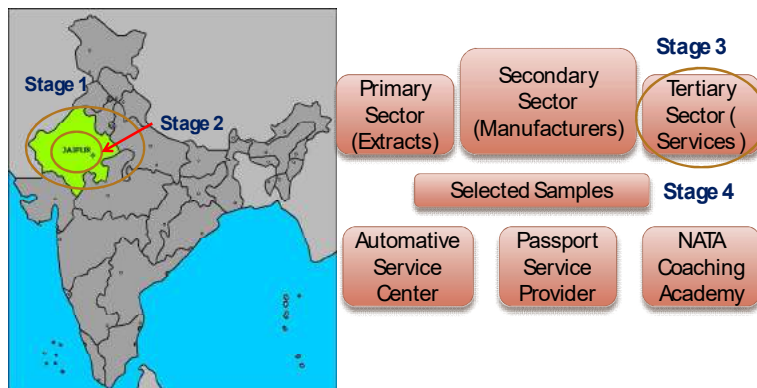


Figure 5: The stage wise thought process for selection of samples (The Industrial Sectors)

## 2. THE SELECTED SAMPLES AND THEIR FUNCTIONS

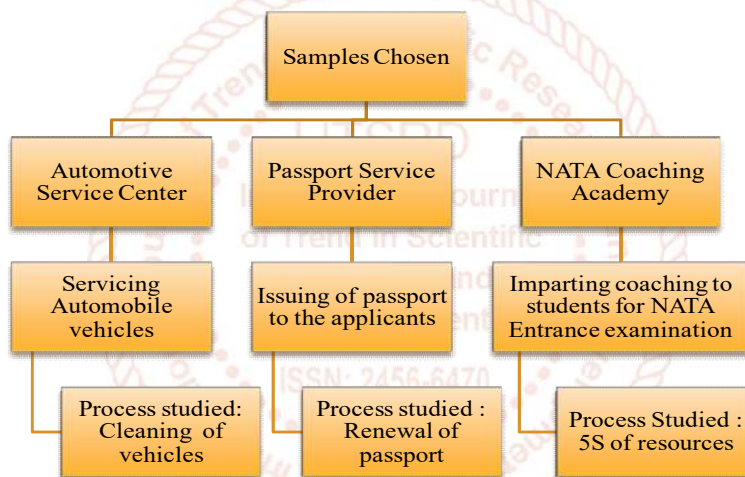


Figure 6: The functions of the 3 service sector industries selected

### 2.1. Automobile Service Center

The process studied was cleaning process. The major waste identified was wastage of resources (humans) and wastage of time (7 wastes) because of unorganized set up.

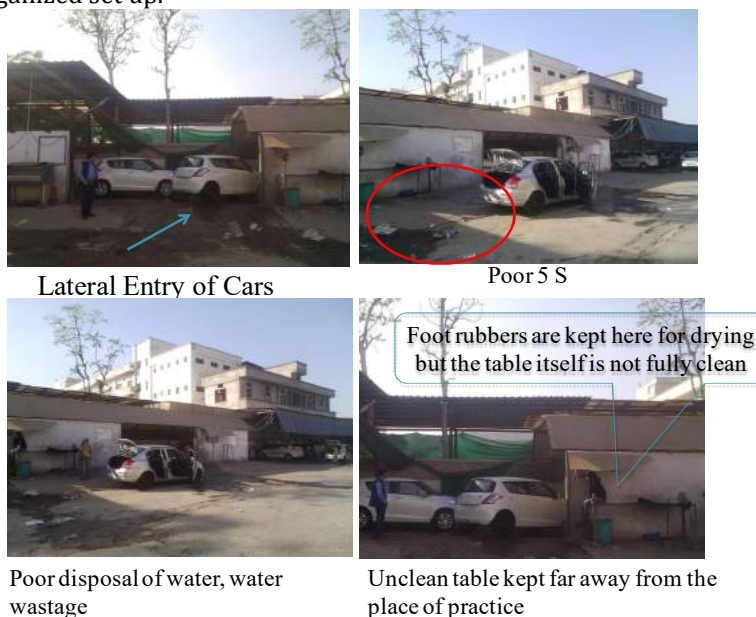
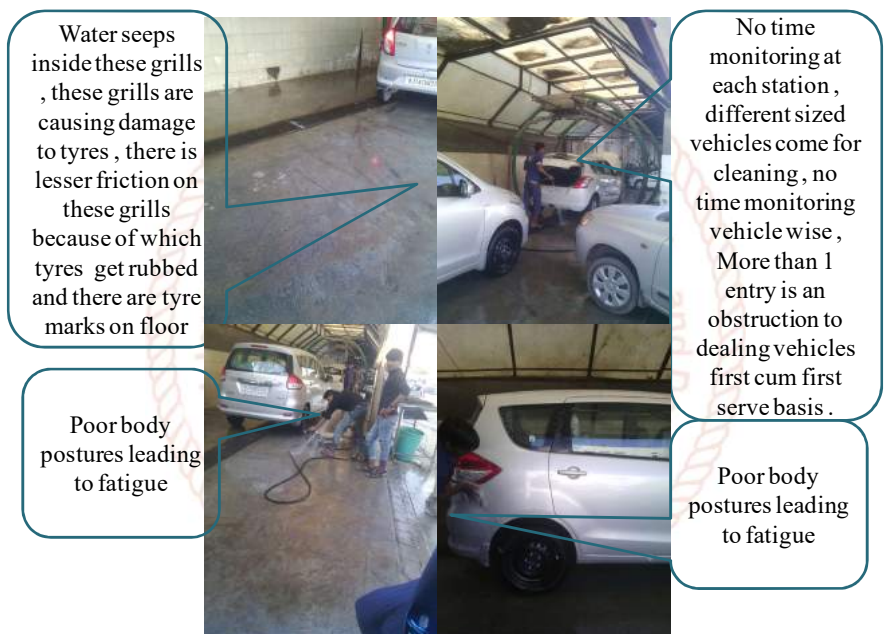


Figure 7: Photographs of cleaning process at Automotive Service Center





**Figure 8: Photographs of cleaning process at Automotive Service Center**



**Figure 9: Photographs of cleaning process at Automotive Service Center**



**Figure 10: Photographs of cleaning process at Automotive Service Center**

The effects of poor body posture and poor work allocation are shown below.

