GOLDEN JUBILEE YEAR

सीएसआइआर - खनिज एवं पदार्थ प्रौद्योगिकी संस्थान
(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)
भुवनेश्वर - 751 013, ओड़िशा, भारत

CSIR - INSTITUTE OF MINERALS & MATERIALS TECHNOLOGY
(Council of Scientific & Industrial Research)
Bhubaneswar - 751013, Odisha, INDIA

INSTITUTE OF MINERALS AND MATERIAL TECHNOLOGY

BHUBANESWAR -751 013

TEST REPORT

Date: 22.08.2017

Name & Address of the Party :- BHARTI WATERS Pvt. Ltd
ARADHANA BHAWAN
AZADPUR COMMERCIAL COMPLEX
NEW DELHI 110033

Sample Ref No. :- **TSP 003/ 08/17/698**

Sample Details :- Testing of ARSENIC media & the unit as per BIS-10500/2012 for a required number of days with input contamination of Arsenic at 0.05 ppm, 0.09 ppm, 0.15 ppm, 0.30 ppm, 3.00 ppm & 5.00 ppm and the results thereof, including the functionality of the unit & the user friendliness of the unit & the rate of adsorption per lit.

Date of Receiving :- 20.07.2017 (Full money received 18.08.2017)

Date(s) of Conducting Test :- All working days during 20.07.2017 to 22.08.2017

Date of Completion of Test :- 22.08.2017

Standard / Method Adopted :- BIS methods

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PERFORMANCE OF THE UNIT:-

WHILE OPERATING THE UNIT FOR SEVERAL DAYS, THE HANDLING MECHANISM WORKED VERY FINE AND APPEARED TO BE STURDY. THE ON SITE WARRANTY CLAIM OF 04 YEARS INCLUDING THE MEDIA, APPEARS GOOD VALUE FOR MONEY (THIS ISSUE IS NOT COVERED UNDER THE INVESTIGATION)

ADOPTABILITY: THE UNIT IS SUCH THAT IT CAN BE HOOKED TO BOTH SMALL AND MEDIUM FOR ARSENIC REMOVAL REQUIREMENTS IE; BETWEEN 1000 LPH TO 2000 LPH & EVEN FOR DOMESTIC APPLICATION TOO.

THE TESTING WAS CARRIED OUT ON THE BASIS OF 24Hrs, 48 Hrs & 72 Hrs BACK WASH INTERVALS.

Observations:

- **Arsenic (total) and pH pass test within the permissible limit as per BIS 10500-2012 set for drinking water by Bureau of Indian Standard**
- All materials were received in good condition and packing of the materials have been found to be safe enough to carry to the field
- The systems are efficient for arsenic removal from source. Very easy operation and practically maintenance free.
- **The system as submitted to us is approved for drinking water application**

Standard methods were followed for all the parameters as shown in the Tables (1-13) using "**Titrisol Grade**" standard chemicals from Merck, Germany.

Turbidity: ECTN100IR PORTABLE TURBIDITY METER (EUTECH INSTRUMENTS) WAS USED FOR CROSS CHECK.

Quality: Very good

CONCLUSION: ARSENIC REMOVAL PLANT PASSES THE QUALITY AS CLAIMED BY THE PARTY

Test Report of Bharti Senco Nano Based Adsorption Arsenic Removal Unit

Sample Details	**Evaluation of Bharti Senco Nano Based Adsorption Arsenic Removal Unit**

Online Nano Based Adsorption Arsenic Removal Technology Submitted by M/s. Bharti Waters Pvt Ltd, Aradhana Bhawan, Azadpur Commercial Complex, New Delhi 110033, for performance testing and Arsenic Removal proficiency of the unit against Arsenic Contamination of 0.05 PPM, 0.09 PPM, 0.15PPM, 0.30PPM, 2.00PPM.

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Table 1

Date: 24.07.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	3.1
	0.09 (90)	6.2
	0.15 (150)	9.3
	0.30 (300)	9.4
	2.00 (2000)	5.2

Table 2

Date: 25.07.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	3.7
	0.09 (90)	6.3
	0.15 (150)	8.3
	0.30 (300)	7.5
	2.00 (2000)	8.2

Table 3

Date: 28.07.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	4.6
	0.09 (90)	7.1
	0.15 (150)	7.9
	0.30 (300)	7.8
	2.00 (2000)	8.4

Table 4

Date: 01.08.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	4.2
	0.09 (90)	7.8
	0.15 (150)	7.4
	0.30 (300)	7.9
	2.00 (2000)	8.1

