

Industrial Design Project I

MINI WASHING MACHINE FOR UNDERGARMENTS

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(2013-15)

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Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all the principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/ data/ fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Signature:

Name: Naman S Varma

Date:

Acknowledgement

I would first and foremost like to thank my college Industrial Design Center, IIT Bombay for giving me this opportunity to work on my Project 1. I wish to express my deepest gratitude to Onida Mirc Electronics, R & D, Mumbai, for allowing me to experience this enriching journey with them.

I am greatly indebted to Mr. Pradip Save, Senior Manager (R & D), Onida for providing me with insights and honest opinions at every stage of the process. I am very thankful to him for encouraging me through the course of the project and imparting to me valuable industrial knowledge.

Overall, this project undertaken by me has been a great learning experience, both in terms of design and industry understanding. It gave me the opportunity to understand the way in which the Industrial design industry works. This experience will always stay with me as a wonderful learning curve.

- Naman S Varma

Sr PD

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ABOUT SPONSORS & CLIENTS



VISION:

The aim is to make Indians proud of the Made-In-India label by providing highly innovative products, which are better than the competition, which simplify our lives and provide an unmatched customer experience.

MISSION:

To benefit society at large through innovation, quality, productivity, human development and growth, and to generate sustained surpluses, always striving for excellence, within the framework of law, and with pride in ethical values.

Onida has always been driven by the Vision and Mission of the organisation, and a sense of collective ownership and responsibility is palpable within the organisation.

Onida has been an enduring brand in the Indian Consumer Durable space, and has won the trust of millions of consumers with its high quality products. Being an Indian company, the company understands the unique requirements of the Indian consumer – more than any other company does. This has found expression in so many of the innovative products that have been launched over the years. This understanding of the consumer is one of the core strengths of the company that has enabled it to compete in the market.

Onida has often been voted as the top most trusted consumer durable brand in India – a reflection of its continued success.

The company has strived to imbibe its employees with the Vision and Mission of the company through clear articulation and internal communication. The articulation of the Vision has also brought in sharper focus, greater sensitivity to consumers and led to clearly defining priorities

VALUES:

- Different and Unique
- Respect for Individua
- Integrity
- Customer Relationship
- Achieving the Impossible
- Passion for Perfection

ABOUT SPONSORS & CLIENTS



BRAND POSITIONING:

TRENDY, UNCONVENTIONAL Brand for Young Nesters that offers products with Innovative Form & Functionality satisfying consumer needs in surprising ways.

The Brand Values that will define Onida are:

- Unconventionality
- Creativity
- Surprisingly Thoughtful
- Wit
- Brand Idea

Think WhyNot! will be the Onida Brand Essence. The 'WhyNot!' application will be across all functions of the organisation and will encourage an attitude of challenge and creativity.



THE ONIDA WAY :

All around us, rules and regulations define our existence. Sure, they were create for a purpose. But many a times, the same very rules put blinders on us, handcuff us from stretching our limits, impair our imagination, dissolve our power to think and view things differently. Onida will exist to challenge these rules, unshackle people and more importantly, their imagination from these rules and boundaries. Onida believes that while some rules need be followed, a lot many need to be challenged. It believes that challenging these rules may create a possibility of failure, but not challenging these rules will create a certainty of it. Onida will say... Think WhyNot! "Think WhyNot!" is an expression of challenge, a new language, a new way of thinking that shall drive Onida to unleash the maverick attitude of creativity and challenge in its products, employees and culture.

CORPORATE JOURNEY:

Onida has been an enduring brand in the Indian Consumer Durable space, and has won the trust of millions of consumers with its high quality products. Being an Indian company, the company understands the unique requirements of the Indian consumer – more than any other company does. This has found expression in so many of the innovative products that have been launched over the years. This understanding of the consumer is one of the core strengths of the company that has enabled it to compete in the market. In the annals of Indian advertising, Onida enjoys a storied past. The advertisements that Onida brought out broke all conventions and are a defining feature of the organisation. The company created amongst the most powerful icons in advertising, the Onida Devil, and amongst the most memorable taglines, 'Neighbour's envy. Owner's pride.'



ONIDA MIRC ELECTRONICS BRAND PORTFOLIO

ONIDA TELEVISION SERIES



LED Television

LED TVs represent technology, and Onida has ensured that its LED TVs stand for innovative technology. Onida has worked on ensuring that the latest in technology is made more access...



LCD Television

Onida has a wide range of LCD TVs designed to suit just about every requirement. The range includes entry level models, which are loaded with the best of features, to high end mode...



Colour Television

Onida Colour Televisions have been renowned for their splendid picture clarity and stunning sound. The TVs deliver a wholesome experience, and with their beautiful aesthetics, add ...

ONIDA DVD PLAYERS



Blu Ray DVD Player

Feel the Movie on Blu Ray
Experience viewing like never before! So get on to the new Blu Ray for complete entertainment



USB, Card Reader & HDMI Connectivity

Connected through USB, Card Reader HDMI
Now you can connect your DVD player through USB, Card Reader & HDMI as well. This triple connectivity range from Onida has been introduced keeping in mind your connectivity options so that you enjoy a hassle free cinematic experience.



USB & Card Reader Connectivity

Connected through USB and Card Reader
Onida presents a range of DVD Players that can be connected through USB & Card Reader to suit your connectivity options and give you an enhanced cinematic experience.



USB Connectivity

DVD Players connected through USB
Onida has a range of DVD Players that can be connected through USB. Now you can simply plug in your USB to the DVD player and enjoy a superior cinematic experience.

ONIDA MULTIMEDIA SPEAKER SYSTEMS



Home Theatre System

Advanced Sound Quality & Aesthetics
Onida Home Theatres come with advanced sound quality and extraordinary aesthetics combining it to a truly a perfect piece of art. When it comes to Sound solutions we ensure that your living room is alive with a rocking sound experience.



LED Light Speaker System

Enjoy radiant music with a great ambience.
Experience Sound with a difference! Onida GlowBeats gives you a dazzling experience of sound with superior LED Lights. Now you can enjoy crystal clear wireless music by simply docking your iPod, iPhone or select mobiles to the docking station.

ONIDA MIRC ELECTRONICS BRAND PORTFOLIO

ONIDA AIR CONDITIONERS

Window AC

Powerful Cooling, High Energy Efficiency, Long Life, Reliable Operation

Onida range of Window ACs are designed for Maximum Efficiency without compromising on Powerful Cooling. Going through over 25 stages of quality control and rigorous test at peak load in adverse conditions ensures long life and trouble free operations.

Split AC

Powerful Cooling, High Energy Saving, Stylish Looks

Onida Split Air Conditioners are continuously innovated for powerful & efficient performance, ease of use, delivering superior consumer experience and lifestyle designs based on consumer insight.

Commercial AC

Powerful Cooling, Efficient design & High Savings, Reliable Operations

Onida Commercial Air Conditioners portfolio includes VRF and Ducttype ACs. Using cutting-edge technology & world-class components, Onida CACs are designed for improved heat transfer resulting in high efficiency, long life and reliable operations.

ONIDA WASHING MACHINES

Semi Automatic Washing Machine

For a Perfect Washing Experience

Onida has a wide range of semi automatic washing machines to take care of your laundry needs. Leveraging from its revolutionary in-built brush feature in the fully automatic range, Onida has this revolutionary feature in its semi automatic range as well.

Fully Automatic Washing Machine

For a Perfect Washing Experience

Onida Fully Automatic Washing Machine Range has a unique feature of in-built brush to give your clothes a wash as good as handwash. Onida Fully automatic washing machines have a powerful motor and lot many other features to give you a perfect wash.

ONIDA MICROWAVE OVENS

Solo

Today's Special

Onida offers you first ever Highly Economical and convenient, Solo Range of Microwave Oven which comes with 8 Indian Auto Cook Menus, simplifying your cooking and re-heating and de-frosting needs. It comes with Digital display and easy to use Jog wheels.

Convection

Cooking in a jiffy

Onida convection microwave oven allows food to be cooked quickly, yet come out blow-dried or crisped, at a lower temperature and often with better results. Now bake your cakes at ease with Onida convection microwaves.

Grill

Healthy Cooking in just few minutes

Grill Range of microwave offers you all that is needed for your food grilling needs, making cooking simpler, healthier and time saving and giving you value for money with its unique built in calorie-meter, features and aesthetics.

Barbecue

Chef-Cum-Dietician

Onida Barbecue Range of Microwave Ovens with Barbecue Menus. Now enjoy your favorite Tandoori Chicken, Paneer Tikka at just a touch of a button in a healthier way with ONIDA'S Smart Microwave Ovens.

ONIDA INDUCTION COOKTOPS

Push Button

6 Auto-Cook Menus

Onida Push Button Induction Cooker is a stylish, cooking appliance. The Indian auto cook menu makes cooking a joy.

Touch Button

8 Auto Cook menus

Onida Touch Button Induction Cooker is a stylish, compact and portable unit. It is designed with Indian auto cook menus and its smooth sensitive touch control panel makes operating easy and elegant. With a power of 2100W, cooking was never so simple.

INTRODUCTION

MARKET SCENARIO

India is a growing market for consumer durables today. The lifestyle of people is changing, owing to an increase in the disposable income. There is a shift in the market towards the base of the pyramid. There is a great need to introduce a new segment of white goods for such a market segment.

WHY LAUNDRY?

People all over not only desire but also need clean clothes. We can hope to reduce the time, effort and resources needed to perform these tasks. By understanding local customs, practices, and geography, we can hope to fill the void and modernize an age old process for people who need it the most.

DESIGN SCOPE:

Hence, the Indian market situation provides with a user group which has been unattended to with regards to laundry devices.