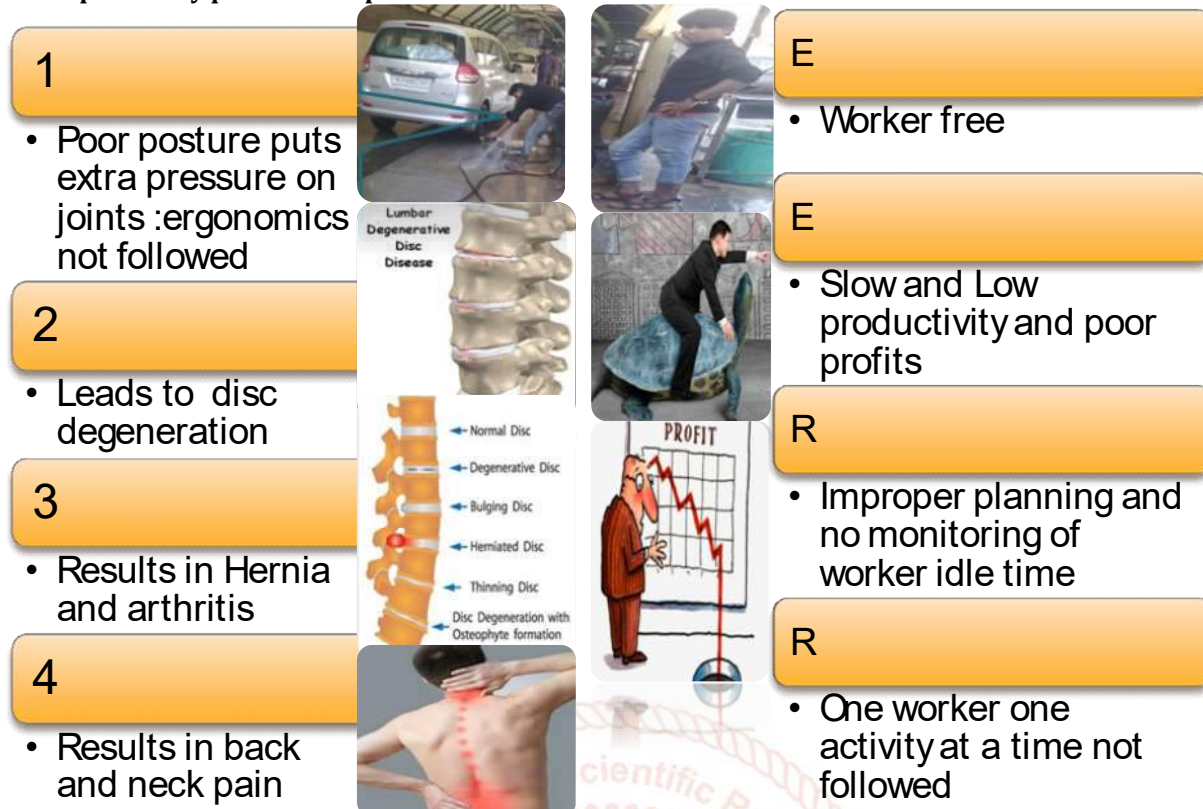


Figure 11: Effects of poor posture and poor work allocation effects and reasons ([www.laserspineinstitute.com](http://www.laserspineinstitute.com)) ([www.googleimages.com](http://www.googleimages.com))

Washing Manpower Allocation Board	
DATE 27-11-15	
NAME OF PERSON	
STATIONS	
STATION-1 AIR BLOW	GADENDRA
STATION-2 UNDER CHASSIS AND ENGINE WASHING	ANKIT
STATION-3 ENGINE ROOM DRYING AND FLOOR MATS	KESH
STATION-4 SPARE WHEEL AND REAR DOOR CLEANING	"
STATION-5 TOP WASH	JIL
STATION-6 FINAL ENGINE ROOM CLEANING	NESH
STATION-7 MOPPING EXTERIOR CLEANING	10-11-15 - wajiL
STATION-8 MOPPING INTERIOR CLEANING	JIPAK
STATION-9 GLASS CLEANING	APJUL - SURESH
STATION-10 FINAL INSPECTION	

Last 4 stations not in line and cleaning took place in a haphazard manner

Figure 12: Photographs of Washing manpower weekly control chart and Washing Quality Performance Trend Chart at Automotive Service Center





Figure 13: Photographs of Washing manpower weekly control chart and Washing Quality Performance Trend Chart at Automotive Service Center

Table 1 Recommended improvements based on observation of washing line (S. Martinich) (Lean Production, 2013-2014)

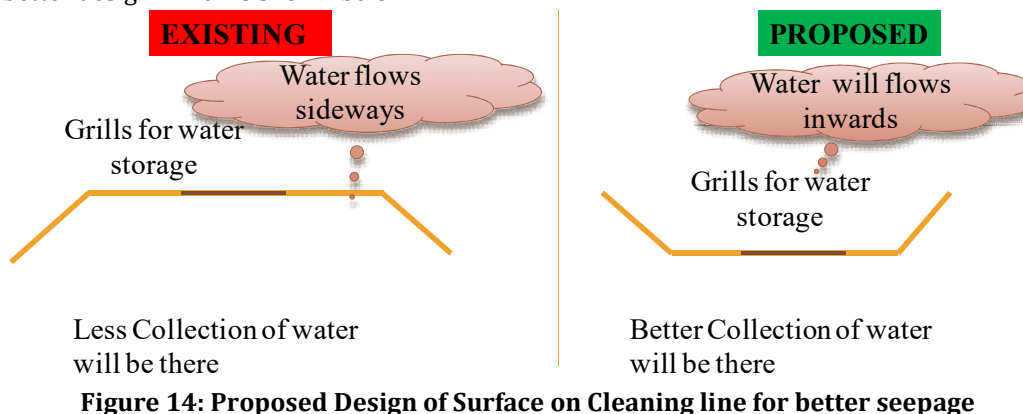
S. No	Recommended Improvement
1	Lateral Entry of cars to be stopped to ensure single line flow and vehicles should be dealt first cum first serve basis
2	Car handling to be improved to avoid Tyre damage because of grills in ground for water seepage
3	Process to be standardized by station identification. Eg; Car polish is not applied on all vehicles and on request it is applied.
4	External Set-up time for cleaning can be avoided by providing racks on both sides for keeping consumables like washing cloth, shining polish etc. With the availability of consumables unnecessary movement of workers can be avoided.
5	Grouping Technology can be used where similar cars like Alto, A Star can be sent in groups of 10 so that same processes will continue for similar models to reduce number of set ups in a day and reducing the chances of process skips if a vehicle like Ertiga comes which is 7 seater.
6	Proper space to be generated for last 4 processes as currently these processes are not in single line and vehicles are parked in haphazard manner.
7	A better 5 S to be maintained with washing aids available wherever required..
8	Foot pads of vehicles can be kept on side tables at sufficient height so that workers do not need to bend to clean it.
9	Average time for cleaning one car to be monitored regularly, discipline should be there in workers so that they fill the board details regularly.
10	Waste Management practices for managing lean wastes and handling of hazardous chemical wastes to be introduced and workers should be made aware.

Wastes identified are **time, resource waste** as inefficient utilization of humans, **space** was discovered, **unnecessary extra movement** was also identified because of non availability of essentials on the cleaning line. Lean wastes were present along with material waste. Hazardous substance instruction and material safety data sheet should be referred for all chemicals, paints used during car cleaning. The waste generated during cleaning is water which has dust, oils etc in it. Ideally the Automobile service center should have a treatment plant for such water and aim to separate water from all these chemicals, oils etc.

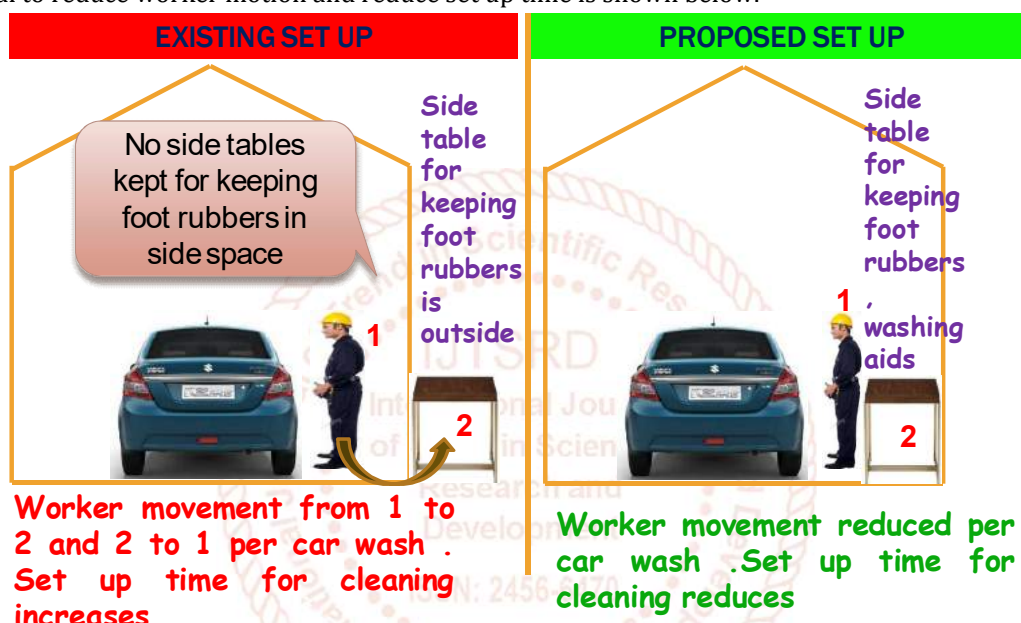
As per the feedback received by **2 employees of the Automotive Service Center** the water storage tank was of 550 Litre capacity and the water treatment is done at Effluent Treatment Plant where water is separated from sludge etc. and then reused. However another employee was not sure about the existence of ETP and he said that in every 15 days water is removed and replenished. Lack of awareness within the plant was a problem. (<http://www.envicareystems.com>)

### Proposed Solutions -

1. A design flaw was observed at the cleaning process where the design is not promoting water retention and the proposed design is a better design which is shown below.



