Confederation of Indian Industry

Honda Motorcycle and Scooter India Pvt. Ltd., Narsapura

CII National Award for Environmental Best Practices - 2021

GreenCo SM

Presented By:
Purushottam Sarma- Division Head-Plant Engineering
Sriram Karikkat-Section Head-Environment
Kishore N – Leader-Environment
Manjunatha B C –Leader-Environment

HMSI 3F — Honda Motorcycle and Scooter India-At a Glance

HONDA MOTOR COMPANY, GLOBAL OPERATIONS

Mr. Soichiro Honda
(1906 – 1992)

Honda Motor Co Was Founded In 1948

Honda operates in 150 countries

Automobiles

Motorcycles

Power Products

Robotics

Honda jet

Aero Engine

HONDA MOTORCYCLE AND SCOOTER INDIA

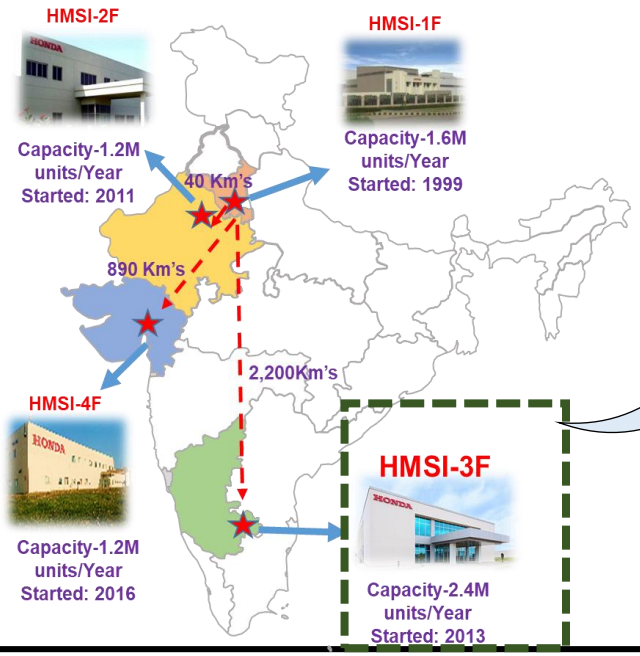
OVERALL HMSI

Total 4 Factories in India

Capacity 6.4 mil units/year

Associates 24,000 people

Activa Sales 2.4 mil Units/year



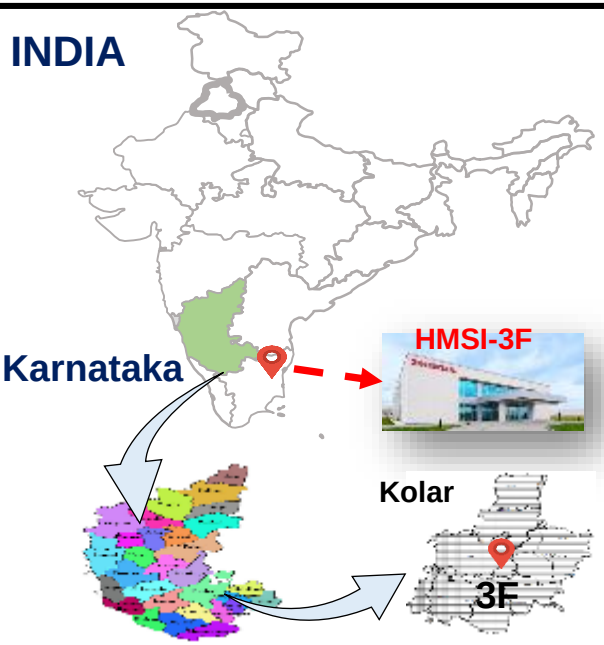
Land Area	: 4,81,757 m²
Built up Area	: 2,65,706 m²
Manpower	: 7041
Capacity	: **2.4 Million**
Models	: Activa, SP125, Shine SP, Livo, Dio

- Greenco Platinum Rated Company
- Received National Water Award from Ministry of Jal Shakti
- Received National Energy Conservation Award from BEE
- Received Greenco Star Performer and Innovative Project Award

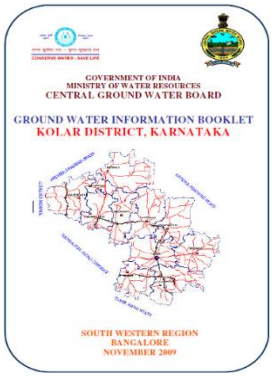
Honda Narsapura is located in Kolar, Karnataka.
It is Honda's largest factory globally with a capacity of 2.4 Million vehicles per year

Best Practices in Recycling of Wastewater to maximize Rainwater Conservation

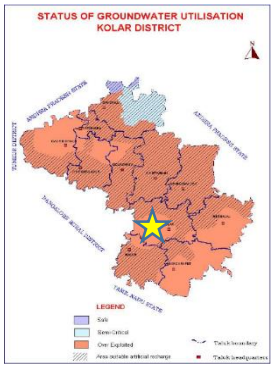
Factory Location and Limitation



HMSI set up operations in 2013



Ground water Survey of Kolar region by CGWB

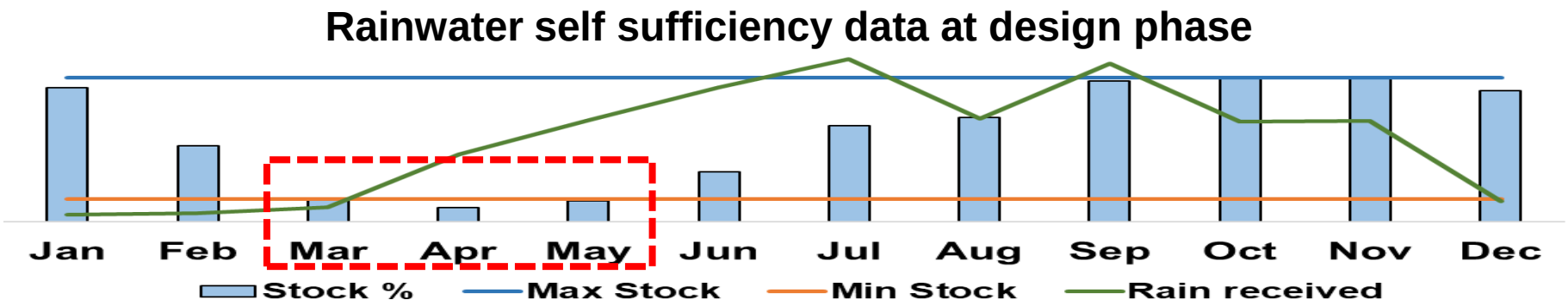


HMSI is situated in over exploited ground water region

- Kolar is considered as a **OVER EXPLOITED ZONE** means highly depleted ground water table as shown in image 2
- Due to rapid utilization (urbanisation), recharging of ground water has diminished
- The scenario requires an alternative source to bridge the gap, which is available and is the purest form of water – Rain water
- Rain water will be an immediate source of water supply by, **"Catching water wherever it falls"**

Due to water unavailability, HMSI decided to install three rainwater tanks for meeting the factory's water demand. These tanks have a capacity of 80 Mill Litre.