As a designer this gives an opportunity to produce a durable, simple, product as well as create jobs with an understanding of local materials and customs, to not only help the laundry process, but also affect the people.

Thus, designing a mini laundry device for washing undergarments in the Indian market that allows me to focus on solving life's daily problems for the people who need it the most.

WASHING MACHINE:

A washing machine is White good Consumer durable. The shift in lifestyle of users who are now buying White goods not as luxury good but as basic commodity products, widens the market scope for this product segment.

PROJECT SCOPE

PROJECT UNDERSTANDING

To begin with understanding the entire portfolio of the company while absorbing its brand values and DNA

Finding opportunities for design intervention within company portfolio.

Upon studying various product ranges, narrowing down on Washing Machine as product of choice.

Decision made to expand project into developing a mini washing machine for washing undergarments .

INITIAL PROJECT BRIEF

To study the entire process of washing undergarments in various scenarios and try to incorporate or design a more effective and efficient aid/product for hotels or domestic use.

OBJECTIVE :

Study different scenarios in terms of domestic and commercial methods of washing undergarments.

Study further under each area, various socio economic sectors of people and activity mapping of their process of washing undergarments.

Understanding the difference in process/ steps in the various scenarios studied.

Understanding of users in all dimensions of emotional, social, cultural and financial factors.

Analyzing the observations, and finding insights from the washing process.

METHODOLOGY

The methodology follows the understanding of the current market scenario in India pertaining to consumer durables. This would help in understanding the market condition and decide upon the product development needed.

Since this is not a cliental based project, there was a great level of challenge involved in finding user segment for washing machine users.

Since in India, washing clothes by hand is still a largely practiced method and hence introducing a machine specifically for garments to the users poses to be a challenge.

Study of a washing machine in detail and understanding the working of different kinds of machines and technology involved.

System of washing clothes in India was broken down into Commercial(Hotels) and Domestic scenarios. After conducting field and user study for the various scenarios, a user group with maximum potential was decided upon.

Upon further studying the social, psychological, behavioural traits of chosen user group, a type of washing system was decided to be designed which would serve the purpose of getting a good quality wash.

The device should encourage the users to use the machine without qualms and enhance the experience of luxurious living.

MARKET STUDY- CONSUMER DURABLES

WHAT ARE CONSUMER DURABLES?

The consumer durables are classified into two major groups as the brown goods and white goods.

The term 'brown goods' stands for the electronic consumer products as mobile phones, television, CD/DVD player, and personal computer etc.

'Brown goods' much stressed to the relatively light and low priced and fast moving electronic goods including gadgets of various nature.

On the other hand, 'white goods' signify for the relatively high priced, heavy, and slow moving electronic goods like fridge, air conditioner, washing machine, microwave oven etc. White Goods mainly include all ranges of home appliances.

In recent times, the brown goods sector has suffered significant loses in terms of revenue earning. But, the world consumer's buying trend remained almost unaffected for the white goods as these are the long terms investments towards a better living.

White goods	Brown goods	Consumer electronics
• Air conditioners • Refrigerators • Washing Machines • Sewing Machines • Watches and clocks • Cleaning equipment • Other domestic appliances	• Microwave Ovens • Cooking Range • Chimneys • Mixers • Grinders • Electronic fans • Irons	• TVs • Audio and video systems • Electronic accessories • PCs • Mobile phones • Digital cameras • DVDs • Camcorders

CONSUMER DURABLES- INDIAN MARKET

Refrigerators

- The Indian refrigerator market accounted for sales of 6.5 million units in 2010
- This segment make up 18.0 per cent of the consumer appliances market
- Key growth drivers are lower prices and rising demand for frost free refrigerators

Air conditioners

- ACs are perceived as high-end products; current penetration stands at 3.0 per cent
- The segment had a 13.0 per cent share (2010) in the consumer appliances market
- High income growth and rising demand for split ACs are the key growth drivers

Washing appliances

- Washing machines are the second largest contributor to the consumer appliances market (after refrigerators); in 2010 4.7 million units were sold**
- Fully automatic washing machines are garnering an increasing share of the market due to reduction in prices and higher disposable incomes**

Electric fans

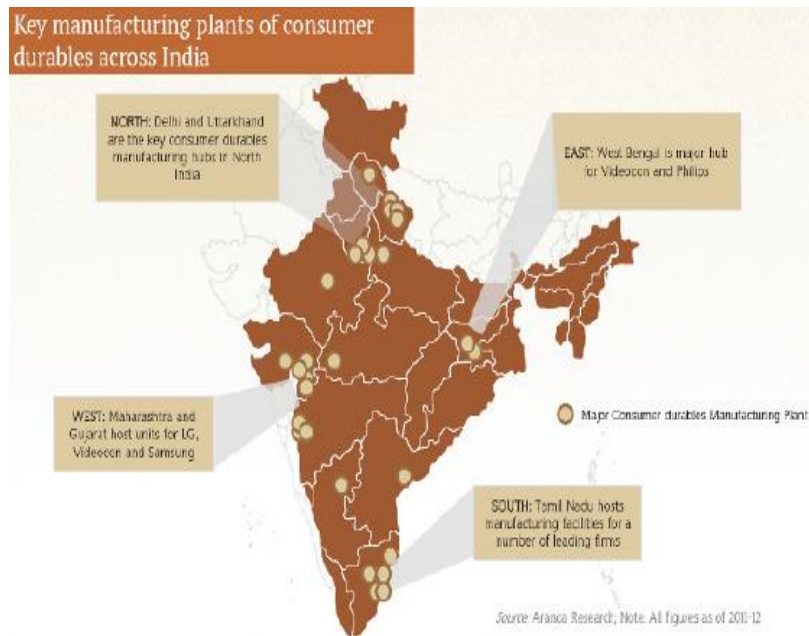
- This is a highly penetrated market
- Electric fans are an essential utility for more than six months of the year in most parts of the country

KEY PLAYERS

	ACs, refrigerators and specialty cooling products
	ACs and cooling equipment
	Refrigerators, ACs, washing machines, microwave ovens, DVD players, digital imaging products and audio-visual products
	ACs and refrigerators
	TVs, audio-visual solutions, computers, mobile phones, refrigerators, washing machines, microwave ovens, vacuum cleaners and ACs
	LCDs, washing machines, DVD players, ACs, microwave ovens, mobile phones, projectors and display product

	TVs, home theatre systems, DVD players, audio products, personal care products, household products, computers and phones
	TVs, home theatre systems, DVD players, mobile phones, digital cameras and camcorders, refrigerators, ACs, washing machines, microwave ovens and computers
	TVs, projectors, DVD players, audio systems, home theatre systems, digital cameras and camcorders, computers, video-gaming products and recording media
	TVs, DVD players, microwave ovens, refrigerators, washing machines, ACs and power backup solutions
	Refrigerators, washing machines, microwave ovens, water purifiers and power backup solutions

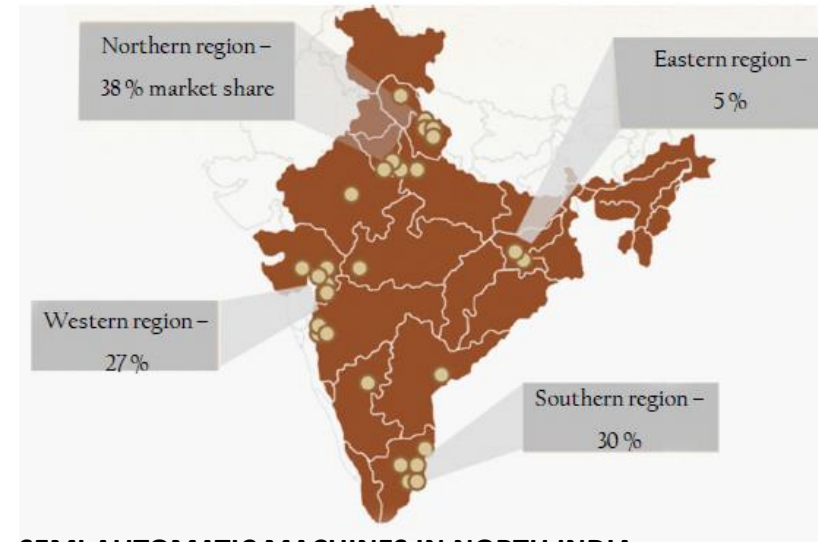
INDIA- ZONAL WISE STUDY



- North India has preference for semi automatics
- South India prefers fully automatic washing machines



PURCHASE DECISION BASED ON CLIMATIC REGION



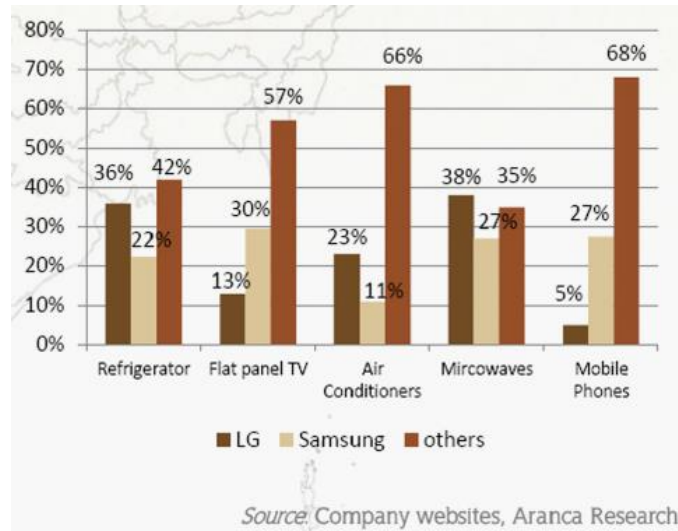
SEMI AUTOMATIC MACHINES IN NORTH INDIA :

North India has dry climate. Hence, not much need for spinning cycle is needed. Poverty level is more as compared to southern parts. Peoples lifestyle and cultural patterns are more rough and tough. Hence need for a basic regular kind of machine. Multiple uses (lassi making) of machine.