2. The proposal to reduce worker motion and reduce set up time is shown below.



3. The proposal to improve the rhythm of workers at cleaning line is by grouping similar cars together in a set of 5-10 so that same washing aids can be used 5-10 times and same process repeats at least 5-10 times.



## 2.2. Passport Service Provider

The observations at the station 1 to 3 are shown below. **The task times mentioned in tables below are not exact but approximate times.**

**Table 2: Process Flow and observations from station 1-3**

	1	*	2	*	3
People with Appointment	Guard Checking Point	Waiting Area	Document Verification Counter	Waiting Area	Counter Area A1-A24
Big queue outside the seva kendra and people are given appointments as per availability or as per their choice of time slot from available slots.	Guard sees the appointment slip or mobile message at the entry. Guard says he wants to see the appointment slip and not sms.) The instruction on the webbsite is not to carry appointment slip as SMS will be sufficient. Time taken by guard is 30 seconds approximately.	10-20 minutes (waiting time)	Long line at the counter.  Officer took 2 minutes to check the documents and issue the token number.  No separate line for passport renewal applicants.  The number Issued was 541 by the document verifier	People wait sitting on chairs and are then sent to counter area A. Turn comes very fast and the waiting time is hardly 1-2 minutes.  Numbers appear in sequence and are shown on television monitors	24 counters are handled by 24 different passport officers.  Task of reverification ,document uploading,finger printing, photo capturing is done in around 5-7 minutes

The observations from the station 4 to 7 are shown below.

**Table 3: Process Flow and observations from station 4-7**

*	4	*	5	6	7
Waiting Station	Counter Area B1-B8	Waiting Area	Counter Area C1-C8	Acknowledgement Slip Counter	Police Verification
Common waiting lounge for B and C counter. Numbers appear randomly and are shown on television monitors probably because different officers took different time for verification at counter A (no pressure to adhere timelines). All the chairs were allmost filled. Waiting time is around 5-7 minutes as there was huge absenteeism on counter B (only 2 officers were present at B counter out of the 8 counters).	Only 8 counters are there.  Task of reverification and verbal enquiry was done in 2-3 minutes. Absenteeism is high in passport officers.	Common waiting lounge for B and C counter, Numbers appear randomly and are shown on television monitors probably because of different officers took different time for verbal enquiry.  All the chairs were allmost filled as waiting lounge is shared by people moving from A to B & B to C counter. Waiting time is around 15-20 minutes,only 2 officers were present on counter C.	Only 8 counters are there.  Task of checking the documents accomplished in 30 seconds to 1 minute.  Absenteeism is high in passport officers as only 2 out of 8 were present.	Form taken along with token number and acknowledgement slip issued in return of token number in 20-30 seconds	Maximum time is 3 weeks and applicant is asked to contact the police station if police does not verify on it's own.

The police verification was in 13 days and received after 10 days of verification.



**Prominent Wastes in the Process****General Wastes:**

Solid Waste - Garbage

Hazardous Waste

Waste of Energy

Waste of Water

Emissions to air

Emissions to water

Emissions to soil

Waste of Human

Resources

**Seven Manufacturing Wastes (Toyota)**

1. Waste from Overproduction

2. Waste of Waiting Time

3. Waste of Transportation

4. Waste in Processing

5. Waste of Inventory

6. Waste of Motion

7. Waste from Product Defects

**Figure 17: Prominent Wastes at Passport Service Provider ( The Case for Zero Waste)**

The above diagram clearly shows that apart from paper waste and power waste the other wastes present are Lean wastes like waiting time ,processing and motion. Inefficient utilization of resources is also found because of an unbalanced line.

**Table 4: Existing Process Flow and Approximate Time Consumed at each station**

	STATION POINT	Time in minutes	Number of counters
1	Guard checking point	0.50	1
*	Waiting Queue	15.00	2
2	Document Verification Counter	2.00	2
*	Waiting Area A	1.50	1
3	Counter Area A	6.00	24
*	Waiting Area B	6.00	1
4	Counter Area B	2.50	8
*	Waiting Area C	17.50	1
5	Counter Area C	0.75	8
6	Acknowledgement Slip Counter	0.42	1
*	Average Time of stay at passport office	52.17	
Out of control	Police Verification	3 weeks	

Type of work	Time in minutes
Value added work	12.17
Non Value added work	40

Non value added work time is > than 3 times of value added work time

The analysis shows that Value added work needs only 12.17 minutes and 40 minutes is waiting time.

**Table 5: Applying Rank Positional Weight Technique (S.Martinich)**

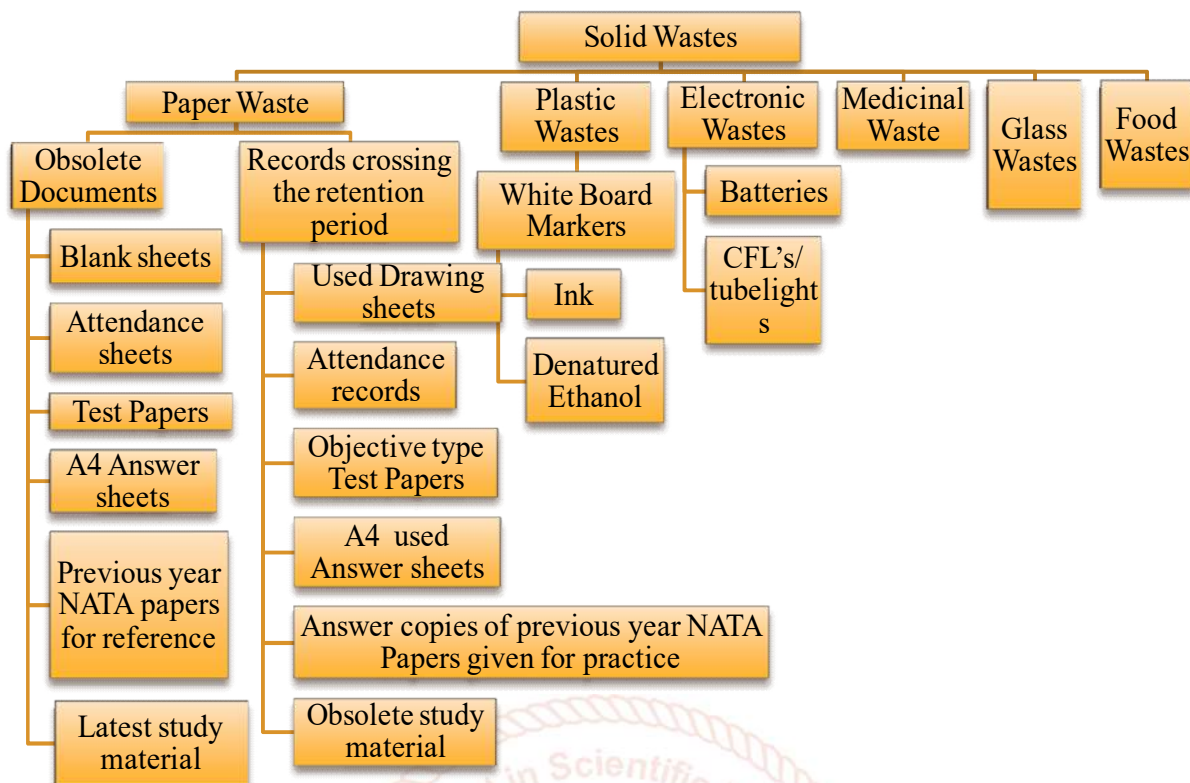
	Task Description	Time in minutes	Positional Weight
1	Guard checking point	0.5	12.17
2	Document Verification Counter	2	11.67
3	Counter Area A	6	9.67
4	Counter Area B	2.5	3.67
5	Counter Area C	0.75	1.17
6	Acknowledgement Slip Counter	0.42	0.42