Challenge: Rainwater stock is below minimum level in 3 summer months



Analysis: Options to ensure water self sufficiency for entire year

Idea	Pros	Cons	Judge
Water sourcing from borewells		• Very low groundwater table • Very less water yield from borewells • Legal liabilities to government	X
Procurement through external source		Lack of external water supply during summer months	X
Construction of additional rainwater tanks	Rainwater stock availability throughout the year	No space inside the factory	X
Reduce, Reuse and Recycle approach	• Rainwater stock availability throughout the year • Water efficient technologies will ensure overall reduction in water risk of the factory in future • Water efficient technologies will result in overall reduction in water and wastewater treatment cost		O

Solution: Rigorous approach towards Reduce, Reuse & Recycle through continuous PDCA

The trigger for Reduce, Reuse, Recycle and Upcycle was the management decision to run the factory on 100% rainwater

Reduce

- Water reduction in Design phase
- Reduction through process modification
- Reduction through New technology

Reuse

- Reuse of effluent through quality based control
- Reuse of effluent in paint shop sludge pit cleaning

Recycle

- Phytoremediation
- Membrane Bio-Reactor
- Electro De-Ionization
- Decanter for sludge handling
- High efficiency membranes

Upcycle

- Upcyling of STP effluent to ETP
- Upcycling of storm water to domestic drinking water

Contributing factors

kaizen

横展開

yoko ten kai

yoko = horizontal, lateral, sideways
tenkai = develop, deploy, advance

Each aspect of the above strategy will be explained in detail

Milestone 01 - Water reduction in Design phase

Background

Due to geographical constraint, HMSI has built 3 rainwater tanks to store and use rainwater for application. HMSI Narsapura has adopted 4R principle to reduce freshwater consumption and implemented several changes in the conventional manufacturing practices through design changes as it was difficult to maintain with rainwater alone.

Shop floor Ventilation

Before

Water washers

Water consumption : **54,000 KL/Annum**

After

Air Handling Unit

Water consumption : 0 KL/Annum

Compressed Air Requirement

Before

Centrifugal compressors with cooling tower

Water consumption : **2750 KL/Annum**

After

Air cooled Compressor

Water consumption : 0 KL/Annum

Process Chilled Water Requirement

Before

Water cooled chillers

Water consumption : **20,625 KL/Annum**

After

Air cooled chillers

Water consumption : 0 KL/Annum

Diesel Generator Cooling

Before

Water Cooled DG

Water consumption : **550 KL/Annum**

After

Air Cooled DG

Water consumption : 0 KL/Annum

77925 KL/Annum

116.87 Lakhs/ Annum

NA

NA

Considering the geographical constraints, several water reducing initiatives are adopted in design phase itself

HMSI 3F

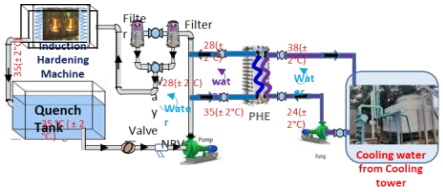
Milestone – 02 Reduction through process modification

06/24

Induction hardening elimination

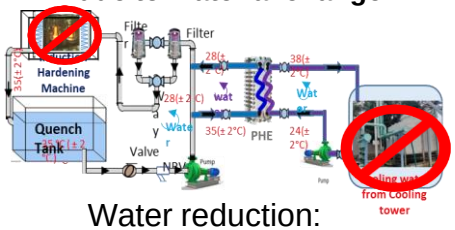
Before

Cooling tower requirement for induction hardening



After

Induction hardening eliminated due to material change



Water reduction:
1350 KL/Annum

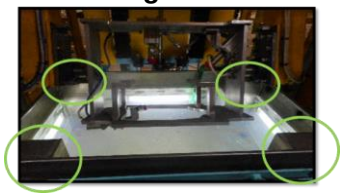
Weld Shop Leak Testing Machine

Before

Water consumption in leak testing machine

After

Water consumption in leak testing machine



Water reduction:
143 KL/Annum

Handwash water requirement

Before

Handwash line without PRV

Water wastage due to high pressure

After

PRV in handwash line

20 No.s of PRV installed. Wastage reduced

Water reduction:
5520 KL/Annum

Domestic Water requirement

Before

Taps for handwash

After

Sensor taps for handwash

Water reduction:
2070 KL/Annum

save water

9083 KL/Annum

MONEY SAVING

7.15 Lakhs/ Annum

INVESTMENT

19.80 Lakhs

ROI

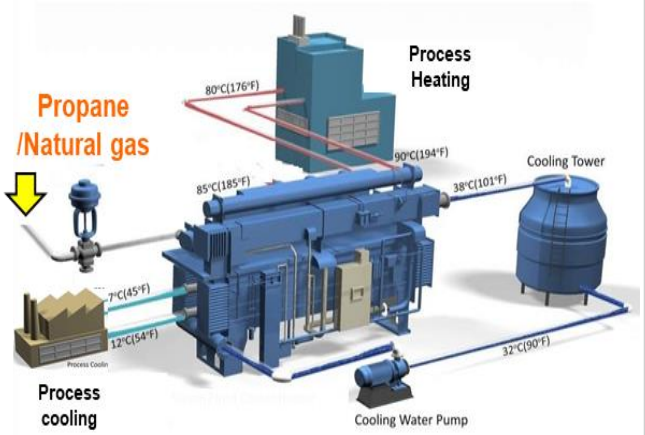
32 Months

Process modification done wherever necessary to reduce water consumption

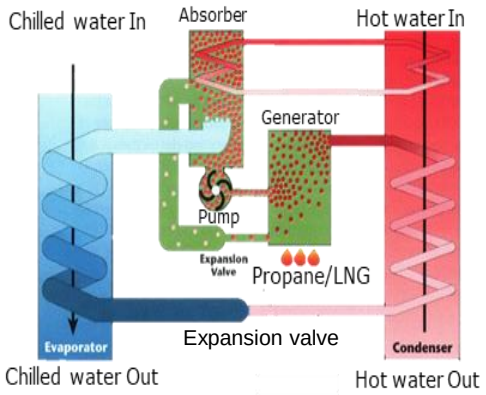
Milestone – 03 Reduction through New technology - VAM

VAM works on the Vapour absorption refrigeration cycle
Previous generation VAM heater required a cooling tower for part of heat rejection
The current generation VAM heater doesn't require a cooling tower and rejects the heat into process water heating