FULLY AUTOMATIC MACHINES IN SOUTH INDIA :

Humid climate, coastal zone. Hence, requires spinning cycle. Literacy levels are higher, stand of living is better overall as compared to northern region. Hence they prefer fully automatic machines.

COMPETITION STUDY



Videocon is a major player in the consumer durables industry in India. The company leads the market in colour TVs, refrigerators, washing machines, and microwave ovens.

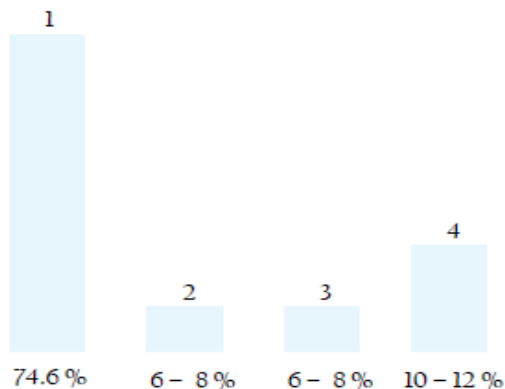
Samsung entered India in 1995 whereas LG began operations in 1997.

Before 2005, LG's entry strategy was to establish its presence across the country, offering a range of affordable but feature-rich products.

Samsung focused on creating a premium brand image by emphasising on the design and technology aspects of its higher-priced products and targeting a more affluent customer base.

After 2005, the two have expanded the scope of their target markets and offer both functional and high-end products.

Product innovation, heavy investment in R&D, and customer preferences have been the key factors behind the success of the two Korean giants.



1. Four major players – LG, Samsung, Videocon, Whirlpool
2. Godrej
3. Onida
4. Others – Ifb, Haier, Panasonic, Texla, Maharaja etc

MARKET STUDY- WASHING MACHINE

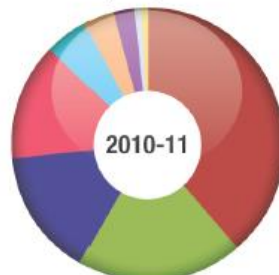
Indian Washing Machines Market
Total 4,728,000 units



Company	Sales (Units)	Share (%)
LG*	1,364,000	28.85
Samsung*	840,000	17.77
Whirlpool*	687,405	14.54
Videocon Group	636,200	13.46
Godrej	355,000	7.50
Onida	274,540	5.81
IFB	250,000	5.29
Haier	95,950	2.03
TCL	47,000	0.99
Others	177,905	3.76

*January–December 2010

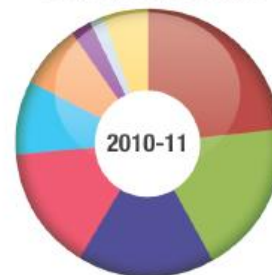
Indian Fully Automatic Market
Total 1,673,000 units



Company	Sales (Units)	Share (%)
LG*	650,000	38.85
Samsung*	330,000	19.73
IFB	250,000	14.93
Whirlpool*	230,000	13.75
Godrej	85,000	5.08
Videocon Group	62,000	3.71
Onida	40,000	2.39
Haier	16,000	0.96
Others	10,000	0.60

*January–December 2010

Indian Semi-Automatic Market
Total 3,055,000 units

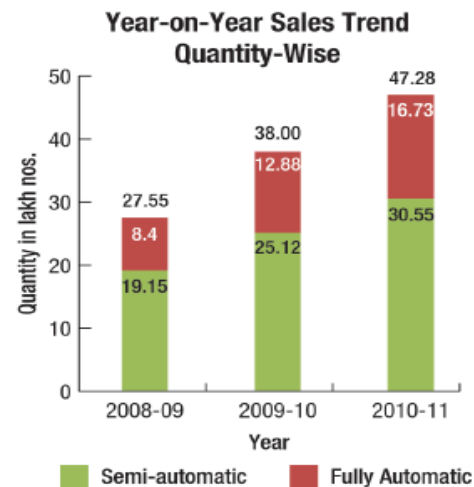
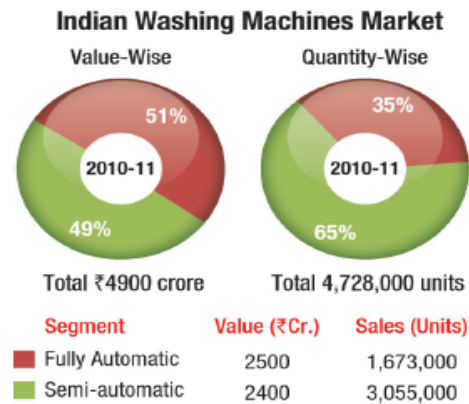


Company	Sales (Units)	Share (%)
LG*	714,000	23.37
Videocon Group	574,200	18.80
Samsung*	510,000	16.68
Whirlpool*	457,405	14.97
Godrej	270,000	8.84
Onida	234,540	7.68
Haier	79,950	2.62
TCL	47,000	1.54
Others	167,905	5.50

*January–December 2010

The Indian washing machine market continues its high growth trajectory, albeit the annual growth rate has come down from 38 percent in FY 2010 to 24 percent in FY 2011. The total market of washing machines in FY 2011 was 4.7 million units. The market is dominated by four players – LG, Samsung, Videocon group, and Whirlpool – with a combined share of 74.6 percent. The semi-automatic segment continues to have a dominant market share of 65 percent in terms of quantity, at sales of 3.05 million units in 2010-11. Zone-wise, the northern region of India leads with 38 percent market share, followed by southern region 30 percent, western region 27 percent, and eastern region five percent. Capacity-wise, the industry is showing an increasing preference for larger capacity machines. In the semi-automatic segment, demand is skewed in favor of washing machines with the capacity of 5–7 kg.

METHODOLOGY



The washing machine market in India is set for sustained growth over the long term, fuelled by favorable consumer demographics, availability of finance, and infrastructure development in rural areas. Several leading companies are now differentiating their products in areas of relevance to the changing aspirations and lifestyle of the consumers. Hence, the future of washing machine is on the verge of evolving from a mere utilitarian product to a truly energy-efficient, well-connected, and value-added appliance.

GLOBAL MARKET DYNAMICS

The global appliance industry faces a great deal of uncertainty about the future. For the core major appliance segment, including laundry appliances, cold appliances, dishwashers, and cooking appliances, shipment units for 2010 were 38.2 million, up 1.7 million from 2009.

Several appliances manufacturers are relying on Smart Grid and green technology to increase appliance shipments through 2011. Most smart appliances will connect to the Smart Grid and text owners about relevant matters. A number of manufacturers have also planned for Internet-assisted troubleshooting when the appliances are having issues. Some washers can now communicate with the dryer to help the dryer better anticipate the drying cycle of its clothes. Smart appliances connected to the Smart Grid can delay the start of the wash until a less cost-consuming time is available. Some companies will offer upgrades electronically and automatically such as advanced wash cycles.

MARKET STUDY CONCLUSION

WHY WASHING MACHINE?

- The profile of consumers in India has altered dramatically over the past few years.
- Income levels have gone up substantially and the wealth effect has spread across the population.
- The emphasis has changed from just price consideration to design, quality, and trends.
- The desire to look and feel good is also a guiding factor for customers while making their purchase decisions.
- Washing machine, no longer a luxury appliance, is gaining ground as a utilitarian product for the rapidly growing middle class and increasing younger population. With their evolving lifestyles, consumers are warming up to the idea of purchasing home appliances with advanced features.

History of washing machine

1400 - BEATING CLOTHES ON STONES



<http://www.oldandinteresting.com/washing-beetles-possing.aspx>

1851 HAND POWERED



<http://www.ebay.com/sch/Washing-Machines-/163057/i.html>

1908 FIRST ELECTRIC WASHER



<http://www.forcvec.com/powerkids/timeline.html#>

1797 - SCRUB BOARDS



<http://www.oldandinteresting.com/washboards-history.aspx>

1907 FLYWHEEL ADDED



http://en.wikipedia.org/wiki/Washing_machine

1861 FIRST CLOTHES WRINGER ADDED



<http://www.gettyimages.in/editorial/clothes-wringer-pictures>

History of washing machine

1922 AGITATOR SYSTEM



<http://www.mrappliance.com.au/Appliance-Spare-Parts/Washing-Machine-Parts/Spare-Parts/Simpson-Hoover-Agitator-Part-0231224001K>

MODERN WASHING MACHINE



<http://admissions.vanderbilt.edu/insidedores/2011/01/laundry/washing-machine/>

MILESTONES IN THE HISTORY OF WASHING MACHINES AND DRYERS 18TH AND 19TH CENTURIES:

- 1797 scrub boards.
- Early 1800s first clothes dryers; hand powered.
- 1851 first, hand-powered, washing machine with a drum, invented by James King.
- 1861 first clothes wringer added to the washing machine.
- 1874 William Blackstone built his first hand driven wooden washing machine. The Company he founded still produces and sells washing machines to this day, out of Their New York headquarters.
- 1858 first rotary washing machine, invented by Hamilton Smith.
- Early 1900s Wooden wash tubs are replaced by metal tubs.