Refer Source (2) for rank positional weight technique

Proposal after applying line balancing . A better estimate can be obtained after taking each task time at counter A separately .

ws	station number	cycle time
1	1+2	2.5
2	3	6
3	4+5+6	3.67

### 2.3. NATA Coaching Academy



**Figure 18: Solid wastes identified at NATA Coaching Academy**

For all the paper wastes a Control of Documents and Records procedure according to the guidelines of ISO 9001 Quality Management Systems is defined and the retention time for each record and document is stated in the procedure. The NATA Academy students are asked to prepare their portfolio in soft as well as hard copy. Earlier the hard copies were retained

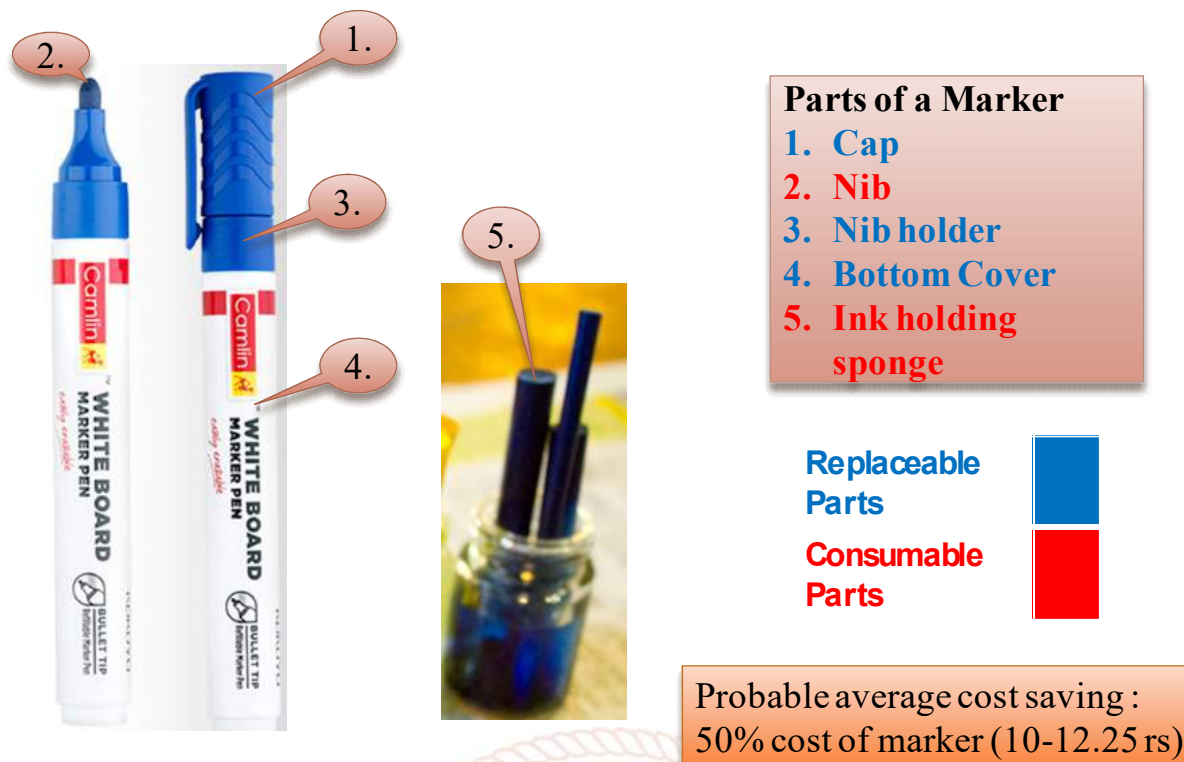
but now the submissions are in hard copy which are evaluated and returned back to them and they are asked to send a softcopy of same for record. This practice is turning out to be very beneficial as students now understand the importance of record keeping.

**Food Wastes of the Academy is given to street animals to strengthen the food chain and improving the chances of their survival**



**Figure 19: Waste food /water and extra food /water to street cats, cows & dogs, squirrels & birds [9]**

The white board marker or other drawing related consumables are used in the academy. An idea is shared by the Coaching Academy team with Reynolds, Cello ,Luxor and Camlin to purchase plastic cover back as it is reusable ([www.googleimages.com](http://www.googleimages.com)). The belief of the academy is in mutually beneficial relations with all our stakeholders and hence sharing of ideas wherever possible is the strategy.



**Figure 20: Replaceable and Consumable Parts of White Board Markers ([www.googleimages.com](http://www.googleimages.com))**

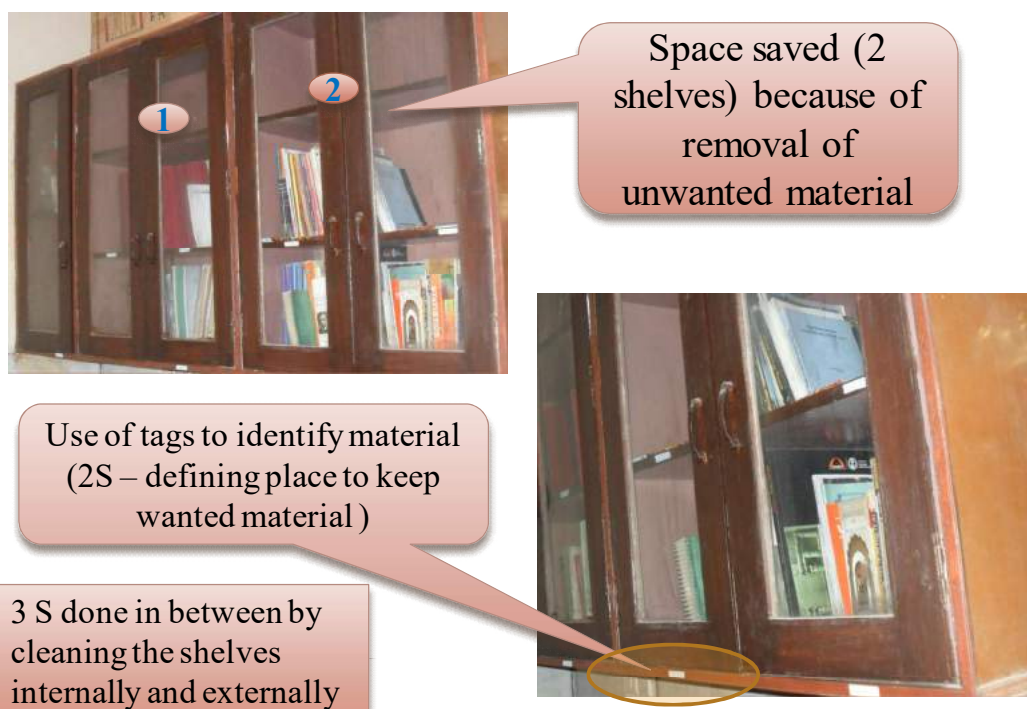
### 2.3.1. Building the Culture of Waste Management

Inspired by Toyota Production System 5S activities are started at the academy. The collective use of 5S and reduce ,reuse and recycle strategy resulted in a benefit comparison matrix.