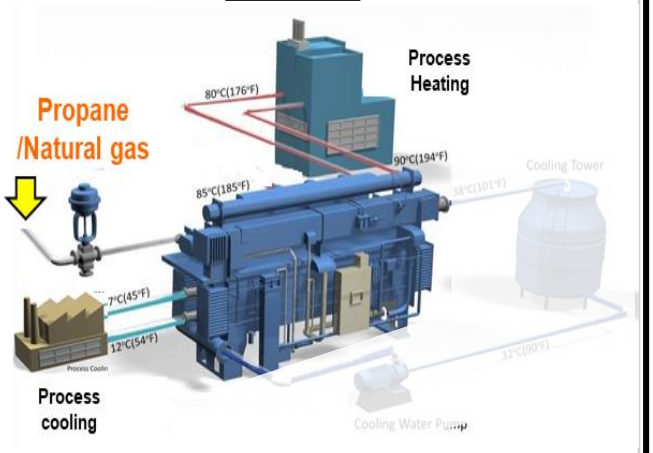
Before



Working principle



Current



- ❖ Cooling tower is used in the old process
- ❖ In cooling tower water is evaporated to take the heat from the machine
- ❖ Fresh water required on daily basis for cooling tower top up
- ❖ The water consumption is ~ 60 KL/Day
- ❖ 3F is not having water source like underground water, Government water supply etc
- ❖ Due to unavailability of water this theme was not feasible in 3F

US Patent: 23/09/2014

Indian Patent: 25/09/2018

1650 KL/Annum

163 Lakhs/ Annum

- ❖ The latest technology machine operates without cooling tower
- ❖ Fresh water is not required on daily basis

Conventional system

New system

New Generation patented VAM operates without cooling tower
Eliminates the water & power required for cooling tower. Improves Process efficiency

HMSI 3F Milestone – 03 Reduction through New technology – Magnetic Module 08/24

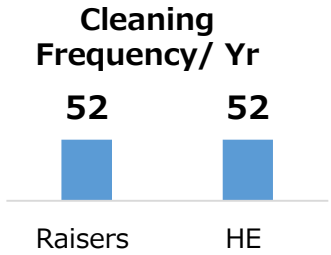
Background

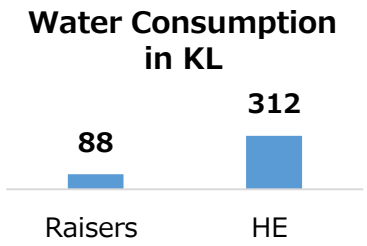
Wherever water circulates as heating or cooling mechanism , build up of calcium carbonate , iron phosphate & various hydroxide forms a major maintenance headache endangering productivity & operational cost & increased risk of down time

Situation Analysis

Phosphate process line forms phosphate scales resulting in major maintenance issue and damage of pipeline and equipment

Challenge





Magnetic Module for Phosphate Bath

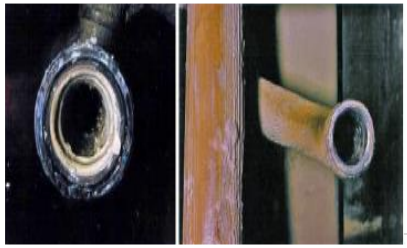
Magnetic Module

Working Principle

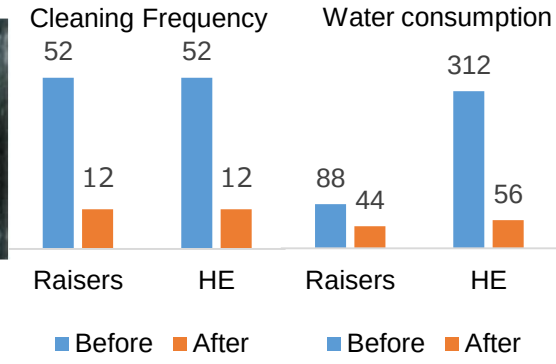
Magnetic module generates magnetic field and cause phosphate molecule to form crystalline structure with lower lattice energy.

Reduced covalent bond formations within crystal leads to smaller particle size.

Due to smaller in size, they remain suspended in the fluid and avoid scale formation



Spray rings & Nozzles remain open after MHD installation in the line



save water

300 KL/Annum

MONEY SAVING

0.5Lakhs/ Annum

INVESTMENT

00 Lakhs

ROI

NA

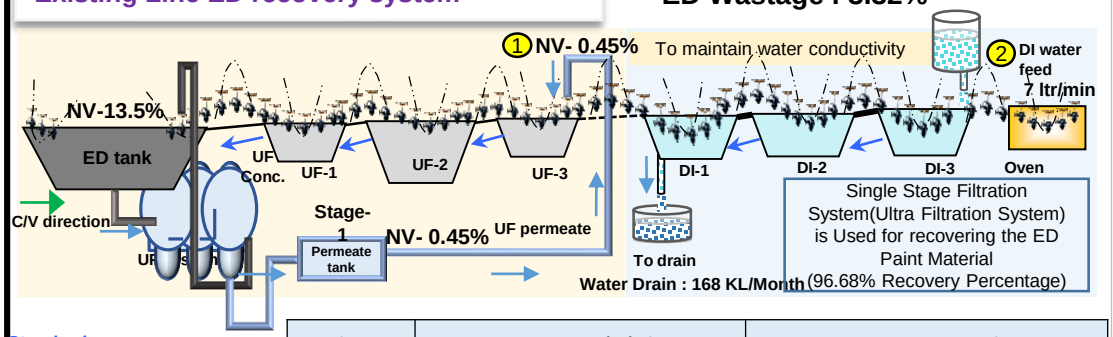
Water consumption reduced by reducing cleaning frequency of Raisers and Heat Exchangers through installation of Magnetic module in phosphating process

HMSI 3F — Milestone – 03 Reduction through New technology - EDRO — 09/24

Present Condition

Existing Line ED recovery system

ED Wastage : 3.32%



Standards :-

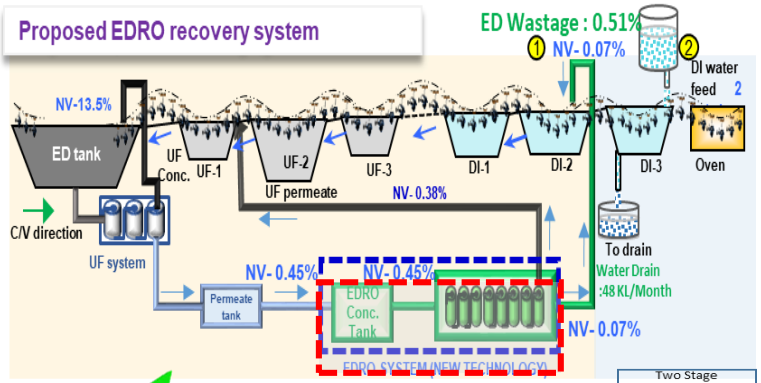
- Permeate NV < 0.45%
- ED paint recovery is 96.68%
- DI water consumption is 7 LPM

Lines	ED recovery calculation	DI water consumption
ACED Line 1	**Recovery ratio**	DI water Supply in DI-3 is 7 L/min
CED Line 1	= (Bath NV% – UF3 NV%) / Bath NV%	
ACED Line 2	= (13.5 – 0.45%) / 13.5% = 96.68%	Total DI Water Consumed=168 KL/Month

Proposal

Proposed EDRO recovery system

ED Wastage : 0.51%



Efficiency

Merits :-

- ED paint recover is 99.26% (+2.8%)
- DI water consumption will reduced by 70%.

