

IMPACT ASSESSEMENT REPORT REVERSE OSMOSIS WATER PURIFICATION PLANTS-2023

BHARAT FORGE LIMITED



DOORSTEP
HEALTH
SERVICES

Certified Social Impact Practitioners

Assessment Team

Project Director- Dr Suchitra Mankar

Program Impact Director- Nikhilesh Paradkar

Field Co-ordinator- Jitendra Kumar

Data Entry Operator- Ashish Uttekar

Executive Summary

Background. The entire area of Purandar is scarce in water resources. The available aquifers have been depleted over time and their recharge is only by rains, which are scanty in the region. The ground water samples analysed for major chemical constituents by Central Ground Water Board for Purandar (Annexure-1) show that ground water is chemically suitable for use and within the permissible limits set by Bureau of Indian Standards (IS 10500 : 2012). However, the main issue with drinking water faced by villagers is its turbidity, colour, high total dissolved solids, presence of organic and microbiological contamination and brackish taste. With this need of the community in mind, the plants have been set up. It is envisaged that would improve hygiene, sanitation and thus the health and well-being of the population. Doorstep Health Services was commissioned by Bharat Forge Ltd to assess the impact of setting up Reverse Osmosis Plants in ten villages in Purandar Taluka during the period 2019-2022. The villages where the plants were installed were Bhivari, Bopgaon, Chambli, Udachwadi, Kalewadi, Sonori, Askarwadi, Romanwadi, Ponde and Kumbharvalan.

Aim

To assess through independent evaluation to what extent Reverse Osmosis Plants have impacted the community and to make recommendations.

Methodology and Assessment Framework. Multifaceted evaluation including document review and surveys was carried out. Results were evaluated on parameters like:-

- Parameters laid down by Organisation for Economic Co-operation and Development (OECD)
- Alignment with Sustainable Development Goals (SDG)
- Impact Mapping (Details at Annexure-2).

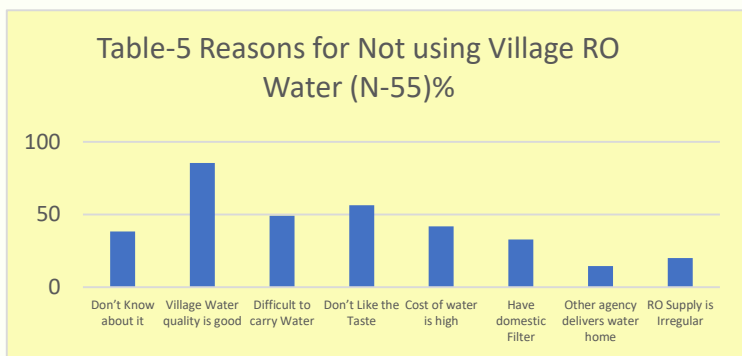
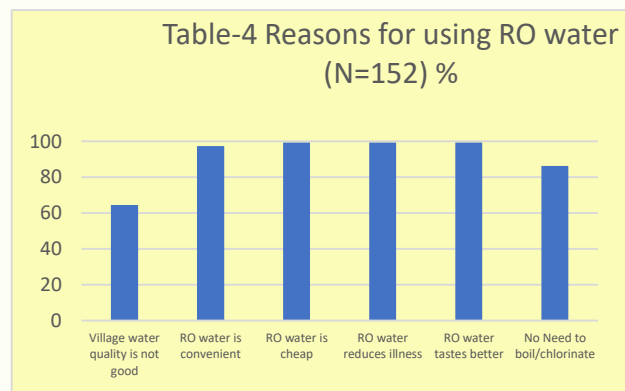
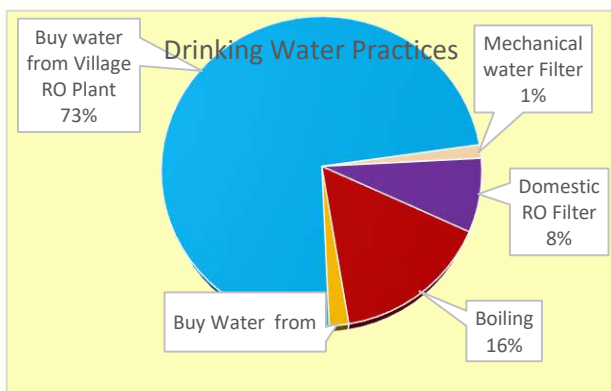
Salient Findings