**Table 6: Results of 1S (sort)**




Result of	Wanted Items	Unwanted Items
1 S	Blank Sheets Polybags Markers which can be used by ink refill or denatured Painting Exhibition Catalogues Test papers of the academy Old test papers of the exams Bags Files (used and unused ) Manuals of electronic and electrical items still in use	Used sheets Loose answer sheets Used test papers Old newspapers Transparencies Old letters and envelopes Old calendars Old unused diaries Visiting cards Catalogues related to construction Pamphlets Butter Paper Discarded electronic items catalogues i.e mobile phones Magazines Used Bulbs /CFL's and Tube lights Used Batteries Expired medicines Plastic bottles Glass bottles





**Figure 21: Results After 2S (define place and arrange)**

**Table 7: Examples of paper waste and Reduce Reuse Recycle benefit comparison for Paper Waste ([www.kagziindia.com](http://www.kagziindia.com)) (<http://www.r3greens.com>)**

1-14	Strategies For – Paper Waste	Examples - Used sheets, Used test papers, Loose answer sheets, Old newspapers, Old letters and envelopes, Old calendars, Old Visiting cards, Catalogues related to construction, Pamphlets, Butter Paper, Magazines Discarded electronic items catalogues i.e mobile phones Cartons, Old Unused Diaries,		
Reduce strategy applicable (Y/N) If Yes – Probable Benefits	Reuse	Benefit of Reuse	Recycle	Benefit of Recycle
Yes Shelf space saved, Scrap Collector is buying scrap at 10 rs /kilogram	As polythene is banned newspaper and magazine paper bags are gaining importance. The thought was to sell the newspapers and magazines to such bag makers.	Paper Bags 	Can't be recycled at Coaching Academy but in discussion with Kagzi India and R3 greens to sell the material for recycling or donate to PRAVAH (NGO which collects waste paper).	Handmade embossed paper  Office Sets 

**Table 8: Examples of electronic wastes and Reduce Reuse Recycle Benefit Comparison for E-Waste (Bhatia)**

15-16	Strategies For – Electronic Wastes		Examples – Used CFL's, Used Tube Lights	
Reduce strategy applicable (Y/N) If Yes – Probable Benefits	Reuse	Benefit of Reuse	Recycle	Benefit of Recycle

Yes Shelf space saved, the manufacturer representative has asked to send the used tube lights and CFL's to one of the known electrical shops in vicinity (Khandelwal electrical).	Not usable without dismantling hence not in scope	Lack of information available on same	Can't be recycled at Coaching Academy but in discussion with E-WASTE RECYCLERS like Green Leaf recyclers	The manufacturer disassembles the waste and segregates it material wise and sends it to obtain maximum output. The END OF LIFE collection centers are not yet established by the manufacturers. Rajasthan Government has started collection of E-Waste at 20 collection centers and in return giving money.
--	---	---------------------------------------	--	--

**Table 9: Examples of electronic wastes and Reduce Reuse Recycle Benefit Comparison for E-Waste (Bhatia)**

17	Strategies For – Electronic Wastes			Examples –Used batteries
Reduce strategy applicable (Y/N) If Yes –Probable Benefits	Reuse	Benefit of Reuse	Recycle	Benefit of Recycle
Yes Shelf space saved, chemical exposure can be hazardous, to be handed over to collection shops	Not Possible, chemical exposure can be hazardous	Obsolete item	Can't be recycled at COACHING ACADEMY but in discussion with E-WASTE RECYCLERS like Green Leaf recyclers	The manufacturer disassembles the waste and segregates it material wise and sends it to obtain maximum output. The END OF LIFE collection centers are not yet established by the manufacturers. Rajasthan Government has started collection of E-Waste at 20 collection centers and in return giving money.

**Table 9: Reduce Reuse Recycle benefit comparison for Medicinal Waste**

18	Strategies For – Medicinal Waste			Examples –Expired Medicines
Reduce strategy applicable (Y/N) If Yes –Probable Benefits	Reuse	Benefit of Reuse	Recycle	Benefit of Recycle
Yes Consumption can be unsafe, give back to manufacturer through medicine take back programme. Refer below sheet for further information.	Not Possible	Unsafe to consume	Yes but not in scope	The manufacturer needs to spread awareness on same

**Table 10: List of medicines at Abhinav Arts NATA Academy**

S.No.	Name of medicine	Expiry Date	MFD
1	Combiflam	Jul-19	Aug-16
2	Tolifast 150	Oct-17	Nov-15
3	Nimutal Cold and Flu	Sep-18	Oct-16
4	Reactin Plus	Jul-16	Aug-13
5	Cefixime tablets	not known	Aug-16
6	Ibuprofen and Paracetamol	not known	
7	Ondem MD4 (Ondansetron orally disintegrating tabletsip )	Mar-18	Apr-16
8	Paracetamol	Jun-19	Jul-16
9	B Complex forte with Vitamin C	Apr-19	Nov-17
10	Disprin	Aug-20	Sep-17
11	Nestor Paracetamol and Diclofenac Sodium tablets	not known	
12	Cefixime	Jul-18	Aug-16
13	Lansoprazole	Oct-17	Nov-15
14	PCI Pudina capsules (MP/25D/13/239)	not known	
15	B Complex forte with Vitamin C	Apr-19	Nov-17
16	Azithromycin	Jun-17	Jul-15
17	Amoxycillin and Dicloxacillin	not known	
18	Combiflam ( batch number 6NA0327)	not known	

S.No.	Name of medicine	Expiry Date	MFD
19	Somee Cold Nimesulide ,Paracetamol cetirizine HCL	not known	
20	Omeprazole capsules	Aug-16	
21	Disprin	Jun-16	Jul-17
22	Azipro	Apr-19	
23	Ultracet	Jun-17	
24	Salbutan Mol	not known	
25	Honitus	May-19	Nov-17
26	Diclomol	Feb-21	Mar-18