EXISTING PRODUCT STUDY



http://www.germes-online.com/catalog/93/456/page8/81280/mini_washing_machine.html

- Portable machine
- 15 minutes quick wash cycle saves
- 1kg rated washing capacity



<http://bobuai.en.hisupplier.com/product-148107-semi-auto-mini-washing-machine.htm>

- Multi functional Semi-auto mini washing machine.
- The small garment can be washed easily. Capacity is 2.0 kg.



<http://miniwashingmachines.blogspot.in/>

- Portable machine
- 2kg rated washing capacity



<http://reganfang.en.ecplaza.net/6.asp>

- Portable fully automatic machine
- 2kg rated washing capacity



<http://antikrisis.net/article/69-gadgets--hand-powered-portable-washing-machine>

- Wonderwash a manually operated machine.
- Uses 90% less water.

PRODUCT ANALYSIS

FRONT LOADING FULLY AUTOMATIC MACHINE:

BASICS

A front loading washer consists of a drum that spins clothes with the help of an agitator.

This setup is surrounded by a metal casing and controlled by a timer that cycles through the various portions of the wash, a regulator that stops the inflow of water and thermostat that regulates the temperature.

A counterweight made of a concrete block typically, supports the entire drum and mechanism weight which is cantilever mounted.



Concrete counterweights



Counterweight supports at front of the drum as well



Entire mechanism is supported by springs on the top and a mount at the base

LOADING / UNLOADING

- On top loading washers, the door sits above the action, which allows you to drop in a forgotten sock or or fabric softener while the wash is in progress.
- Front loading washers feature doors that form a sealing wall at the front of the drum and hold in water, clothing and suds during a wash.
- For adequate sealing, the door in a front loader features a rubbery gasket that forms a water tight barriers.

PRODUCT ANALYSIS

WATER CONSUMPTION:

- Front loaders only use enough water to fill the bottom half of the drum.
- Because the drum is horizontal, all clothes spend time on the bottom of the drum as they tumble.
- Top loaders, conversely, require enough water to fill the entire drum.

SPIN CYCLE:

- The clothes in a washer all require drying after the end of the cycle, but how much drying depends on the rate of spin the clothes are subjected to during the spin cycle of the wash.
- Top loading washers feature agitators that spin an average of 650 rpm.
- This pales in comparison to front loaders which can spin up to 1,000 rpm.



Tacho meter used to decipher the rpm of the machine



DETERGENT:

- Front loading washers require a high efficiency detergent, rather than the normal detergents used in top loading washers.
- Because less water is used in a front load washer, normal detergent is often too powerful, creating too many suds for the washer to rinse off during the rinse cycle.
- The high efficiency detergent creates fewer suds and washes away completely at the end of a wash



Connections for control panel

PRODUCT ANALYSIS

TOP LOADING SEMI AUTOMATIC MACHINE: BASICS:

- A semi automatic washing machine, also known as a twin tub, has two sections a washtub in which laundry is agitated in soapy water and a spin dryer that is used for rinsing and water extraction.

FOR SETUP:

- The machine is positioned in front of the sink.
- The drain hose is hooked onto a faucet for water supply
- The washtub is filled with water and the machine is attached to the electricity supply.



Wash and Spin Tub



Connecting pipe to faucet, which will be placed in washer to fill the tub with water

WASHING:

- Detergent is added to the water and the agitation system is briefly activated to dissolve this in the water.
- The laundry is placed in the washtub and the agitation system is again activated for the desired amount of time.

RINSING AND SPINNING:

- The washing is lifted from the washtub into the spinning drum. The suds are spun out of the washing and water is then poured on top of the load using the fill hose.
- This water rinses soap out of the clothes when the spinner is again activated.

The process should be repeated until the water emerging from the drain hose contains no soap traces.

- The load should then be spun until water ceases to emerge from the drain hose.



Outlet pipe fixed to washer



Motor drive for spinning mechanism



Control panel



Top loading action of semi automatics



Spinning drum

PRODUCT ANALYSIS

WORKING:

- The pulsator moves in two directions
- Clockwise and anticlockwise
- Gear box helps in reducing gear ratio
- Hence, RPM of motor > RPM of gear box > RPM of pulsator
- Normal mode: pulsator moves in one direction for a short period of time, pauses for longer time for soaking action, resumes action in opposite direction.
- Strong / Heavy mode: pulsator moves in one direction for longer time, pauses for less time and resumes action in opposite direction.



Motor connected to a gearbox for reduction of gear ratio.
The gear box is connected to pulsator via a belt pulley mechanism

WASHER ONLY

- Works on a pulsator which is used for agitation
- Low duty machine
- Smaller in size
- Pulsator moves only in one direction
- Quality of wash is not great



Washing Machine Feature based Comparison (table1)

Features	Semi- Automatics	Top Loading	Front Loading
Capacity	4-8 kg	5-10 kg	5-8 kg
Floor space required	36" x 36"	16"x 16"	16"x 18"
Wash quality	Average	Good	Excellent
Delicate clothes	Average	Good	Excellent
Wash cycle	Fastest	Fast	Slow
Hot wash	No	Few	All
Water connection	Not required	Required	Required
Water consumption	Less	More	Less

Type of machine evaluation (table 2)

	Top load	Front load	front load for hotels
Initial cost	+ (low)	- (High)	+(low)
Product cost	-	-	-
Mechanical complexity	+ (no)	-(yes)	+ (no)
Complete Drying of clothes	- (no)	+ (yes)	+ (yes)
total	2+	1+	3+
✓ ✗	✗	✗	✓

Mechanism finalized: front load/hotel front load

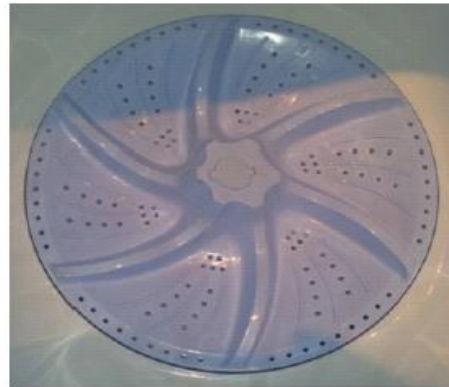
Process: quick wash(10mins)+ complete dry (20 mins)

Why frond load?

- As seen in **table 1** the front load machine has better features than the semi automatic & top load machines.
- According to the design a separate category of front load for hotel is added in **table 2** because some of the negative issues like initial product cost & mechanical complexity of the product are not real problem when it comes to designing for premium hotels.
- Intial cost of the machine & Mechanical complexity designed of the machine designed for hotels is reduced as the size of the machine is reduced and also there is no need for heavy concrete weight and water gaskets.