Two Stage Filtration System (Ultra Filtration & Reverse Osmosis) added to increase the ED Recovery Percentage from 96.68% to 99.49%

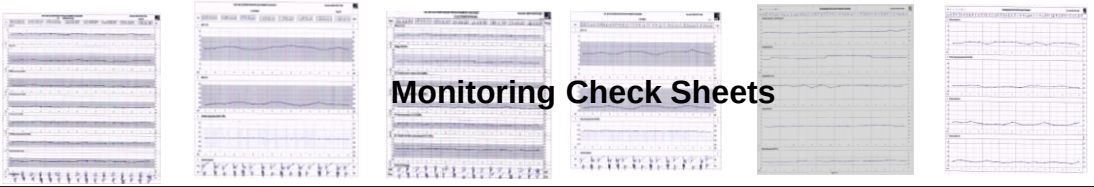
Site Photos

ACED – Line 1,2,3

CED – Line 1,2,3

ACED – Line 4

Monitoring Check Sheets



Benefits

1440 KL/Annum

25.6 tons

12 Tons/annum

46.4 Lakh/annum

153 Lakh

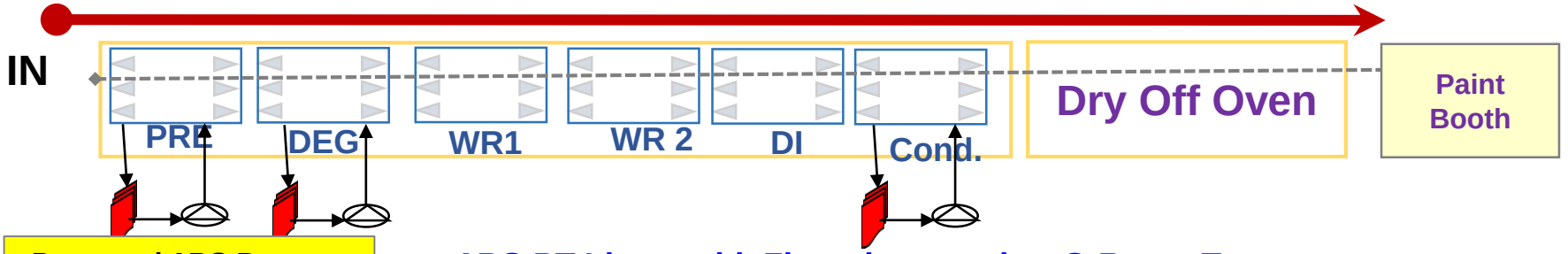
40 Months

With this ED/RO water recovery has been improved in Electro Deposition process reducing water consumption and waste generation

Milestone – 03 Reduction through New technology – Zirconium coating in pre treatment

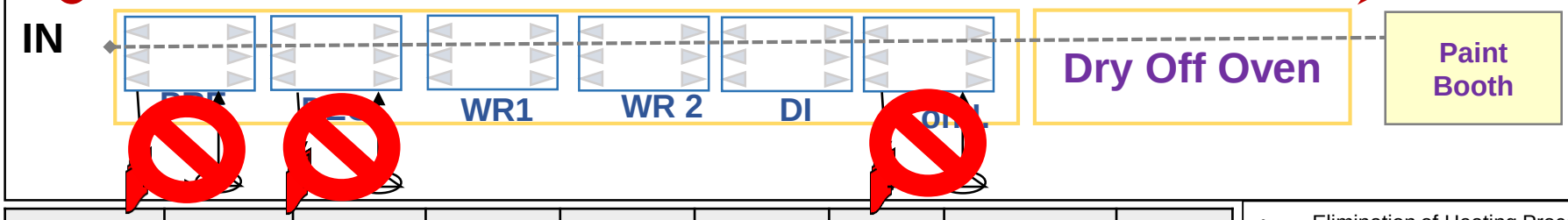
Current ABS Process

ABS PT Line - With Hot water @ 45 ~ 55^{0} ~ c



Proposed ABS Process

ABS PT Line – with Zirconium coating @ Room Temperature



ABS PT Process	Stages	Pre Deg	Deg	WR 1	WR 2	WR 3	Conditioner	Oven
	Cy.Time (Sec)	32	49	16	16	16	16	900
Current	Temp	45 ~ 55	45 ~ 55	30 (RT)	30 (RT)	30 (RT)	45 ~ 50	75 ^{O} C
Proposed	Temp	30 (RT)	30 (RT)	30 (RT)	30 (RT)	30 (RT)	30 (RT)	

- Elimination of Heating Process
- Heat Exchanger cleaning Elimination
- Steam Reduction

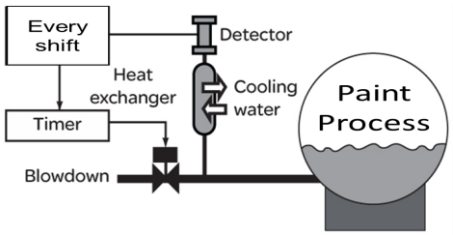
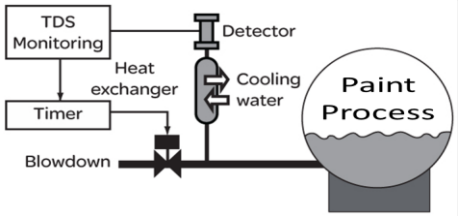
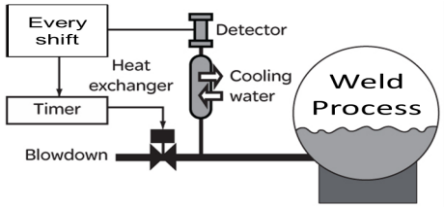
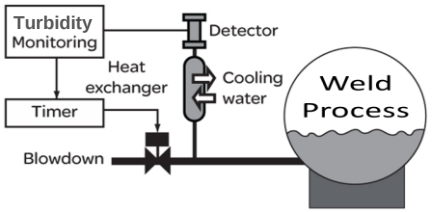
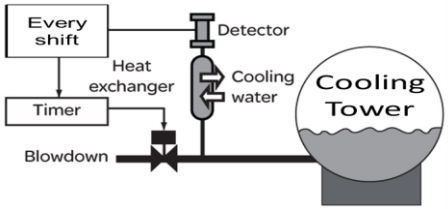
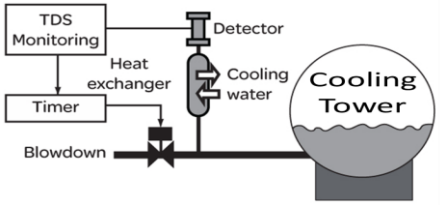
550 KL/Annum

0.8Lakhs/ Annum

00 Lakhs

NA

Zirconium coating in Pre-treatment process results in lesser water requirement due to elimination of heat exchangers

Before	After	Before	After
Manual blowdown in Paint shop	**Quality based blowdown in Paint Shop**	**Manual blowdown in Weld Shop**	**Quality based blowdown in Weld Shop**
	 **Water reduction: 1080 KL/Annum**		 **Water reduction: 810 KL/Annum**
Before	**After**	**Before**	**After**
Manual blowdown in Cooling Tower	**Quality based blowdown in Cooling tower**	**Water consumption in sludge pit cleaning**	**Sludge pit cleaning frequency reduction**
	 **Water reduction: 540 KL/Annum**	 Sludge pits are cleaned once a quarter	 Sludge pits are cleaned once a year with addition of proprietary chemicals **Water reduction: 2000 KL/Annum**

4430 KL/Annum

12.53 Lakhs/ Annum

00 Lakhs

00 Months

Through water and effluent quality monitoring several areas of wastewater generation have been reduced

Milestone – 05 Recycling Initiatives

Phytoremediation concept for STP

Background

Phytoremediation treatment is a novel technique using plants for sewage treatment
As a trial we propose for 30KLD trial to observe performance and after success future 100% implementation

Situation Analysis

- Sewage treatment is done using the following process:

Toilet & canteen

- The effluent treatment system is similar at 1F, 2F and 4F
- Currently at 3F we are having two STP of capacity 250 KLD and 120 KLD for Line 1,2,3 and Line 4 respectively.

