

Table 1 - BIOREMEDIATION OF DOMESTIC AND INDUSTRIAL WASTES WITH PERSNICKETY® 713 IN USA

Sr. #	Plant	Location	Purpose of Treatment	Conditions Prior to Treatment	Benefits Achieved
1	Municipal (trickling filters with aerated lagoons)	Minnesota, USA	To reduce H ₂ S odors generating from lagoons	a) Strong odor b) Low DO level c) Accumulated sludge in lagoons d) BOD and TSS not under standard limits	a) Complete odor was eliminated b) DO level significantly increased c) Accumulated solids reduced and clarity of water significantly improved d) BOD and TSS reached under standard limits
2	Cheese / Dairy	South Central Wisconsin, USA	a) Reduce H ₂ S odors b) Reduction in BOD & TSS to meet standard limits c) Reuse treated effluent for spray irrigation d) Reduce overall electrical costs by reducing working hours of aerators	a) Strong odor making working environment unpleasant b) High electrical costs due to continuous operation of aerators c) BOD more than 100 ppm (standard level) restricted reuse of effluent for irrigation	a) Complete odor was eliminated b) BOD reached to 50 ppm & maintained constantly, 50 points lower than required level c) working of aerators reduced
3	Municipal (three Oxidation Ponds)	Minnesota, USA	To control H ₂ S odors generating from lagoons	a) Over 400 community complaints for odors due to high DS level b) High solid accumulation in no. 1 pond	a) 1st year treatment only 2 phone calls regarding odors b) DS reached to 0.05 ppm c) Over 1 ft accumulation of sludge was reduced within 6 months
4	Municipal	Minnesota, USA	To reduce DS and related odors	DS concentration was more than 5 ppm resulting many complaints	DS concentration less than 1 ppm
5	Soy bean	Nebraska, USA	To reduce dissolved sulfides in effluent	Dissolved sulfide level was 5 ppm	DS concentration less than 1 ppm
6	Cheese / Dairy	Central Wisconsin, USA	a) Reduce H ₂ S odors b) Reduction in BOD & TSS to meet standard limits	a) Neighbourhood complaints for odors due to high DS level b) TSS & BOD not reaching standards of stream discharge	a) Odor complaints halted b) TSS & BOD reached standards of stream discharge

7	Rendering	Minnesota, USA	<ul style="list-style-type: none"> a) Reduce H₂S odors b) Reduce overall electrical costs by reducing working hours of blowers 	<ul style="list-style-type: none"> a) Complaints for odors due to high level of H₂S emission b) Two blowers continuously working in winter & three in summer c) BOD & TSS not reaching permissible limits of discharge 	<ul style="list-style-type: none"> a) Odor complaints halted b) Only one blower is working except 2 in hottest summer c) TSS & BOD reached standards of stream discharge
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Table 1 contd.

S. No.	Plant	Location	Purpose of Treatment	Conditions Prior to Treatment	Benefits Achieved
8	Rendering	Minnesota, USA	<ul style="list-style-type: none"> a) To reduce H₂S odors generating from lagoons b) To reduce accumulated sludge in lagoons 	<ul style="list-style-type: none"> a) Complaints for odors due to high level of H₂S emission from equalization tank and lagoons b) About 2 ft accumulation of sludge in lagoons c) Effluent standards not reaching 	<ul style="list-style-type: none"> a) No complaints due to odors b) Over 1 ft accumulation of sludge was reduced within 7 months c) All effluent standards were met
9	Vegetable canning	Minnesota, USA	<ul style="list-style-type: none"> a) To reduce H₂S odors generating from lagoons b) To reduce accumulated sludge in lagoons 	<ul style="list-style-type: none"> a) Complaints for odors due to high level of H₂S emission from lagoons b) About 4 - 5 ft accumulation of sludge at the bottom of lagoons 	<ul style="list-style-type: none"> a) No complaints due to odors b) About 60% reduction in accumulation of sludge
10	Meat Packing	Iowa, USA	To reduce BOD	<ul style="list-style-type: none"> a) BOD level up to 500 mg/L b) High DS level and strong odors 	<ul style="list-style-type: none"> a) Average reduction of 60% BOD b) Odors completely eliminated
11	Paper & pulp	Minnesota, USA	<ul style="list-style-type: none"> a) Reduce H₂S odors b) Reduce H₂S levels in the belt press room 	<ul style="list-style-type: none"> a) Strong H₂S generation in 3 primary clarifiers b) H₂S in belt press room reaching to 40 to 50 ppm & occasionally up to 100 ppm 	<ul style="list-style-type: none"> a) No complaints of odor b) H₂S level in belt press room reached to less than 2 ppm