COMPONENT STUDY

PULSATOR



COMPONENTS STUDY

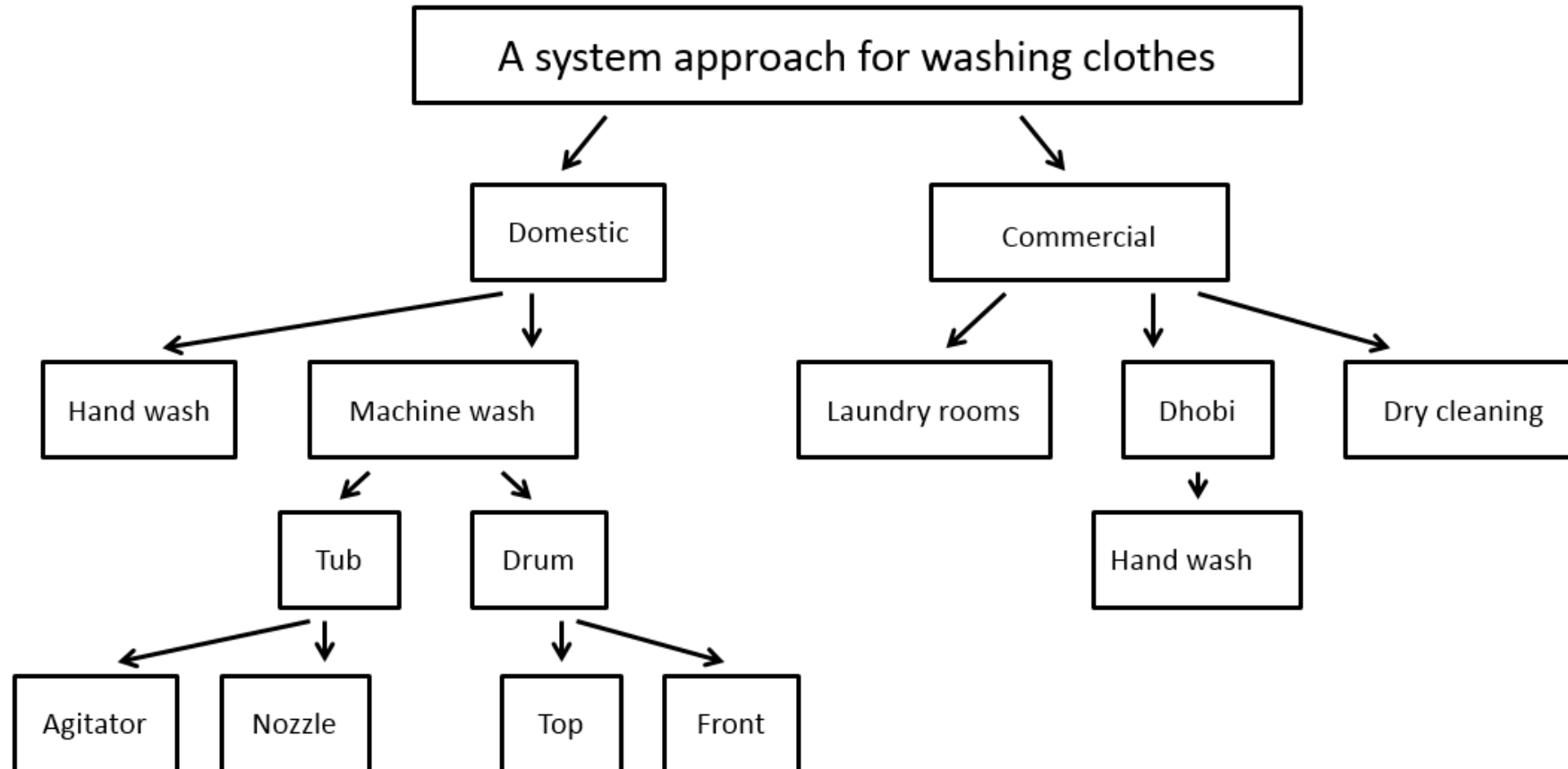
CONTROL PANEL



LIDS



A system approach for washing clothes



CLOTH WEIGHT CHARACTERISTICS

Measured	Cotton trouser (size 36)	500 gm
	Cotton shirt (full sleeves, size 42)	250 gm
Estimated	Sari	400 gm
	Salwar suit	600 – 750 gm
	Jeans / denims	650 -750 gm
	T shirts	200 gm
	Kurta pajama	600 gm
	Undergarments	200 gm
	Shorts	200 – 300 gm
	Bedsheet	400 gm (single, 750 – 100 gm(double)
	Bedcovers	1250 gm
	Curtains	1250 gm (full length)
Childs clothes	Shirt and pant	500 gm
	Undergarments, socks, handkerchief	400 gm

Source: Onida MIRC Electronics R & D

CLOTH WEIGHT CHARACTERISTICS

AVERAGE DAILY REQUIREMENT CALCULATION FOR A FAMILY OF 4 (2 ADULTS + 2 CHILDREN)

1 Adult Male	1 t shirt + shorts	450gm
	1 shirt + trousers	750 gm
	1 kurta pyjama	600 gm
	1 set of undergarments	200 gm
		= 2.25 kg (with 250 gm misc)

1 Adult Female	1 salwar suit	600gm
	1 sari (2 days)	350 gm
	1 night gown (2 days)	500 gm
	1 set of undergarments	200 gm
		= 1.75kg (with 250 gm misc)

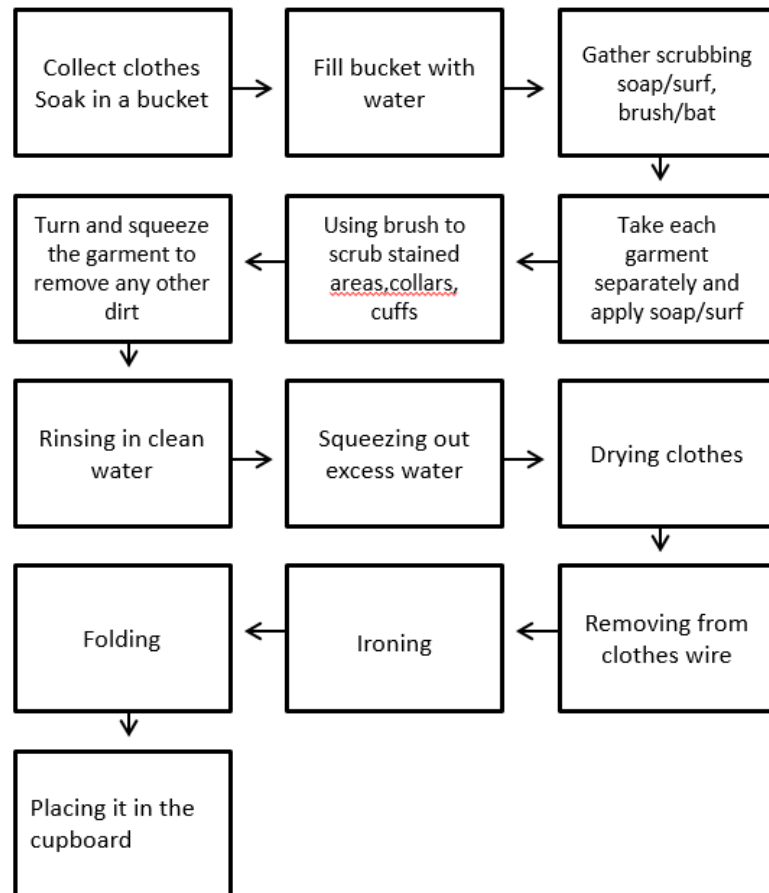
1 Child	2 set shirts + pants	750 gm
	1 set of undergarments	150 gm
		= 1.1 kg (with 200 gm misc)

Therefore,
 Family daily average = 5 – 5.5 kg
 (Add on wt = 400 gm (towels, bed sheets
 etc)

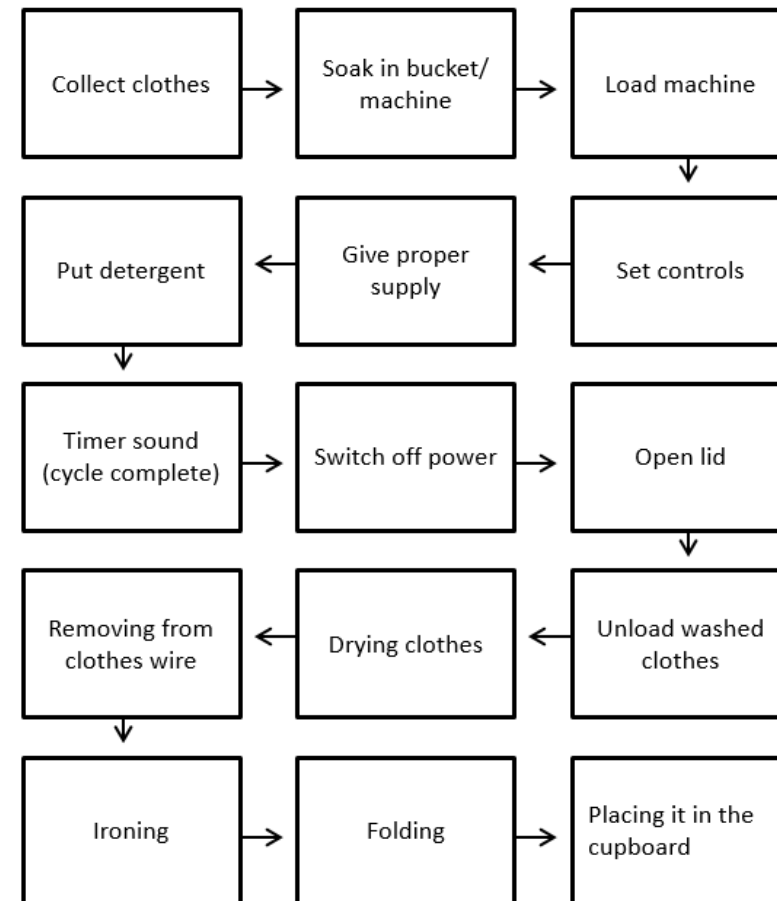
Source: Onida MIRC Electronics R & D

Activity Analysis

Washing clothes manually (by hand)



Washing clothes in a washing machine



BRAINSTORMING AND USER MIND MAPPING

Factors that affect washing clothes :

- Economic
- Behavioral
- Lifestyle
- Cultural
- External
- Circumstantial
- Social
- Personal

ECONOMIC FACTORS:

- Cost effectiveness
- Low income
- Male working members
- Base of pyramid
- Low affordability
- Self sufficient environment
- Increase in standard of living
- Upliftment
- Low buying power
- Decision maker is male member of family
- Low power consumption

BEHAVIOURAL FACTORS:

- Mental blocks
- Old school techniques
- Orthodox
- Water consumption
- Unintentional wastage of water
- Apprehensions
- Machine needs to be supervised
- Time wastage
- Running water activities
- Routine

LIFESTYLE FACTORS:

- Extensive
- Time consuming
- Manual labor
- Large family strength
- Small children
- Mandatory tasks
- Distribution of chores
- Daily washing of clothes
- No attached toilets

CULTURAL FACTORS:

- Traditional methods
- Hand washing

- Personal satisfaction
- Kurtas and saris
- Household chores - female duties
- Stain/sirt prone
- Low ownership of garments
- Low acceptance towards new methods

CULTURAL FACTORS:

- Traditional methods
- Hand washing
- Personal satisfaction
- Kurtas and saris
- Household chores - female duties
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- Low ownership of garments
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CIRCUMSTANTIAL FACTORS:

- Limited water supply
- Storing water
- Faulty electrical connection
- No judgement of consumption
- Space constraints
- Habitual
- Accustomed over period of time
- Reuse of grey water

SOCIAL FACTORS:

- Pride
- Maintaining standards
- Competitive
- Involuntary sharing of things
- Unfriendly relations within community
- Open activity
- Task carried out in public eye
- Possessive

PERSONAL FACTORS:

- Visual interaction
- Cleanliness
- Intensive manual work

EXTERNAL FACTORS:

- Social atmosphere
- Possession
- Peoples opinions

Critical observations

Smell is an important user perception of clothes being dirty. Smell may beat stains as a mark of cleanliness.

Users tend to relate the noise a washer makes, to its speed and vice versa. This results in a false perception of efficient cleaning by the user.

Idle machine takes a lot of valuable space.

Additional process issues – Filling water (incase of semi automatic), drying clothes, folding, storing clean and dirty clothes separately. Key differences between housewives working women is time. Hence, working women or households which have both adults working prefer to own and use a machine to wash clothes

Many households have the children operating the machine incase of working adults.