### Category Wise Number of medicines

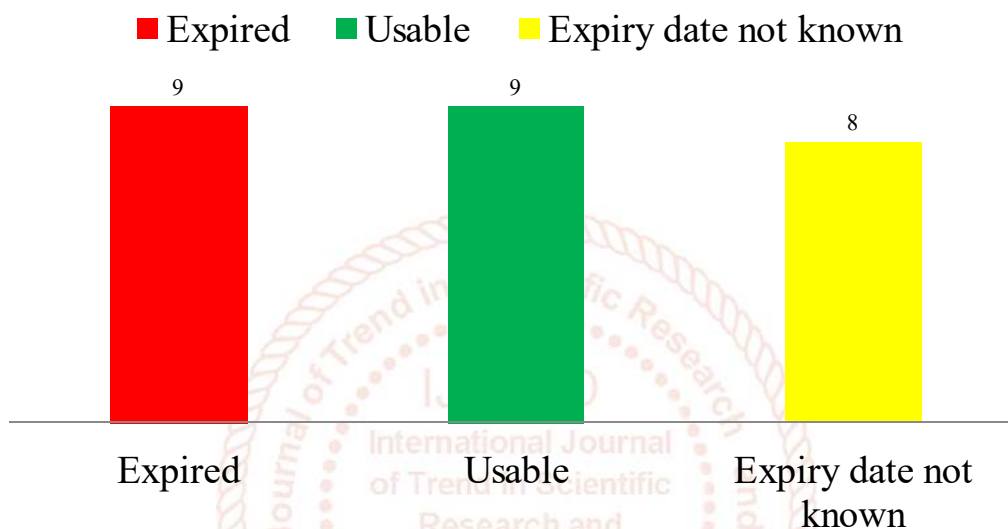


Figure 22 Total number of Usable –Expired and Unidentified medicines

### Date Wise Expiry of Currently Usable Medicines

■ Sep-18 ■ Apr-19 ■ May-19 ■ Jun-19 ■ Jul-19 ■ Aug-20 ■ Feb-21

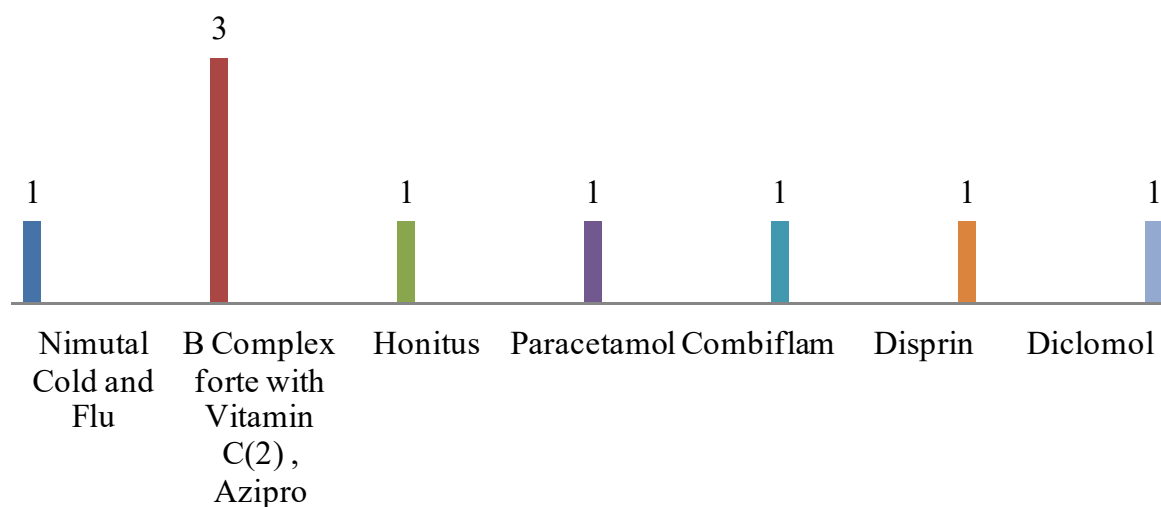


Figure 23: Date wise expiry of usable medicines in coming months



**CURRENT SYSTEM**

Medicine take back is only possible for entire strip and not for single strip.

**WHY :** Expiry date is printed on a limited portion of a strip and if medicines in that portion are consumed then expiry date not known for remaining tablets .

**PROPOSED SYSTEM**

Medicine take back will be possible for each and every medicine .

**WHY :** Number and letter punches can be used to punch expiry date on each and every medicine as E404 is punched in below picture.



Like number E404  
expiry date should be  
punched

**Alternate Method :** Printing or writing of manufacturing date on bill itself and storing the bill of medicines purchased so that date of purchase is known for all tablets . (refer slide 4)

Figure 24: Current and Proposed Method for expiry date punching on medicines (<https://www.fda.gov>)

GSTIN : BKAHPPM6823P1ZG  
DL. No. : JPR/2001/5971-72  
Shedule X DL No. : 20/JPR/2001/1875  
State Code : 88-Rajasthan

### CASH MEMO

II OM SATNAM SAKSHI II  
**PADMA MEDICOS & GENERAL STORE**  
63/84, HEERA PATH, MANDHYAM MARG,  
MANSAROVAR, JAIPUR • E-Mail : padma2001.pmgs@gmail.com

Phone : 9828320920, 9587227222  
W-9772202179

GST INVOICE

Patient Name : DR.DINESH CHATURVEDI  
Prescribed by : SAWAI MAN SINGH HOSPITAL

Invoice No. : 0012533  
Date : 30-07-2018

Item Description	Qty.	M.R.P.	Packing	Batch No.	Exp.	GST%	HSN	Amount
DICLOMOL TAB	10	58.80	1*10	PC0158	2/21	12.00	3004	58.80

Expiry date printed on bill  
and should be stored till the  
medicine is consumed

pees in Words : Rs. Fifty Eight & Paise Eighty Only  
52.5%+6%+3.15SGST+3.15CGST, ]

For : PADMA MEDICOS & GENERAL STORE

Authorised Signatory

Other Adj.  
Round Off  
**GRAND TOTAL**

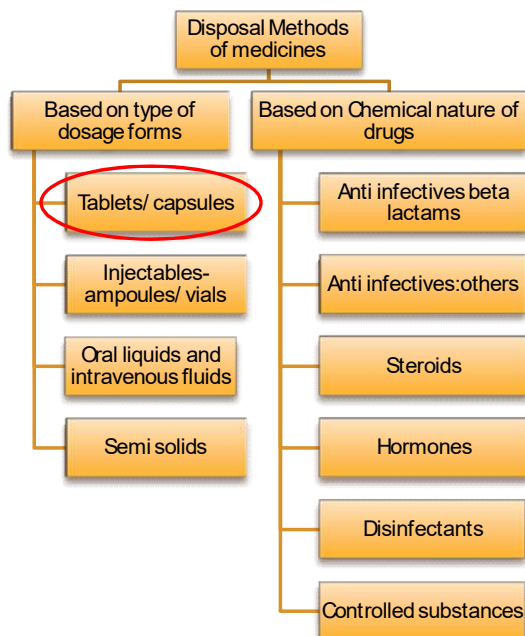
0.00  
0.00  
**58.80**

Detail : OUR BANK : ICICI BANK A/c. No. 677105114141

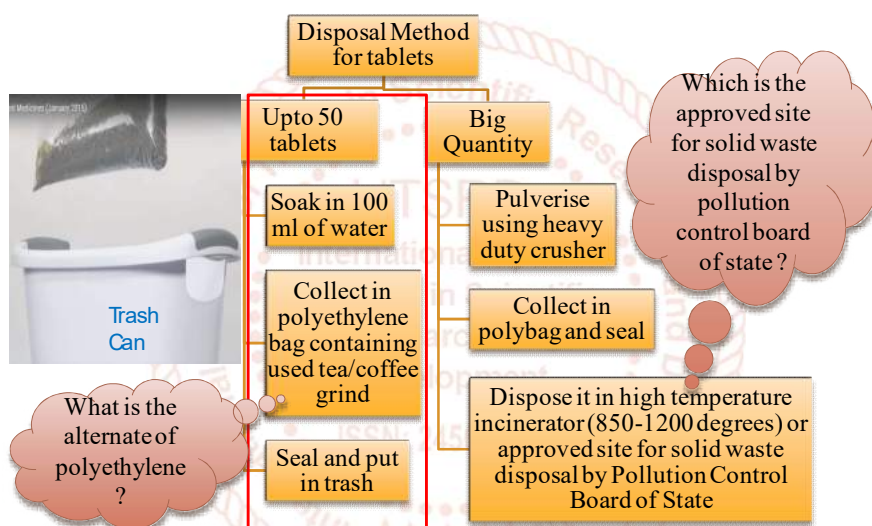
Expiry date printed on bill  
and should be stored till the  
medicine is consumed

Figure 25: Alternate Method to Trace expiry date by Printing it on Bill (Purchase Invoice of Padma Medicos and General Store)

The (National Formulary of India, 2011) has defined different methods for disposal of medicinal waste. All the medicines available at Abhinav Arts NATA Academy were in tablet form and less than 50 in number and hence the chosen method was for disposal of tablets. However before disposal there was an attempt to give it back to the manufacturer through the local shopkeepers. There is no medicine take back program in place in India but the shopkeepers agreed to take medicines back if available in full strip.



**Figure 26: Basis of Classification of disposal of expired medicines (Source: (National Formulary of India, 2011))**



**Figure 27: Disposal Methods for Tablets (Source: (National Formulary of India, 2011))**

**Table 11 Examples of Glass wastes and Reduce Reuse Recycle Benefit Comparison**

19	Strategies For – Glass Waste		Examples –Glass Bottles		
Reduce strategy applicable (Y/N) If Yes –Probable Benefits	Reuse	Benefit of Reuse	Recycle	Benefit of Recycle	
Yes Sold to scrap collector at a cost of 10Rs /kg Disposed in residential dustbins and are collected by local municipal waste collection authorities	Yes	Can be used as a container	Yes but not in scope		

**Table 12: Examples of Plastic Wastes and Reduce Reuse Recycle benefit comparison (Bhatia)**

20	Strategies For – Plastic Wastes		Examples –Plastic Bottles,Plastic Bags		
Reduce strategy applicable (Y/N) If Yes –Probable Benefits	Reuse	Benefit of Reuse	Recycle	Benefit of Recycle	
Yes Sold to scrap collector at a cost of 10Rs /kg Disposed in residential dustbins and are collected by local municipal waste collection authorities	Yes	Can be used as a container	Selling it to Rajasthan Government for recycling	Rajasthan Government has initiated collection of plastic waste at 20 collection centers and in return giving Jute Bags.	