Plant Operations. All ten plants -model DARCO 1:1 1000LPH-were assessed. Details are given in the table at Annexure 3. In essence,

- a. All plants were serviceable and committees to supervise the plants have been set up. They monitor costs and revenue and keep records of the same.
- b. People bring their own containers to collect water and this is a practical way to reduce costs of maintaining jars.
- c. Monthly cards system was implemented at only a few villages. Others paid on the spot.
- d. Stored water at the plant was not chlorinated.
- e. Utilization of water as compared to plant capacity (20000lper day) is low. Maximum utilization use was 1400 l per day. In Askarwadi, the plant provides just 1-2 jars per day (based the revenue collection).
- f. The revenue collection as per registers does not match number of jars stated to be sold (information provided the Plant operator). Based the registered revenue the sale is much lower.
- g. Surroundings and sanitation of the plant needs improvement in a few cases.
- h. Electricity bills have not been cleared by few villages and there is a fair amount of dues. At one place electricity had been tapped from a nearby street light.
- i. Amount of effluent created daily is in the region of 500-1000 litres or more. While half the plants have set up a system for reuse, the other half allow it to flow into the surroundings.
- j. Annual maintenance contracts are not negotiated. Kalewadi had paid and got all filters changed . In rest of the villages only the polyurethane propylene filters are being purchased and changed every few days. Often these are being washed and reused. The technical representative of the company is contacted and he comes and provides services as needed.
- k. Many plants would be due for membrane filter change (Rs 51000/-) after the warranty period. Funds for are not earmarked.

Perception of Users based on interview. 207 persons were interviewed on a structured questionnaire. Salient findings are given in the tables below. 73.4% used water from the RO plant -the remaining used other methods. People were unaware that RO water needs to be chlorinated if stored; There was consensus that diarrhoeal diseases had reduced and that everyone now used purified water to drink. Data on diseases was not made available.

Perception of Villagers				
S No	Statement (N=207)	Yes %	No %	Remarks
1.	Village water supply to home is adequate	89.9	10.1	Good
2.	Due to RO plant village water to homes has reduced	2.9	97.1	This is not an issue
3.	Diarrhea and dysentery cases have reduced in village over the past year	92.3	7.7	Good
4.	Drinking pure RO water without mixing is injurious to health	35.7	64.3	Many unsure
5.	Everyone drinks filtered and purified water at home	83.6	16.4	Good
6.	Many people in village have kidney stones	32.9	67.1	This negates popular perception
7.	RO water needs to be chlorinated	2.9	97.1	Most unaware



Impact Mapping. (Annexure 2). Based on data available, the RO plants have a positive impact on the awareness regarding need for purified water and on the health of the community which in turn would improve overall economic development. The only significant possible negative impact can be due to discharge of high TDS effluent in the environment over a long period of time

Sustainable Development Goals

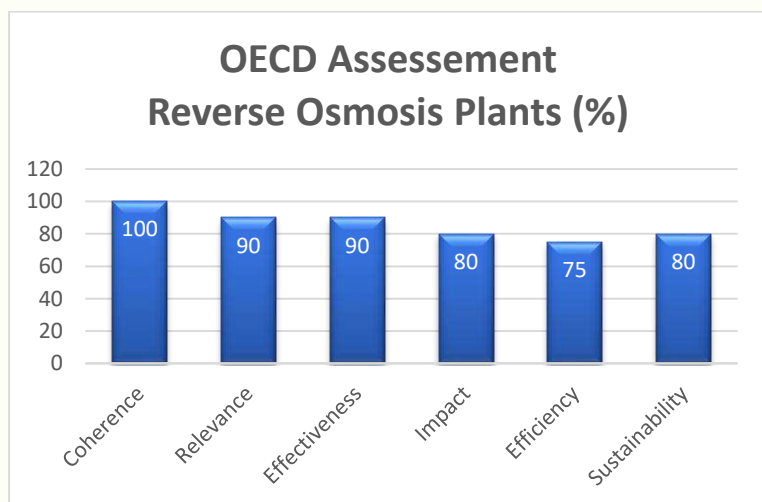
The project is aligned with following Sustainable Development Goals

SDG 3 Ensure healthy lives and promote well-being for all at all ages

SDG 6 Ensure availability and sustainable management of water and sanitation for all.