By tradition, clothes are washed almost everyday

Washing is a parallel process and preferred over other chores

Experience and elder teachings are crucial, power relations (maids-owner) and emotional relations (mother-family)

Cultural judgments based on the type of clothing .Washing using a washing machine does not become a dedicated activity. Thus, it acts as a parallel process leaving the user free to carry out other tasks while clothes are being washed in the washer.

Key differences between housewives working women is time. Hence, working women or households which have both adults working prefer to own and use a machine to wash clothes

Analysis

All users would want to own a machine.

Effort applied is maximum while scrubbing the clothes to remove stains(either with a brush or in some cases with a bat)

Some user Prefer hand wash over machine wash since

In the machine they cannot see the clothes being washed

Machine does tumble wash, hence cannot concentrate on all stains and areas on the garments.

In spite of having a machine, most people still wash clothes by hand and only use the machine to spin clothes.

For hand washing, all users would prefer any area where water comes with good force

Hence, they prefer bathroom, but sometimes the bathrooms are too small.

Many times other house members are using the bathroom and hence clothes cannot be washed in the bathroom.

During hand washing, there was excessive use of soap bars. Around 1 bar is consumed within 2 days for a family of 4 – 5 people.

Users that hand wash clothes, feel that a higher level of cleanliness is achieved with the use of more soap. More than 75% of users do not wash their undergarments, kitchen clothes and baby clothes along with the other dirty laundry. They are either washed separately using the machine or is washed manually (by hand).

USER RESEARCH

UNDERGARMENTS WASHING SCENARIOS- PREMIUM HOTELS

Hotel Taj Landsend, Mumbai

Process

Guest calls.

Laundry pick up from room.

Entry into log book – (guest name, room number, type of laundry, number of garments, date of receiving and delivering.)

Detailed description of each garment is made ie. shirt color, size, brand name etc.

Tagging room number wise.

Washing.

Pressing.

Sorting room number wise.

Hotel washing machine

- 4 washers
- 2 for guest laundry
- 2 for hotel use (110 kg capacity with 85kg dry weight carrying capacity)
- Washers are affiliated with chemical tanks and automated to draw chemicals as per cycle selected.
- For special and heavy garments of guests, normal washing machines are used since there could be wear and tear in heavy duty washers.
- Small dryer for same.
- 4 dryers of 75kg capacity each
- These dryers are used for drying all types of clothing
- 1 dry cleaning machine 15kg capacity (washing and drying)
- Pressing utility press.
- Machine for ironing coats which has a mannequin set up with steam blowing from within.

USER RESEARCH



Type of clothes

Male:-

Tshirt
Shirt
Shorts
Trousers
Jeans
Kurta payjama
Blazzer/ coat

Female :-

Salwar suit
Saree
Jeans
Top
Pants
Skirts
Dress
Trousers
Blazzer/coat
Nighty

Children :-

Shirt
Tshirt
Top
Jeans
Skirts
Frock
Night suit

Observation :-

According to my research and the hotel laundry staff it was observed that more than 90% of the guests do not give their innerwear /undergarments including infant nappy and bib for cleaning in the hotel laundry.

USER RESEARCH

Hotel users

No. of Users- 30

Questions Asked:

1. Do you take over night trips or vacations?
2. Where do you stay during that period?
3. How long do these trips last?
4. How do you wash your clothes when you are on a trip?
5. If hotel laundry, do you give your undergarments in the laundry as well?
6. If not, how do you wash your undergarments?
7. Do you use a washing machine at home?
8. Do you wash your undergarments in the machine at home?

USER RESEARCH

Common Answers:

1. Yes (30 people)
2. Relatives house , Hotels, Guest house, Lodge.
3. A week to 10 days or maximum a month.
4. Hotel laundry. No need of washing we carry enough clothes for the trip and wash them once we are back.
5. No(30 people)
6. Wash it in the rooms at the basin or while taking a shower
7. Yes(26 people)
No(4 people)
8. Yes but separately they are not washed with the regular clothes (17 people)
No we wash them on our own while taking a shower or after we are done(7 people)
House maid washes it (6 people)

Conclusion

It's a typical Indian mentality that undergarments should be washed daily to maintain personal hygiene.

Hotel customers do not give their undergarments for wash in the hotel laundry mainly to maintain personal hygiene.

But they do wash their undergarments in their individual room bathrooms manually.

As there is no particular place given in the hotel rooms to dry clothes the users leave it to dry in any place of the room that seems convenient.

Some users require only dryer to dry their swimming costumes after a swim.

Hence washing and drying of undergarments is a major problem in the hotels.

DESIGN BRIEF

To develop a mini washing machine for undergarments specifically for Premium Hotel rooms. That gives an instant wash and dries the clothes ,involves low water consumption, conserves space and serves as a luxury product for the users.

ESSENTIALS:

- Fully automatic.
- Stored water consumption
- Space efficient
- Hot water
- Portable

DESIRABLES:

- Simple machine mechanism
- Encouraging users to use.
- One step process
- High automation
- Quick wash
- Dryer that dries the clothes completely
- Process complete indicator

DESIGN HYPOTHESIS

- Need for devices and systems to allow users to help themselves.
- Need for high quality, high functioning products made of locally sourced materials and available at a low cost.
- Doing laundry manually is a time consuming and tiring task.
- The washer must ensure of water supply, soak clothes, scrub them and dry them.
- Often the clothes lose structural integrity due to these harsh washing habits.
- To design a mini washing machine that is not only functional, but also keeps the user in mind.
- All people still desire and need clean clothes.
- We can only hope to reduce the time, effort and resources needed to perform the task of washing undergarments in hotel rooms.

WHAT WILL BE DESIGNED?

- A device which will simplify process of washing undergarments in the hotel rooms.
- It can be a small machine that gives and easy wash and dry to the undergarments.

WHAT WILL BE ITS NATURE?

- The device will be easy to use, space conserving, water and electricity efficient.
- It will encourage the users to use it and make the process of washing undergarments more than just a mundane activity.
- It will be made for a specific user group, keeping in mind their behavioral, lifestyle and other aspects in mind.

WHO WILL IT BE FOR?

- The end user are the customers using the hotel rooms.
- This product is for premium hotels only where customers expect luxury products.

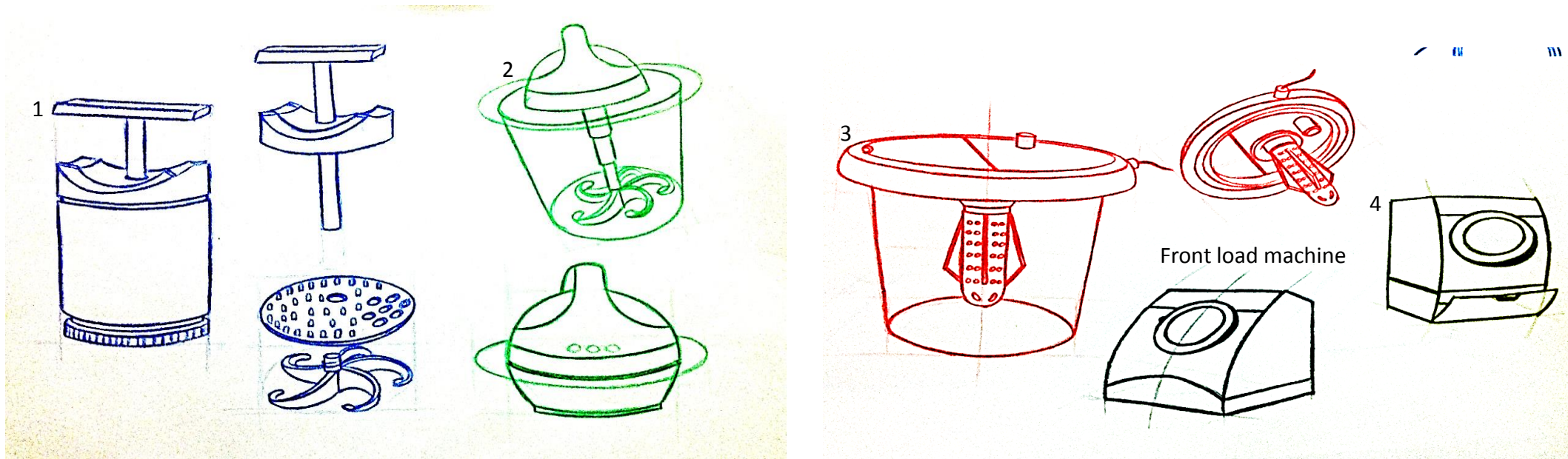
- Washing undergarments is a part of the daily activity .
- Hand washing is done in uncomfortable spaces as there is no choice and hotel laundry is not preferred.

WHY IS IT NEEDED?

- Hand wash – inadequate space, lack of hygiene, usage of water, time spent, manual fatigue caused.
- Hotel customers use the room for a very short period they are temporary residents hence they cannot follow the same process they carry out in their individual homes.
- The mini washing machine will do away with problems of manually washing the undergarments in the hotel rooms.
- It can also act as luxury product.