Challenge

Skilled Manpower and high resource requirement

High Electrical energy requirement

High chemical consumption to treat the Sewage

1800 kg sludge generated every day

Phytoremediation process for STP

- Green technology that uses plant systems for treatment
- Root system absorbs and accumulate water, nutrients and minerals.
- System uses very little power, less manpower & Is self sustainable

Common Plant species used

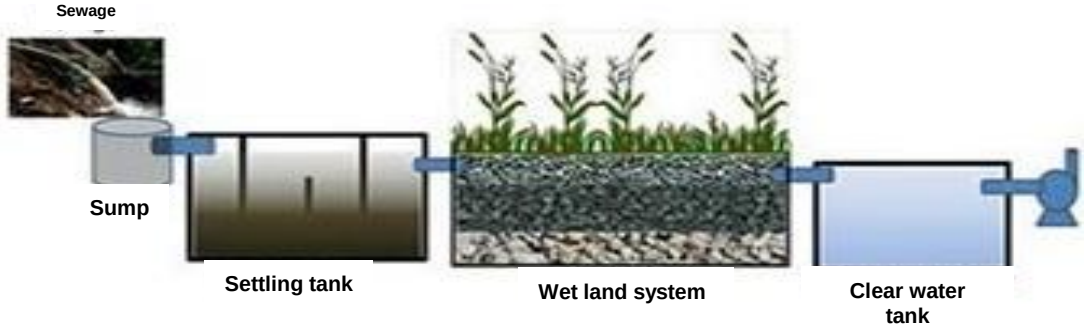

Cyperus papyrus


Heliconia


Typha


Alocasia

Phytoremediation process



1890 KL/Annum

2.83 Lakhs/ Annum

30 Lakhs

120 Months

As the phytoremediation technology is new to HMSI, a 30 KLD pilot plant is installed

Membrane Bio Reactor

Background

Membrane Bio Reactors are treatment processes, which integrate semi permeable membrane with a biological process. To reduce the footprint of Effluent Treatment Plants

Before: Conventional Treatment Process

Effluent from Shop floor

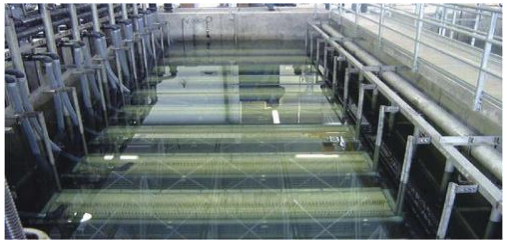
Primary treatment → Secondary treatment → Tertiary Filtration system

Shop floor

After: Membrane Bio Reactor

Effluent from Shop floor

Primary treatment



Membrane Bioreactor

Shop floor

save water

810 KL/Annum

MONEY SAVING

37 Lakhs/ Annum

INVESTMENT

25 Lakhs

ROI

8 Months

Membrane Bio Reactor installation will improve recycling and reduce wastages compared to conventional treatment systems

EDI System for DI water generation

Background

In Paint process De-Ionized (DI) Water is required.

- The RO permeate from ETP passes through mixed bed DM Plant to generate DI water for Paint process.
- System runs on manual operation.
- Weekly backwash required.
- Regeneration required twice in one month, resulting in chemical consumption and water wastage.

Chemical Based DI process → Electro De-Ionization process

Before

- DM Plant has larger footprint.
- DM Plant requires two stage ion exchange and its backwash.
- Involves more operation and maintenance cost for chemical and regeneration
- Treatment cost per KL for DM plant Process is Rs 46/-

After

- System is compact and output is obtained with minimal operations
- Reduction in operation and maintenance cost
- Complete system runs through automation with SCADA
- Water saving (Elimination of backwash & Regenerations)

820 KL/Annum

8 Lakhs/ Annum

24 Lakhs

31 Months

Electro De-Ionization system requires less backwash water and chemicals compared to chemical DM plant

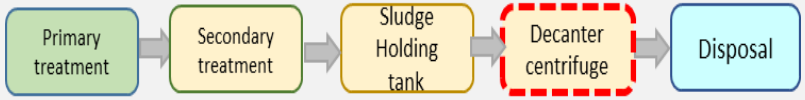
Decanter for sludge handling

Background

- In ETP & STP Primary and secondary system solid separation will takes place with coagulation and flocculation process.
- Filter press is using for sludge handling and removal
- System runs on manual operation.
- System cleaning required on daily basis thus resulting in water consumption

Before

After



Current

- Filter press unit is bulky ,requires larger area
- Lower hydraulic/Volumetric capacity per hrs-makes it semi batch type process
- Many moving parts requires regular maintenance and also consumable requirement is more
- Since system operated in manual mode and overall O&M cost is more

Proposal

- System must be operate in continues with uniform feed flow rate
- Automatic operation
- Less moisture in sludge (10-15% reduction of moisture as compare to Filter press operation)
- Water saving (Elimination of cleaning of Filter cloths)