Table 13 Examples of unused old transparencies and Reduce Reuse Recycle benefit comparison (Bhatia) (Keen for Green)

21	Strategies For – Unused old Transparencies	Examples –Transparency sheets used as a cover page on spiral bindings, Projector transparencies
----	--	---

Reduce strategy applicable (Y/N) If Yes –Probable Benefits	Reuse	Benefit of Reuse	Recycle	Benefit of Recycle
Yes Shelf space saved, Scrap Collector is buying scrap at 10 rs /kilogram	Can be used but if the transparency is not clean chances of use are low	Used as a front cover in Academy booklet Use to make stencils for art projects and t-shirt decorating. Use to make stained-glass art with kids. Use to protect pages in a scrapbook.	Yes but not in scope	

The option which was feasible and which yielded maximum benefits was chosen out of reduce ,reuse and recycle.

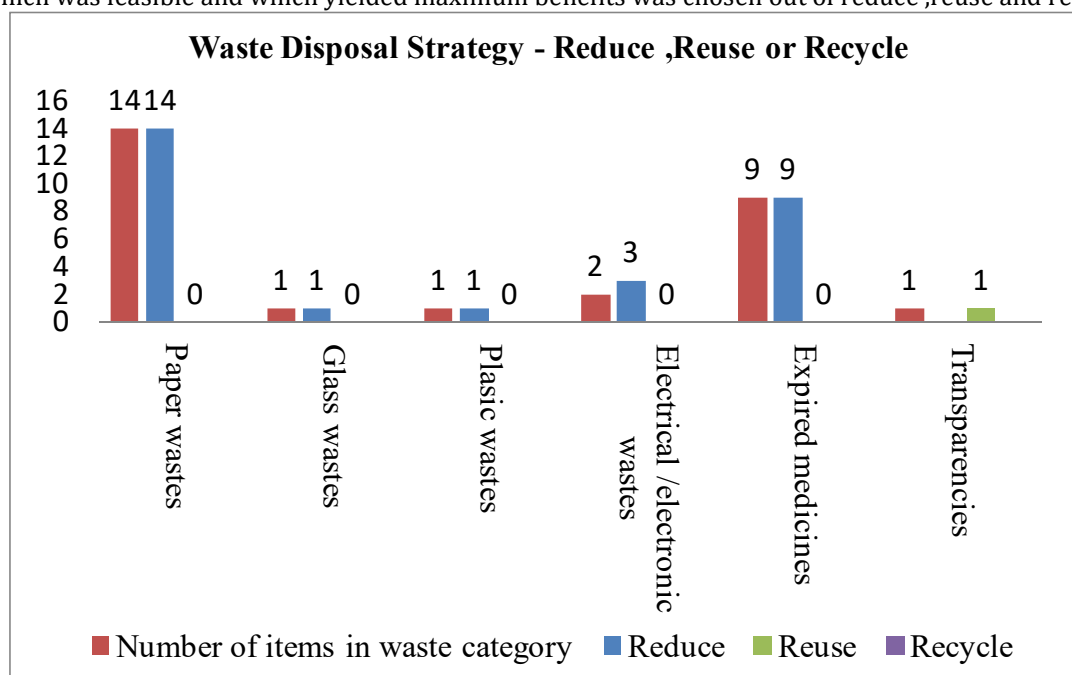


Figure 28: Waste wise Reduce Reuse &amp; Recycle Strategy

The above graph shows that out of the 20 unwanted items 14 were paper wastes and 2 were electrical and electronic wastes. Other wastes were expired medicines and transparencies.

### 3. CONCLUSION

The presence of lean wastes was explored in all 3 service sector industries and Zero Defect Zero Effect questionnaire was also used to do the comparison of the 3 organizations. The ZED scheme criteria is defined for manufacturing sector industries but the idea was that it can be applied in service sector industries as well and hence it was applied.

The point waste management is denoted by A4 in the questionnaire for certification. It covers questions related to 4 points which are shown below and assessment was based on the point “tools actually used to manage waste” as shown in green colour because of shortage of time.

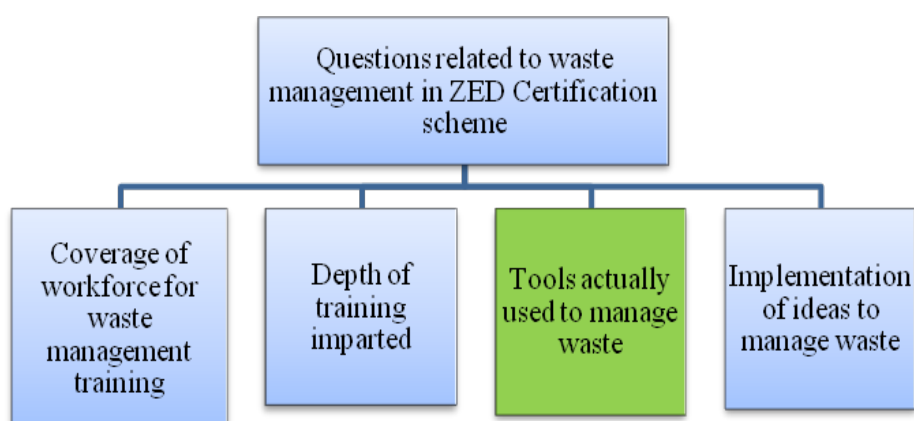
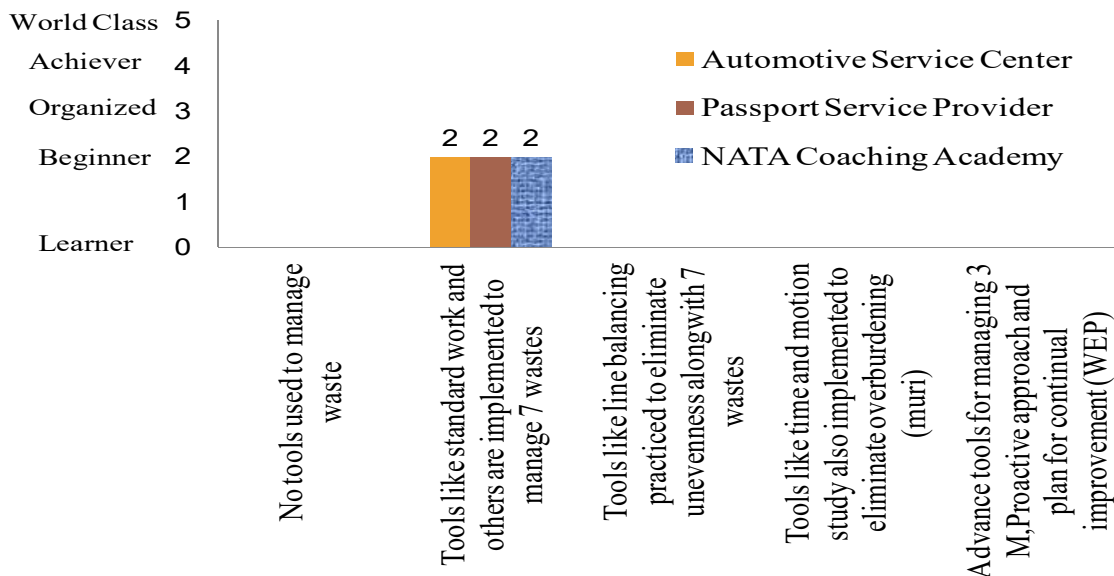


Figure 29: Questions Of Waste Management in ZED Certification Scheme (ZED Certification Scheme Training Manual)