Overall Assessment

Element	Grade (Max 10)	Remarks
Coherence How well does the intervention fit?	10	Fits perfectly with National need, SDG and Vision of Bharat Forge of comprehensive Village Development.
Relevance Is the intervention doing the right things?	9	It is providing purified water which directly impacts health, hygiene and sanitation.
Effectiveness Is the intervention achieving its objectives?	9	Yes, most villagers are using water from the plant, there is awareness about the need to drink clean water and cases of diarrheal diseases have reduced.
Efficiency How well are resources being utilized?	7.5	Plant capacity is underutilized. Maintenance of plants needs revenue. Villages need to prioritize this aspect.
Impact What difference does the intervention make?	8	It improves the health and well-being of the population, which in turn improves productivity. The effluent created needs to be recycled so that there is no degradation of the soil in the long term. In case not well utilized it can eat into Gram panchayat funds
Sustainability Will the benefits last?	7.5	To be sustainable, the maintenance of the plant, adequate utilization of water from the plant, generation of revenue from the plant and earmarking of funds for the plant needs to be ensured by Gram Panchayat



Recommendations

- Periodic cleaning of the area and surrounding may be ensured and documented.
- Fool proof system to count number of jars sold may be kept in place.
- Plan for increasing utilization of available capacity of the RO plants will help increase in revenue for maintenance.
- A detailed plan for use of effluent may be implemented.
- Awareness for chlorination of water, even for RO water may be created. Posters may be put up at water delivery points for the same. Villagers can add chlorine solution at home/or it can be done centrally at the plant itself.
- Timely change of all filters is essential for providing safe water and ensuring the plant functions efficiently. Washing and reuse of filters or delaying changes may have adverse effects on water quality or the plant.
- The use of personal containers by villagers is a good idea and should be implemented.

Annexure-1. (source: AQUIFER MAPPING REPORT, Purandhar and Baramati Talukas, Pune District, Maharashtra(Part-I) Central Region, Nagpur, Central Ground Water Board. 2017

Aquifer 1-Water Quality Purandar Taluka

S No.	Site Name	Ph	EC μs/cm at 25°C	TDS	TH	Ca	Mg	Na	K	CO ₃	HCO ₃	Cl	SO ₄	NO ₃	F
				mg/l											
1.	Askarwadi	7.9	488	312.3	174	30	1.73	105	17	0	195	23	40	7	0.15
2.	Pimpale	8.0	766	490.2	289	39	2.29	184	25	0	224	51	75	46	0.22
3.	Veer	8.0	957	612.5	279	94	1.20	194	21	0	303	69	100	42	0.324
4.	Thapewadi	7.9	389	249	154	16	0.69	125	7	0	161	21	31	7	0.164
5.	Hivare	7.8	826	528.6	299	53	0.97	164	33	0	215	105	50	44	0.247
6.	Dive	7.8	1061	679	289	71	65.70	189	24	0	200	113	161	49	0.234
7.	Kaldari	8.1	338	216.3	144	13	0.49	125	5	0	146	15	23	7	0.313
8.	Daundaj	7.9	858	549.1	209	101	0.41	129	19	0	264	69	75	46	0.309
9.	Jawalarjun	7.8	6818	4364	1195	1024	5.54	40	281	0	220	1439	1100	52	0.646
10.	Rajuri	8.0	1106	707.8	344	95	5.20	204	34	0	200	105	200	44	0.643
11.	Pondhe	8.0	750	480	274	45	0.70	110	40	0	259	82	34	19	0.469
	Ambale	8.2	1834	1174	677	117	5.01	374	74	0	493	154	287	28	0.346
13.	Bhosalewadi	8.2	633	405.1	194	52	0.39	70	30	0	156	87	59	7	0.289
14.	Zendewadi		965	510	425	45.3	1.36	90.2	48.6	0	226	113.4	162	42	0.46
15.	Pangre		620	328	270	45.1	2.45	66.1	25.5	15	275	56.72	32	7	0.5
16.	Sakurde		691	366	295	37.7	14	70.1	29.2	0	250	81.54	68	32	0.42
17.	Kamatwadi-Walha		1172	623	405	105	0.92	56.1	64.4	21	238	195	130	44	0.4
18.	Jejuri		865	458	280	85.9	0.38	66.1	27.9	0	220	134.7	120	7	0.36
19.	Pimpri (Kh)		1251	663	325	132	3.34	46.1	51	0	195	74.45	364	29	0.65