730 KL/Annum

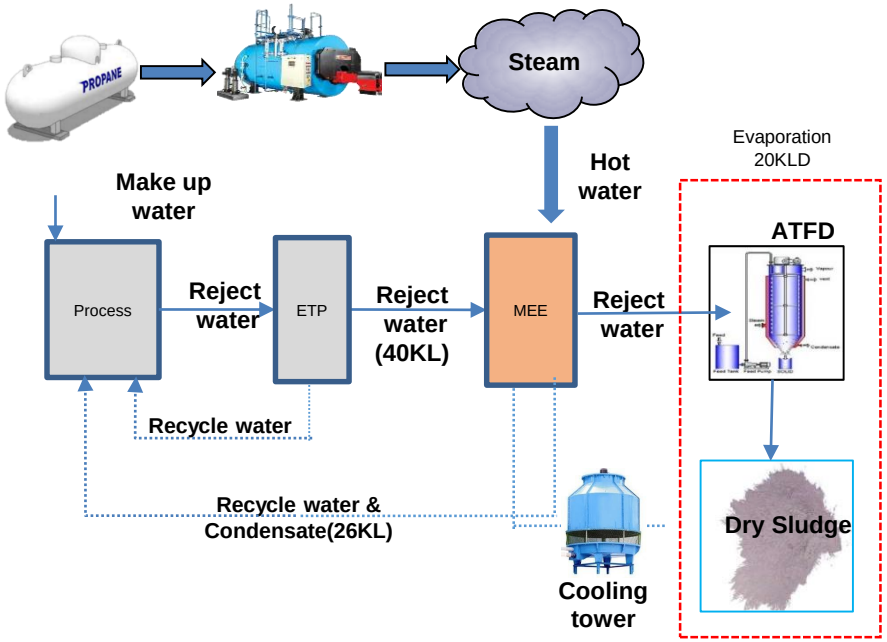
8 Lakhs/ Annum

24 Lakhs

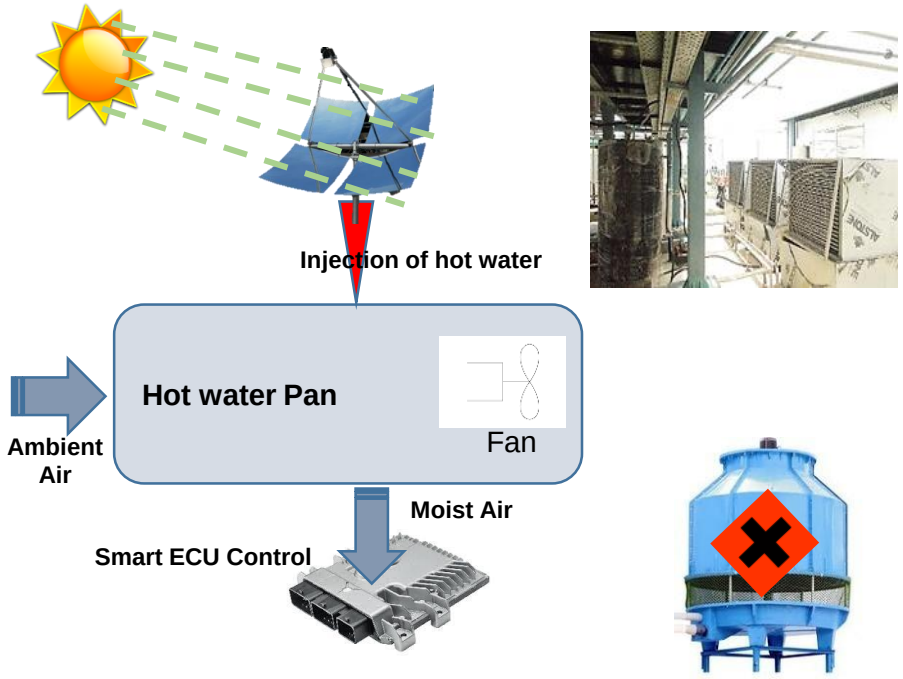
30 Months

Decanter system results in better water recovery in comparison to filter press due and results in lesser moisture in sludge thereby also reducing hazardous waste.

Before



After



1100 KL/Annum

55 Lakhs

30 Lakhs

07 Months

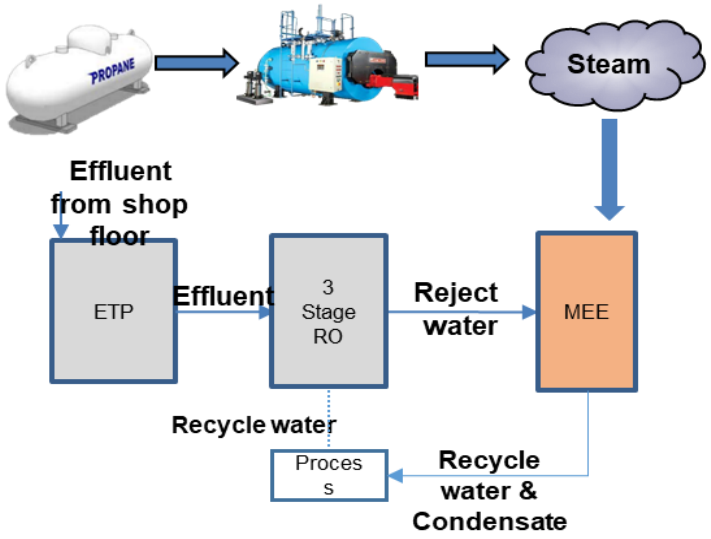
Water consumption reduction through eliminating usage of steam for sludge drying

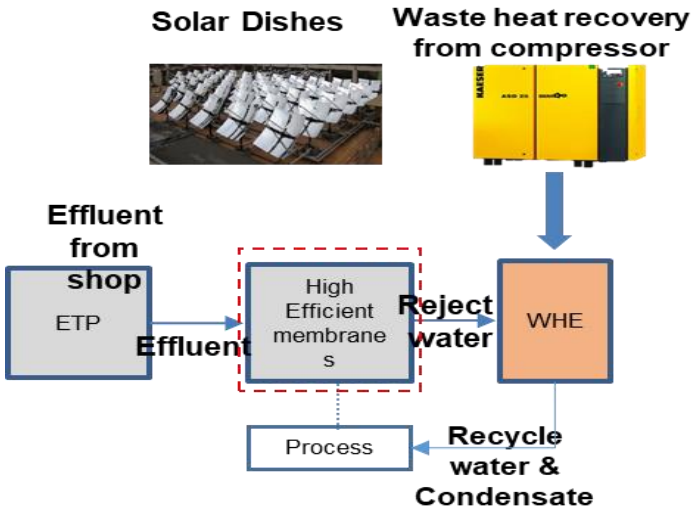
Installation of Highly efficient membranes

Background

- ❖ In ETP 3 stage RO system is used to treat effluent. These systems are manually operated and have low recovery rate.
- ❖ In STP, cross flow membranes are being used which is having a very less permeate recovery rate.
- ❖ Increase in water consumption due to the use of less permeate recovery systems in ETP & STP

Highly efficient Disc & Plate type membrane in ETP and Membrane Distillation





Disadvantages of conventional system

- Cannot operate at higher pressure
- TDS of feed should be lower
- Completely manual control
- Less permeate recovery rate

High efficiency RO

Waste Heat Evaporator

730 KL/Annum

8 Lakhs/ Annum

24 Lakhs

30 Months

Highly efficient disc and plate membranes & WHE are installed to reduce water consumption

PREVIOUS METHOD:

TREATED WATER

PRESENT METHOD:

TREATED WATER

ETP

PROCESS

PAINT SHOP

WELD SHOP

MACHINE SHOP

save water

5520 KL/Annum

MONEY SAVING

13.8 Lakhs/ Annum

INVESTMENT

00 Lakhs

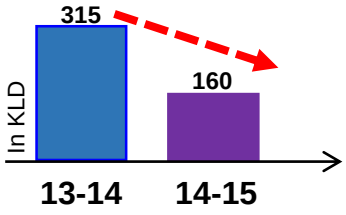
ROI

NA

STP water up scaled to use as industrial water and 5540 KL/Annum water savings achieved.