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Table 5

Date: 02.08.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	6.2
	0.09 (90)	8.1
	0.15 (150)	7.9
	0.30 (300)	8.5
	2.00 (2000)	8.4

Table 6

Date: 05.08.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	6.7
	0.09 (90)	8.9
	0.15 (150)	8.4
	0.30 (300)	8.1
	2.00 (2000)	8.2

Table 7

Date: 08.08.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	5.9
	0.09 (90)	8.1
	0.15 (150)	8.6
	0.30 (300)	8.4
	2.00 (2000)	8.4

Table 8

Date: 09.08.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	5.2
	0.09 (90)	7.9
	0.15 (150)	7.8
	0.30 (300)	7.6
	2.00 (2000)	9.0

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Table 9

Date: 12.08.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	6.4
	0.09 (90)	6.9
	0.15 (150)	8.4
	0.30 (300)	8.2
	2.00 (2000)	8.5

Table 10

Date: 14.08.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	7.1
	0.09 (90)	5.2
	0.15 (150)	8.6
	0.30 (300)	8.5
	2.00 (2000)	8.9

Table 11

Date: 16.08.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	6.4
	0.09 (90)	6.7
	0.15 (150)	8.2
	0.30 (300)	9.4
	2.00 (2000)	9.2

Table 12

Date: 19.08.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	5.9
	0.09 (90)	6.8
	0.15 (150)	8.1
	0.30 (300)	8.8
	2.00 (2000)	9.2

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Table 13

Date: 22.08.17

Arsenic At Inlet or outlet	Inlet (PPM/ mg per lit)	Outlet (PPM/ mg per lit)
	1ppm = 1000 ppb	Results are given in ppb
	0.05 (50)	6.3
	0.09 (90)	6.7
	0.15 (150)	6.9
	0.30 (300)	8.4
	2.00 (2000)	8.8

Technology:-

Bharti Senco Nano Based Adsorption Arsenic Media is as an adsorbent for the removal of inorganic ions; particularly arsenite, arsenate, phosphate, antimony compounds other trace metals and polar organic contaminants (as claimed by the party)

Chemical Name of media used:-

Iron Hydroxide Oxide

Appearance:-

The product consists of black and brown granular material with particles of irregular shape, homogeneous and visibly free of extraneous matter.

Commercial Form:-

Iron Hydroxide Oxide is a granular product consisting of irregularly shaped (Non Molded) particles. The water content is a mass fraction of up to 50%.

Surface Area:-

235 m^2/g

Bulk Density:-

The bulk density is 1.60g/cm^3.

Adsorption Capacity:-

Adsorption Capacity about 16.85 gm of arsenic / Kg of media

Media Life:-

Life of the media about 3 Years as claimed by the party (verification of this issue has not been in the scope of this report)

22.08.2017

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TLCP/ Leaching Test:-

Passes the Test.

Performance of the Unit:-

While operating the unit for several days, the handling mechanism worked very fine and appeared to be sturdy. The onsite warranty claim of 4 years including the media life of about 3 years appears good value for money.

Adoptability:-

The Bharti Senco unit is such that it can be connected to small, medium & large arsenic affected water supply scheme of capacities between 1000 LPH to 50000 LPH (as claimed by the manufacturer) and even for domestic applications. There is no need to add any chemicals for operation/regeneration. The system is totally online.

Bharti-Senco Online Arsenic Removal units works on nano based adsorption media technology with particle size <3 NM and removes arsenic (III) and arsenic (V).

BACK WASH: No traces of toxic elements such as arsenic, lead, and cadmium were present even in the parts per billion level (ppb/ ng/ml) while backwashing with the tap water.

Successfully Observed:-

The Bharti Senco unit passes the Tests of Arsenic, Fe (total) and pH within the permissible limit as per BIS10500-2012 set for drinking water by Bureau of Indian Standard.

All Material were received in good condition and packing of the materials have been found to be safe enough to carry to the field.

It is observed that apart from removing arsenic contamination, the unit also removes iron, phosphate, selenium, antimony, copper, chromate, Molybdenum and dissolved heavy metals.

The systems are efficient in Arsenic Removal from source. It is very easy to operate and practically maintenance free. The system as submitted to us is approved for drinking water application for Arsenic Removal by adsorption based Nano technology.

Standard Method was followed for all the parameters as shown in the table using "**Titrisol Grade**" Standard chemicals from Merck, Germany.

Quality:- Excellent

Conclusion:- Bharti Senco Nano Based Adsorption Arsenic Removal Unit Passed the Quality Tests as claimed by the Party.

Partha Chattopadhyay

22.08.2017.

Signature

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