Aquifer 2-Water Quality Purandar Taluka

S No.	Location	pH	EC μS/cm at 25°C	TDS	TH	Ca	Mg	Na	K	CO ₃	HCO ₃	Cl	SO ₄	NO ₃	F
				mg/l											
1.	Gulunche	7.8	1620	860	510	148	34	83	3.75	0	146	362	121	34	0.09
2.	Narayanpur	7.7	749	397	250	48	32	60	2.08	0	140	103	58	30	0.11
3.	Narayanpur	7.7	782	414	290	56	36	57	1.6	0	134	121	95	27	0.09
4.	Narayanpur	7.9	1112	590	375	76	45	71	1.07	0	262	174	78	34	0.09
5.	Parinche	7.8	307	162	30	8	2	55	0.58	0	61	50	16	7	0.15
6.	Rakh	7.6	2199	1166	770	228	49	96	1.36	0	159	574	129	35	0.12
7.	Sasvad	7.8	1530	893	170	48	13	276	1	0	360	234	91	50	0.4
8.	Singapur	8.3	1120	650	295	28	55	127	5	0	342	92	61	110	0.6
9.	Walha	7.7	971	514	340	82	33	70	1.61	0	244	149	72	34	0.12

Annexure 2

Impact Mapping For RO Plants

Input	Output	Outcome	Impact
<ul style="list-style-type: none"> ● Provision of space by the village panchayat ● Provision of water filtration plant ● Provision of electricity, repairs, supervision to run the plant ● Provision of manpower to oversee the running of the plant ● Provision of water for the plant 	<ul style="list-style-type: none"> ● 10 Water filtration Plants available for provision of purified water. ● 20000 ltr RO water is the output capability of the plant. ● Between 10-70 jars of water sold every day. (200-1400 l) ● 73.4% population use RO water ● 65% of input water available as effluent. 	<ul style="list-style-type: none"> ● Good, clean potable water available for drinking on filtration. ● Water related ailments reduced on consumption of filtered water. ● Time taken for getting water from village wells or river is reduced and hence number of work hours per working individual improved ● The presence of plant has created awareness for drinking safe water ● Gram Panchayat responsible for Cost of running the plant and provision of water 	<ul style="list-style-type: none"> ● Improved health of villagers , improved productivity , revenue generation from plant ● Increased expenditure and responsibility by Gram Panchayat ● Effluent generated available for restricted reuse and needs planning. ● Effluent if unused can degrade soil in long term

Annexure-3

Details of Reverse Osmosis Plants

DETAILS OF RO PLANT					
NAME OF VILLAGE	KALE WADI	BOPGAON	CHAMBALI	SONORI	UDACHIWADI
Model Of Ro Plant	DARCO 1:1 1000LPH	DARCO 1:1 1000LPH	DARCO 1:1 2000LPH	DARCO 1:1 1000LPH	DARCO 1:1 1000LPH
Date Of Installation	Jan-19	Aug-21	Sep-21	Sep-21	Oct-21
Cost Of Plant	3,30,400/-	3,65,255/-	4,28,814/-	3,73,125/-	3,65,255/-
Cost Of Installation	25000/-	3000/- Pipe line	80,000/- 115mtr pipeline overhead tank to RO PLANT	10000/-	30000/-
Building/Modification cost	Gram panchayat	17000/- Gram panchayat building	200000/-	250000/-	Zila parishad school building
AMC	Not done	Not done	Not done	Not done	Not done
Monthly Electricity Bill	1200/- per month	800/- per month	800/-per month	600/-per month	550/- per month
Date Of Change Filter	4/5/2023	3/20/2023	3/16/2023	Jan-23	Sep-22
Carbon/Membrane/P.P FILTER	PP Filter (Pleated polypropylene) (carbon/Membrane 05/2022)	P.P filter(Pleated polypropylene)	P.P filter(Pleated polypropylene)	P.P filter(Pleated polypropylene)	P.P filter(Pleated polypropylene)
Water Input Per Day	5000 L	2000 L	2000 L	1000 L	500 L
Water Output Per Day	2000 L	1000 L	1000 L	400 L	300 L
Effluent Water Uses	collect in tank for villagers use cleanness & plantation	Flash out in village pound to use villagers for Utensil cleaning	flash out in village pound to Reuse villagers for utensil cleaning	flush out to open area	use in school toilet & plantation
Methods Of Purification	Reverse osmosis	Reverse osmosis	reverse osmosis	Reverse osmosis	Reverse osmosis
Cleanliness Of Ro Plant	Neat & clean	Neat & clean	Neat & clean	Needs improvement	Neat & clean
Rate Of 20L Jar	10 Rs/-jar	10 Rs/-jar	10 Rs/-jar	10 Rs/- jar	10 Rs/-
Daily Sales as per Operator	65 Jar	45 Jar	45 Jar	25 Jar	10 Jar
Total sales RO plant as per Register Approx daily Jars based on Revenue	138768/- (Apr22-Apr23) 38 Jars	1,37620/-(Apr22-Apr23) 38 Jars	1,37620/-(Apr22-Apr2023) 45 Jars	70270/- (11/22 - 02/23) 16 Jars	40400/- Apr 22-Apr 23 13 Jar
Total Expenses of RO	14275/- (Apr22-Apr23)	71,000/- (Apr22 -Apr 23)	71,000/- (Apr22 - Apr23)	1700/- (start to 02/2023)	10000/-(Apr22 Apr23)
Pre-Paid Card Holder	70	Not use	not use	20	100
Min pre-paid recharge Charge	200/-	nil	nil	200/-	100/-
Down Time RO Plant	at the day of maintenance	at the day of maintenance	at the day of maintenance	at the day of maintenance	at the day of maintenance
20 L Jars State	NA	100	100	NA	100