Before process :

Bore well yield trend in KLD



From 2nd year onwards, borewell yield started to reduce

It was proposed to utilize the water collected in open water tank

High Turbidity + Colour + Odour + Silica

Surface water Sample

After process :

Open water tank

Upgraded Treatment facility

Treated surface water Sample

Water for domestic purpose

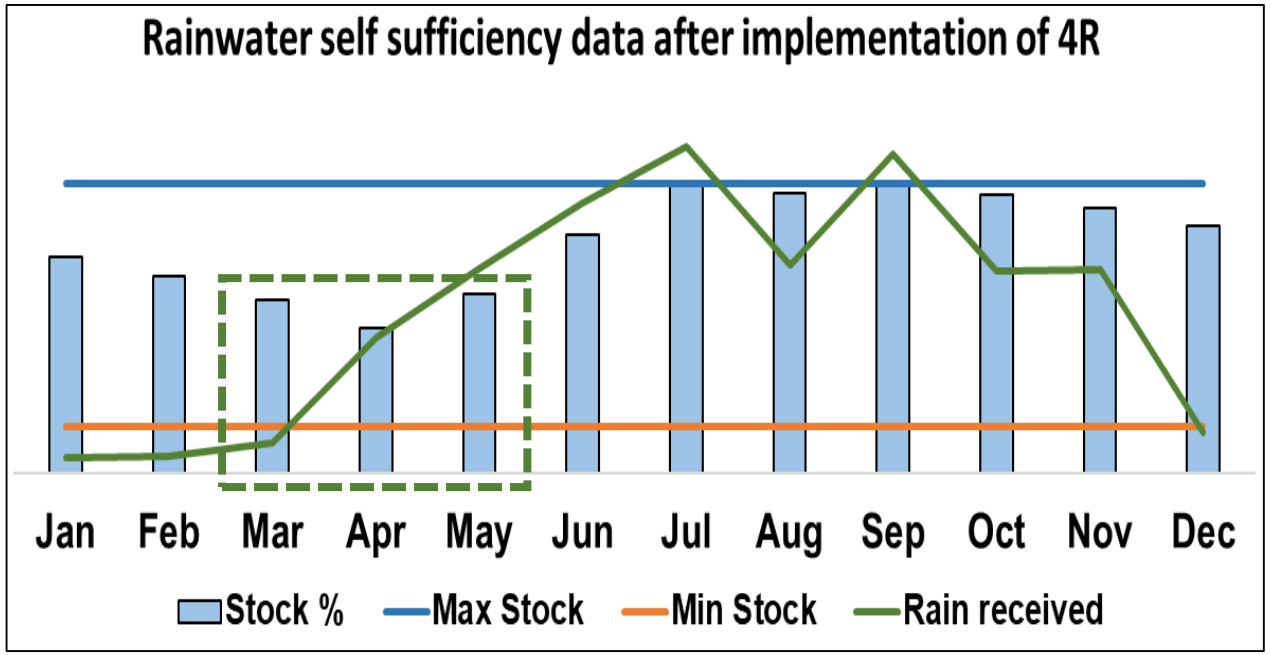
20000 KL/Annum

24 Lakhs/ Annum

00 Lakhs

NA

Rainwater treatment plant upgraded to treat surface water runoff.



Intangible Benefits:

100% of sewage and Effluent is recycled

90% of the process water is recycled water

With 4R, Rainwater stock is sufficient for meeting the annual factory water requirement

Tangible Benefits:

All initiatives: 145788 KL/Annum

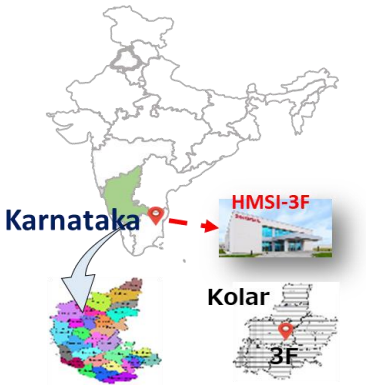
621.45 Lakhs/ Annum

1101.25 Lakhs

20 Months

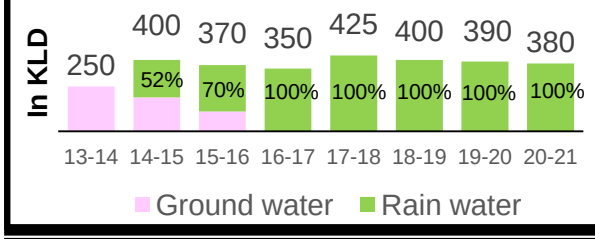
In addition to ensuring 100% self sufficiency, the above projects has also resulted in considerable cost and resource savings also

Result : 100% Water Self Sustenance through Rainwater

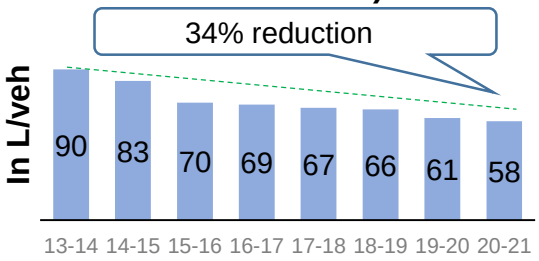


- Kolar is situated in an area of acute water scarcity
- 100% factory operation by Rainwater storage and re-utilization
- Three Rainwater tanks with capacity of 80 Mill. Ltr capable to meet 6 months water requirement
- Zero Liquid discharge factory

Rainwater usage trend (2013-14 to 2020-21)

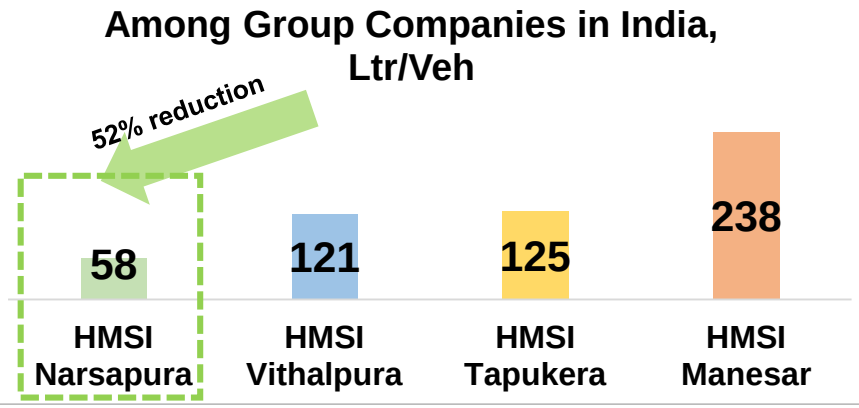


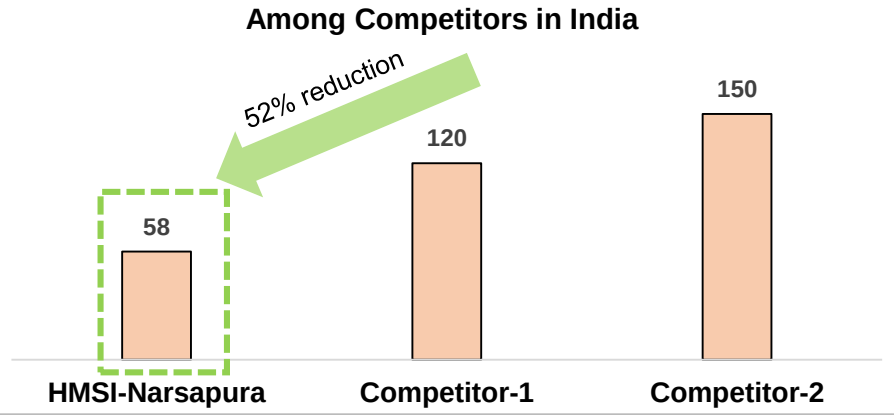
Water consumption trend (2013-14 to 2020-21)