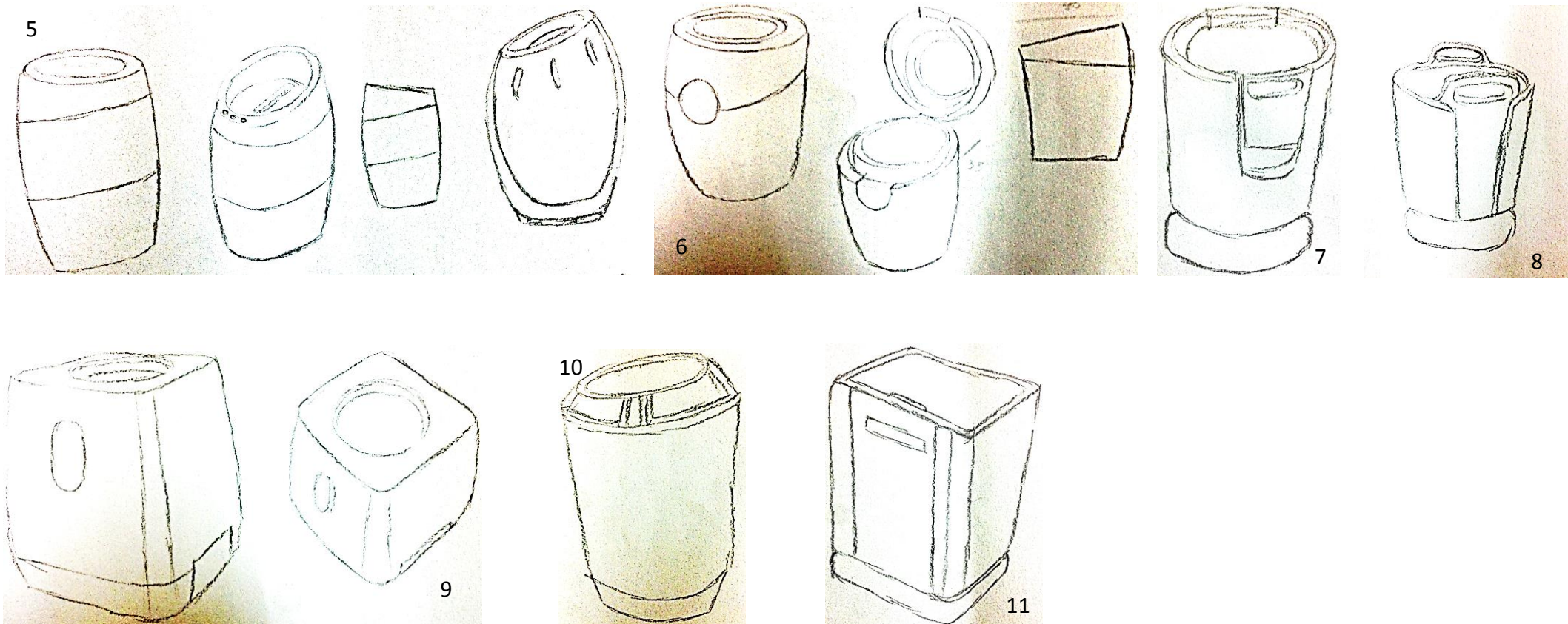
Ideation

A washing device that can be attached to any regular bucket



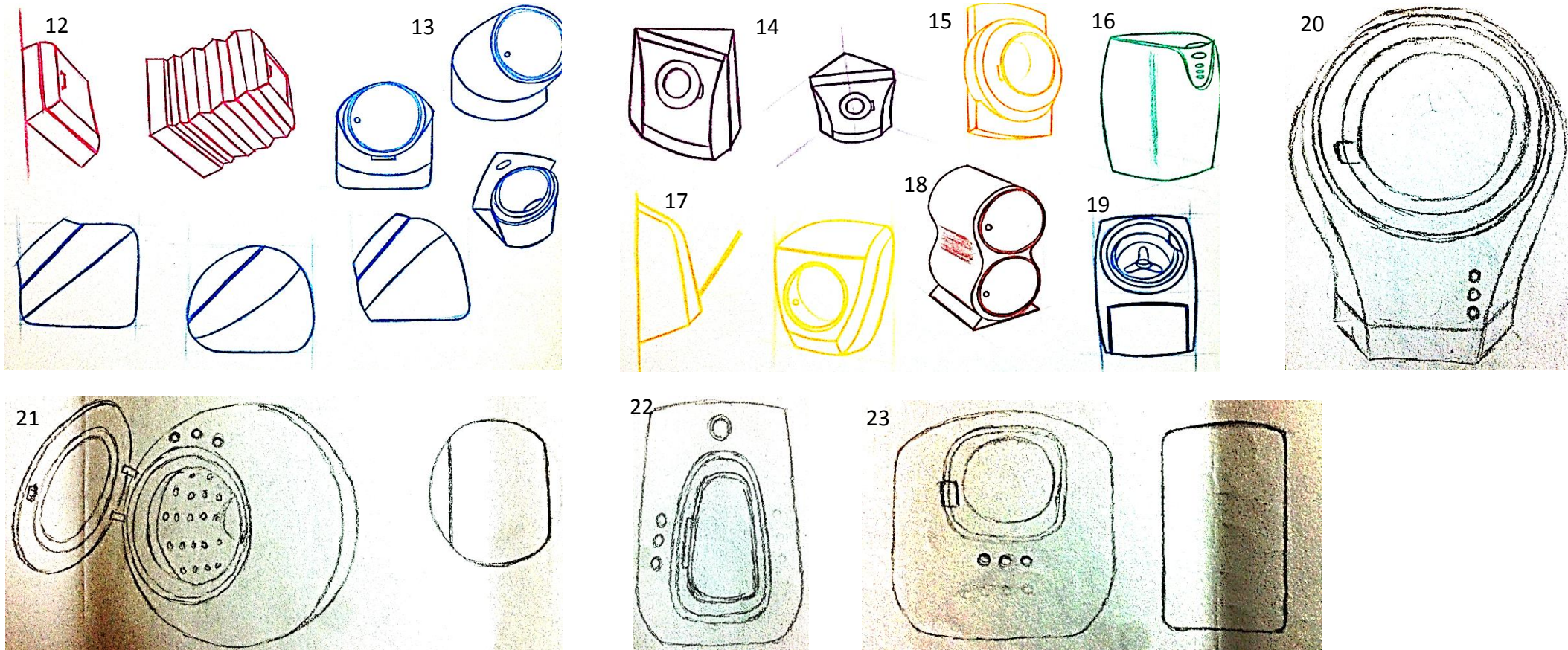
Ideation

Mini top load machines with different shapes

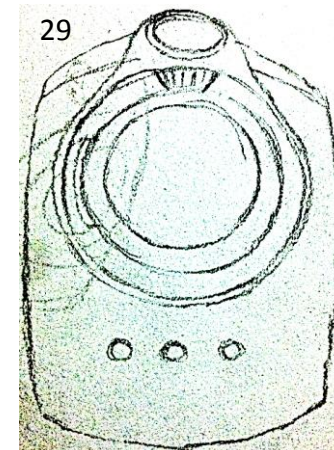
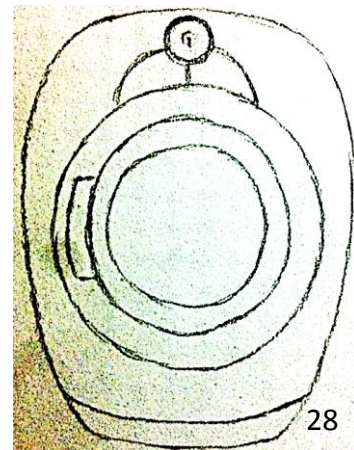
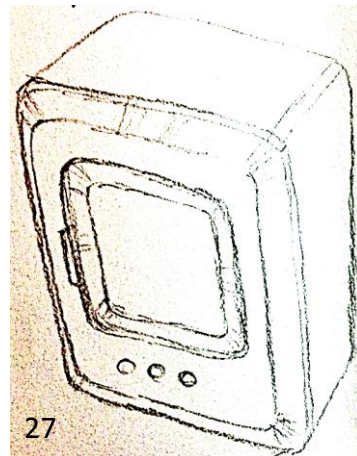
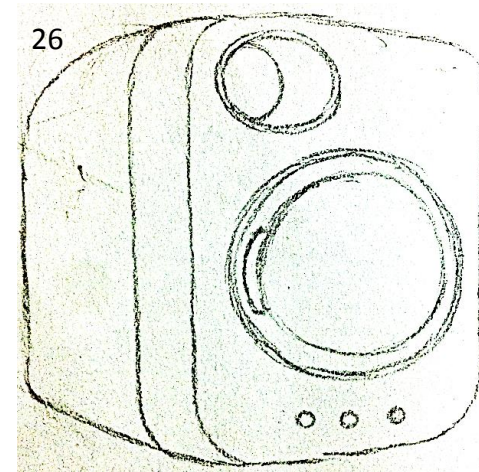
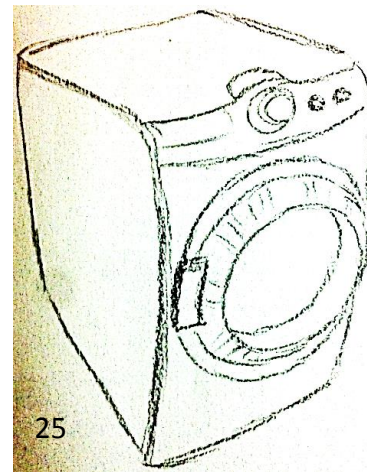
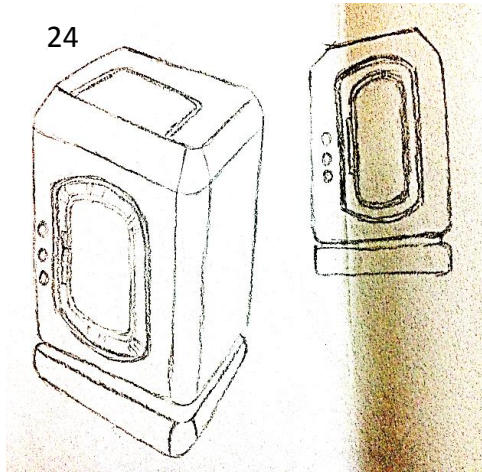