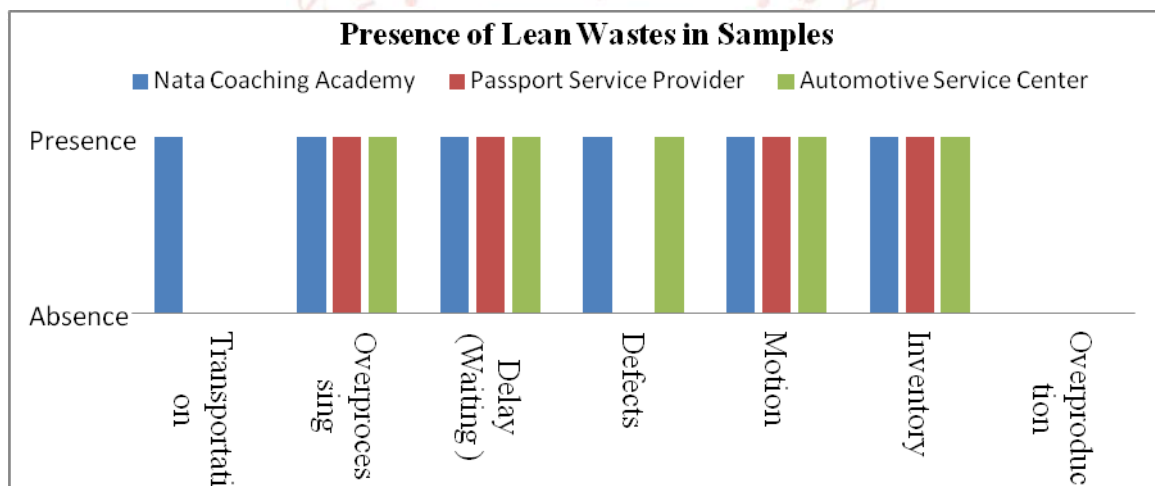


**Level Achieved by the Service Sector Industries**

**Figure 30: Assessment Result of the 3 Service Sector Samples in A4 Questions related to implementation of WM Techniques (ZED Certification Scheme Training Manual)**

**Table 14: Remarks during assessment based on ZED Scheme point A4**

Organization	Remarks
Automotive Service Center	Variation in vehicles is there at the input and hence there is variation in the cleaning cycle time. Job card are issued for all cars and then they go for cleaning. Process flow is defined but still there is scope of improvement in the least stages of cleaning process. On Board monitoring of process time is not there but monitoring is there in form of in time and out time printed during the billing process
Passport Service Provider	Monitoring is done using LCD Monitors stage wise. Process Flow is well defined.
NATA Coaching Academy	Monitoring of course coverage and attendance of students is done using excel sheet by faculties. Last year 23 lectures were conducted for Maths to cover the course.



**Figure 31 Lean Wastes in Service Sector Industries**

**Table 15: Description of Lean Wastes in Service Sector Industries**

Waste Type	Automotive Service Center	Passport Service Provider	NATA Coaching Academy	Proposed Solutions
Transportation			When markers are consumed procurement is done from stationers. The need is to do yearly planning and reduce this transportation to once in a year by forecasting yearly demand.	By estimating yearly consumption the forecasted consumption for the next year can be found out and hence reduce the procurement to 1 or 2 times (yearly or half yearly).

Over processing	Manual recording of data before taking vehicles for servicing and then bills are generated through computers	Even after uploading softcopies printouts are required	Test papers are checked manually and then scores are transferred to excel sheet for analysis. Online tests can be used as a solution.	Online tests can be conducted with investment.
Delay (waiting)	Vehicles wait for their turn, last 4 processes in cleaning are not in single line flow, variation in size and type of vehicles is there.	People wait in between counters ,the cycle time and number of A,B and C type counter varies.	If students join in between or miss a lecture then they have to wait till the same lecture is repeated. Inventory of test papers wait for 6 months before clearance.	Line balancing can be done. Missed lectures can be conducted quarterly.
Defects	Sometimes the back part of the vehicle is not cleaned as the pressure is too much on line.			Group technology can be adopted to clean similar vehicles at a stretch ,this can reduce waiting time. Also students having same competency can be grouped together to reduce the effort of faculties.
Motion	Motion is there when vehicles move between 5 <sup>th</sup> to 8 <sup>th</sup> spot in cleaning as the flow is not in single line and vehicles are parked in a haphazard manner.	Motion of applicants is there during the waiting time till their turn comes. Motion is also there because applicants do not trace the respective counter instantly.	Drinking water facility is not available upstairs and sometimes students move downstairs to get drinking water.	Single line flow from 5 <sup>th</sup> to 8 <sup>th</sup> step in cleaning. Better traceability of counters to be ensured. Drinking water facility to be made available upstairs.
Inventory	Vehicles wait in the waiting area. No control on number of vehicles taken for service per day.	People wait there in between counter A,B and C as line is not balanced.	Used test papers wait in the waiting area for clearance till the retention period is not over.	Number of vehicles taken per day can be limited. Used test papers to be given to students only after recording their performance.

2. Apart from lean wastes solid wastes were thoroughly explored at NATA Coaching Academy but the presence was there at passport office as well as Automotive Service Center Ltd. So reduce, reuse and recycle can also be applied at other 2 service sector enterprises. The quantity of waste was not measured during this research study as it was out of scope.

#### 4. REFERENCES

- [1] (n.d.). Retrieved from <http://greenleafrecycling.in/process.html>
- [2] (n.d.). Retrieved from [https://www.bankersadda.com/2016/07/static-awareness-insight-into-indian\\_7.html](https://www.bankersadda.com/2016/07/static-awareness-insight-into-indian_7.html)
- [3] (n.d.). Retrieved from [www.kagziindia.com: http://www.kagziindia.com/kagzi-textiles.html](http://www.kagziindia.com/kagzi-textiles.html)
- [4] (n.d.). Retrieved from <http://www.r3greens.com/index.php?cPath=34>
- [5] (n.d.). Retrieved from (www.statista.com, 2018)
- [6] *The Case for Zero Waste*. (n.d.). Retrieved from <http://www.trunity.net/upcycling/view/article/51cbe2d7896bb431f68782b>
- [7] Bhatia, A. (n.d.). Retrieved from <https://swachhindia.ndtv.com>:
- [8] <https://swachhindia.ndtv.com/rajasthan-government-e-waste-policy-21306/>
- [9] <http://www.envicareystems.com>. (n.d.). Retrieved from <http://www.envicareystems.com/effluent-treatment-plants-pune.html>
- [10] *Keen for Green*. (n.d.). Retrieved from <http://www.keenforgreen.com>: <http://www.keenforgreen.com/recycle/are-overhead-transparencies-recyclable>
- [11] Kumar, R. (2011). *Research Methodology-A Step by Step Guide for Beginners* (3rd ed.). Sage Publications.

- [12] *National Formulary of India* (4th ed.). (2011). Ghaziabad: Indian Pharmacopoeia Commission on behalf of Ministry of Health and Family Welfare.
- [13] (2013-2014). Operations Management-2 Session 15.
- [14] Purchase Invoice of Padma Medicos and General Store. (n.d.).
- [15] R.Covey, S. (n.d.). *7 Habits of Highly Effective People*.
- [16] Rajasthan Patrika. (2018, 09 23).
- [17] S.Martinich, J. (n.d.). *Production and Operations Management*.
- [18] S. Patel, A. (5th Feb 2015). *National Action Plan for Municipal Solid Waste Management*. Central Pollution Control Board.
- [19] Seet, S. (2016, January 3rd). Retrieved from Youtube: <https://youtu.be/LNPLG7H6-VY>
- [20] *statista.com*. (n.d.). Retrieved from ([www.statista.com](http://www.statista.com), 2018)
- [21] *The Industrial Sectors*. (n.d.). Retrieved from <http://www.learnmanagement2.com:> <http://www.learnmanagement2.com/industrialsectorsprimarytertiarysecondary.htm>
- [22] *www.googleimages.com*. (n.d.).
- [23] *www.laserspineinstitute.com*. (n.d.).
- [24] *ZED Certification Scheme Training Manual*. (n.d.).