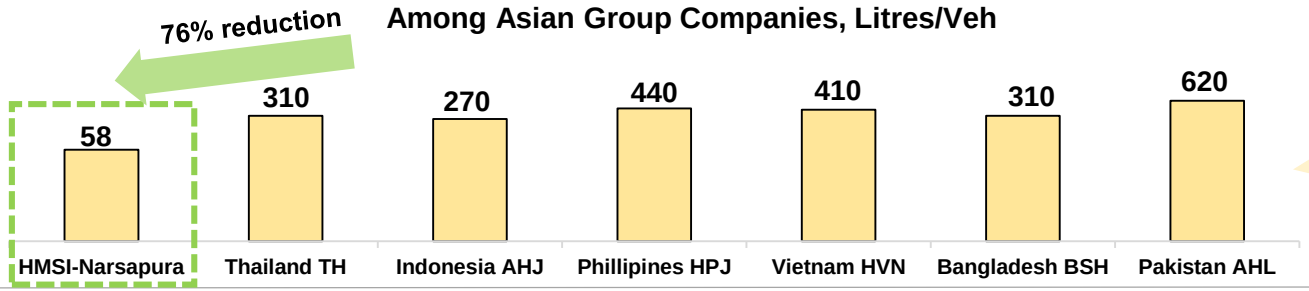


100% Production activity done by storage and usage of rainwater
We are the lowest specific water consuming among Asian Genpos

Benchmarking







HMSI-Narsapura is the lowest water consuming factory in India and Asia region

Uniqueness

- **One of the first industries in the country to meet 100% requirement through only rainwater.**
- India's lowest specific water consumption achieved due to benchmark recycling practices.
- 100% recycling of domestic sewage and process effluent.
- Net water positive factory within the fence.
- 90% Rainwater is utilized for domestic application only.
- **Sustained reduction in specific water consumption even during COVID and production variation.**
- Increase in water self-sufficiency from 92 days to 187 days due to conservation initiatives.

Benchmark performance in water consumption and rainwater harvesting

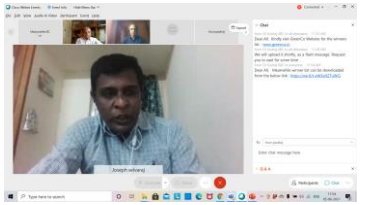
Sharing to Govt Stakeholders

Information sharing to Senior Scientists, CGWB

Information sharing to Member Secretary, KSPCB

Sharing to external agencies & industries

Industrial delegates visit through Greenco Mission



Sharing of best practices through virtual forums

Associate Capacity building

Water Conservation Week Celebration

PURPOSE OF WATER WEEK CELEBRATION

1. To create awareness among associates and suppliers about water conservation.
2. To create awareness about conserving water for future generation through water harvesting methods.

Sl. No	Activity
1	Banner display on all gates and factory entrance
2	Poster Competition - Associate
3	Poster Competition - Family
4	Slogan Competition - Kannada
5	Slogan Competition - English
6	Commitment to Water Conservation by signing on banner
7	Quiz Competition
8	Training by KSPCB Official
9	Training on Water Conservation by Water Gandhi

Banner Sign off

Canteen staff training

Slogan

Govt. Official trainings

Family and School awareness

Total 447 participants in Water week activities in 2021

Environment Week Celebration

PURPOSE OF ENVIRONMENT WEEK CELEBRATION

1. To create awareness among associates and suppliers about Environment.
2. To create awareness about protecting Environment for future generation.

Sl. No	Activity
1	Banner display on all gates and factory entrance
2	Poster Competition - Associate
3	Poster Competition - Family
4	Slogan Competition - Kannada
5	Slogan Competition - English
6	Commitment to Water Conservation by signing on banner
7	Quiz Competition
8	Training by KSPCB Official
9	Training on Water Conservation by Water Gandhi

Banner Sign off

External Training

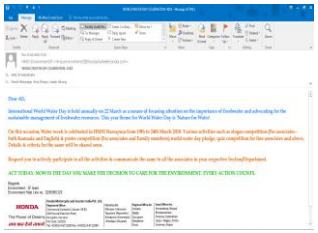
Slogan

Tree Plantation

Scrap models & Posters

Total 390 participants in Environment week activities in 2021

Training by KSPCB regional officer and External agency to associates

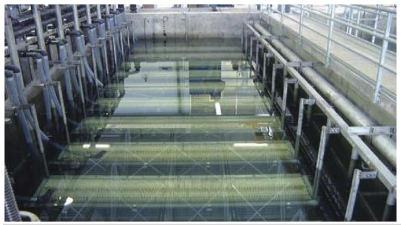


Awareness mailer and poster display regarding water conservation

Our best practices are shared to our stakeholders, external agencies, industries and our associates for capacity building

Replication Potential

Replication of MBR



Industry	Sharing of practices
HMSI Group companies	●
Other Honda Genpos	●
Other industries	●
Other forums	●
HMSI suppliers	●

Industry	Replication Potential	Actual
HMSI Group companies	●	●
Asia & Oceania Honda Genpos	●	
Other industries with ETP	●	●

Major applicable areas:

- Automobile industry
- STP's
- ETP's
- Pharma industry

Replication of EDI

Industry	Replication Potential	Actual
HMSI Group companies	●	●
Asia & Oceania Honda Genpos	●	●
Other industries with ETP	●	●

Industry	Sharing of practices
HMSI Group companies	●
Other Honda Genpos	●
Other industries	●
Other forums	●
HMSI suppliers	●

BOSCH

Major applicable areas:

- Automobile industry
- STP's
- ETP's

Replication of Decanter

Industry	Sharing of practices
HMSI Group companies	●
Other Honda Genpos	●
Other industries	●
Other forums	●
HMSI suppliers	●

Industry	Replication Potential	Actual
HMSI Group companies	●	
Asia & Oceania Honda Genpos	●	●
Other industries with ETP	●	

Ashok Leyland

BOSCH

Replication of Phytoremediation

Industry	Sharing of practices
HMSI Group companies	●
Other Honda Genpos	●
Other industries	●
Other forums	●
HMSI suppliers	●

Industry	Replication Potential	Actual
HMSI Group companies	●	
Asia & Oceania Honda Genpos	●	●
Other industries with ETP	●	●

B.W.S.S.B

LUMAX

IndianOil

HP

Our initiatives MBR, EDI, Decanter and Phytoremediation are well appreciated and replicated in several industries including Honda group companies

Let's make a better tomorrow for our Future Generation……

THANK YOU

It is in our hand to protect our beautiful earth