DETAILS OF RO PLANT					
NAME OF VILLAGE	KUMBHARVALAN	BHIVARI	ROMAN WADI	PONDE	ASKARWADI
Model Of Ro Plant	DARCO 1:1 1000LPH	DARCO 1:1 1000LPH	DARCO 1:1 1000LPH	DARCO 1:1 1000LPH	DARCO 1:1 1000LPH
Date Of Installation	Oct-2021	Oct-2021	Oct-2021	Dec-21	Feb-2022
Cost Of Plant	3,65,255/-	3,65,255/-	3,65,255/-	3,65,255/-	3,65,255/-
Cost Of Installation	20000/-	50000/-pipeline overhead tank to RO plant	60000/-	20000/-	10000
Building/Modification cost	50000/-	100000/-	Panchayat old building	Zila Parishad school building (old)	Gram Panchayat building (modification cost 50000/-)
AMC	Not done	Not done	Not done	Not done	Not done
Monthly Electricity Bill	1000/- per month	680/- per month	500/-per month	2000/-per month	300/-per month
Date Of Change Filter	3/4/2023	Mar-23	weekly	every 3 days	Nov-22
Carbon/Membrane/P.P FILTER	P.P filter(Pleated polypropylene)	P.P filter(Pleated polypropylene)	P.P filter(Pleated polypropylene)	P.P filter(Pleated polypropylene)	P.P filter(Pleated polypropylene)
Water Input Per Day	2500L	2000 L	2500L	3000L	1000L
Water Output Per Day	800L	1000 L	1600L	1000L	500L
Effluent Water Uses	Use Plantation in near garden	use in waste mgt plant through pipe line	Drip irrigation	collect in tank for common uses of villagers	use to plantation
Methods Of Purification	Reverse osmosis	Reverse osmosis	Reverse osmosis	Reverse osmosis	Reverse osmosis
Cleanliness Of Ro Plant	Neat &clean	Neat &clean	Not clean	Not satisfactory	Neat &clean
Rate Of 20Lit Jar	10 Rs/-	10 Rs/-	5 Rs/-	5 Rs/-	10 Rs/-
Daily Sales Data	18 Jar	40 Jar	70 Jar	60 Jar	10 Jar
Total sales RO plant Approx daily Jars based on Revenue	70400/- (Mar 22-Feb 23) 18 Jars	74,135/- (Apr 22-Mar 23) 20 Jars	123666/- Dec 21-Feb 23) 55 jars	79000/- Feb 22 -Feb 23) 43 Jars	7500/- (Apr 22- Apr 23) 2 Jars
Total Expenses of RO	58638/- (Oct 21- Nov 22)	53,700/- (Apr 22-Mar 23)	46745/- (Dec 21 – Feb 23)	78500/- (Feb 22-Feb 23)	800/- (Apr22-Apr23)
Pre-Paid Card Holders	Not issued	Not issued	72	120	Not issued
Min pre-paid recharge Charge	nil	nil	100/-	100/-	nil
Down Time RO Plant	at the day of maintenance	at the day of maintenance	at the day of maintenance	at the day of maintenance	at the day of maintenance
20 L Jars State	NA	NA	NA	NA	NA