Ideation

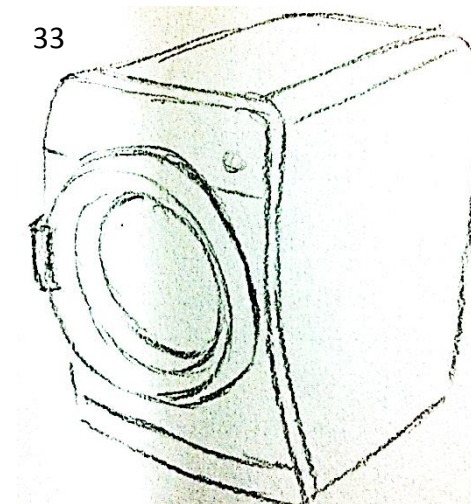
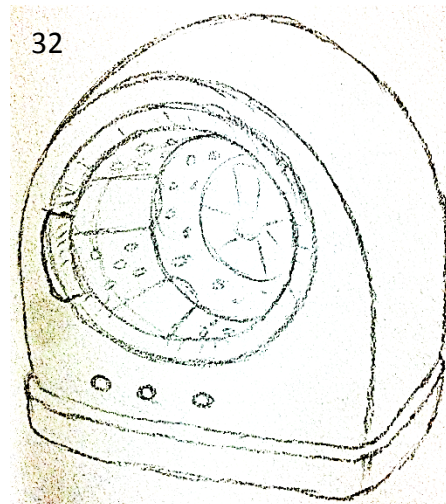
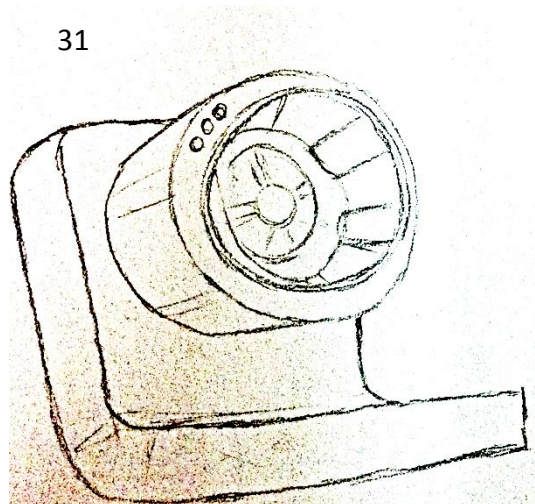
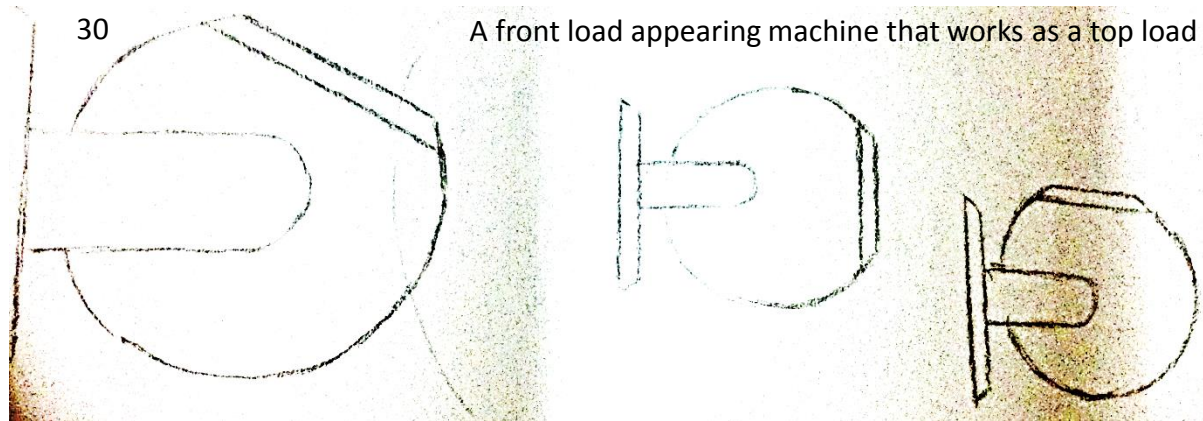
Front load designs with different shapes



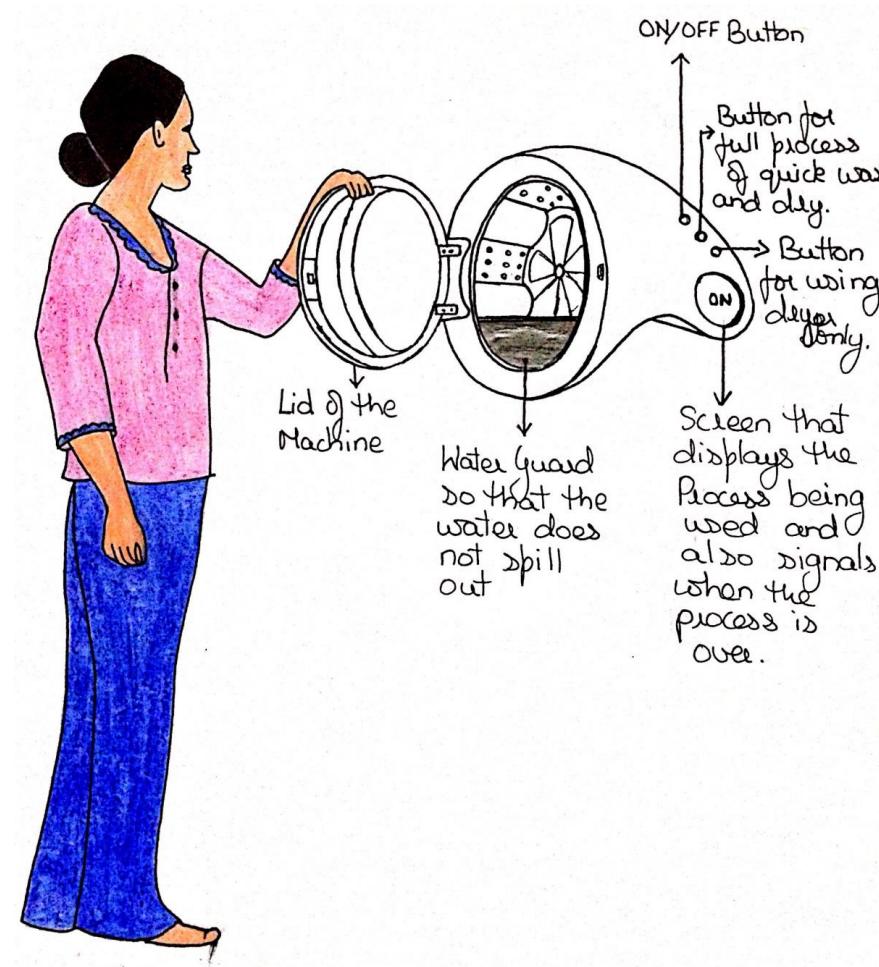
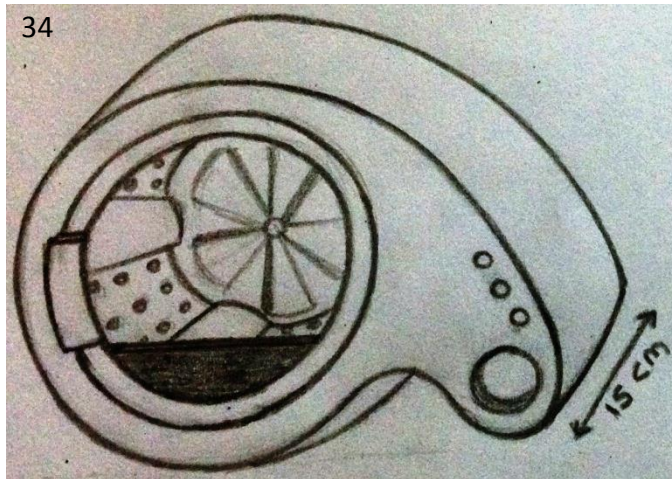
Ideation



Ideation



Final concept



Final Product Features

Lid- The lid is closed when the machine is in use.

Water guard- Prevents water from spilling out or leaking while the machine is in use

Small screen- Displays the process being used and also signals when the process is complete

Three buttons- 1) On/Off button. 2)Button for using the full process of quick wash and complete dry. 3) Button for using the dryer only

In built dryer- The mini washing machine has an automatic in built dryer that uses the hot air drying process.

Multi speed motor

Very high automation.

BIBLIOGRAPHY

<http://www.futureshop.ca/en-CA/research/laundry-buying-guide/rc8602.aspx>
<http://www.scribd.com/doc/22761142/The-Survey-Report-on-Washing-Machine-Market-in-India>
<http://info.shine.com/Industry-Information/Consumer-Durables/902.aspx>
<http://www.slideshare.net/rsm/a-complex-view-of-laundry>
<http://www.slideshare.net/keerthana777/top-washing-machine-brands-in-india>
<http://www.wringerhand.com/>
<http://www.apartmenttherapy.com/the-laundry-pod-international-141324#comments>
<http://www.cleanairgardening.com/portable-washing-machine.html>
http://www.ehow.com/info_10043792_agitator-washing-machine-vs-nonagitator.html
<http://www.walmart.com/ip/Honey-Can-Do-Three-Bag-Mesh-Rolling-Hamper/15641335>
<http://vimeo.com/41938940>
<http://eliotcoven.wix.com/dev-world-laundry>
<http://freshome.com/2007/07/31/detergentless-haier-wash20-washing-machine/>
<http://www.onida.com/>