12	Malting Waste	Minnesota, USA	a) Reduce H ₂ S odors b) Reduction in penalties	a) High DS levels resulting in numerous complaints b) High COD & TSS in the discharge resulting in high penalties	a) COD reduced more than 25% b) TSS reduced more than 33% c) Penalties reduced tremendously d) No odor complaints
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Table 2 – ABR TREATMENT OF SUGAR INDUSTRY EFFLUENT WITH PERSNICKETY®713

Description	Case #1	Case #2	Case #3	Case #4	Case #5	Case #6	Case #7
Location	Minnesota	Idaho	Wyoming	Minnesota	Michigan	Michigan	UK
Production units (tons/day)	5,500	5,000	3,500	5,200	2,800	3,300	12,000
Flow (million gallon/day)	0.6	8.0	0.6	0.7	5.0	2.2	30
BOD (mg/L)	8,500 to 20,000	2,000 to 2,500		8,500 to 21,000	750 to 1,000	2,200 to 2,600	–
Dissolved Sulfides, D.S (mg/L) / H ₂ S (in air) ppm	20 mg/L	20 mg/L	20 to 25 ppm	18 to 22 mg/L	5.5	7 to 12	10 to 15
Mud Pond size (million gallons)	50	4	2.5 to 5.0	75	5.0	4.0	3.8
Flume Capacity (million gallons)	–	1.7	1.0	–	7.0	7.0	–
Period of Pilot study (days)	180 to 220	180	180	180 to 220	120 to 160	120 to 160	110 to 120
Inoculation point	Underflow from clarifier	Factory discharge prior to clarifier	Factory discharge prior to clarifier	Underflow from clarifier	Factory discharge prior to mud pond	Factory discharge prior to mud pond	Underflow from mud thickener

Dosing quantity of 713 (gallons/day)	6.0	8.0	24	7.0	6.0	6.0	25
Conditions prior to treatment	D. S. = 20 mg/L BOD removal = 48 to 50%	D.S = 20 mg/L	H ₂ S in air = 25 ppm	D. S. = 22 mg/L BOD removal = 30 to 64%	D.S = 5.5 mg/L BOD = 750 to 1,000 mg/L	D.S = 7 to 12 mg/L BOD = 2,200 to 2,650 mg/L	D.S = 10 to 15 mg/L
Conditions after treatment	D.S = 1 mg/L BOD removal = 95 to 99%	D.S = 1 mg/L	H ₂ S in air = 1.0 ppm	D.S = 1 mg/L BOD removal = 86%	D.S = < 1.0 mg/L BOD = <500 mg/L	D.S = < 1.0 mg/L BOD = <1,000 mg/L	D.S = <2 mg/L

Table 3 – PROJECTS IN KUWAIT

Sr. #	Name of the Project & Client	Purpose of Treatment	Conditions Prior to Treatment	Benefits Achieved
1	Survey & Study Ministry of Public Works (MPW)	a) To survey the complete networks to isolate most odour generating sites b) To survey sewerage system to assess the existing conditions of lifting/pumping stations & STPs	a) All STPs were overloaded b) Immense odour generation & emission in the networks c) The quality of Treated effluent was not within the standard limits d) Uncontrollable discharge to the sea	A comprehensive report was prepared with recommendations
2	Pilot Study Ministry of Public Works (MPW)	a) To test biological & chemicals products in lab & field on pilot scale to assess their capability to control odour & treat sewage b) To select the best product for above mentioned applications	a) About 30 products were tested in high odour stricken areas b) Different locations were selected to test different products	a) A comprehensive report was prepared with recommendations b) Persnickety®713 was selected as No. 1 product among all
3	Jahra STP Ministry of Public Works (MPW)	a) To increase the capacity from 67,000 to 140,000 m ³ /day	a) 30,000 m ³ /day raw sewage flow was discharged into the sea b) BOD level up to 300	a) Within a month complete 140,000 m ³ /day flow was accommodated in

		<ul style="list-style-type: none"> b) To reduce H₂S generation completely c) To keep tertiary effluent quality within standard limits 	<ul style="list-style-type: none"> c) mg/L High DS level and strong odors 	<ul style="list-style-type: none"> STP b) Average reduction of 96% BOD c) Odors completely eliminated d) Discharge to sea completely stopped
4	Mishref Pumping Station Ministry of Public Works (MPW)	<ul style="list-style-type: none"> a) To reduce pollution level in discharge to the sea b) Bring BOD level >30 mg/L c) Control H₂S odors d) Control NH₃ level in discharge 	<ul style="list-style-type: none"> a) All VFDs of station stopped working b) Pumping station came to standstill state c) 200,000 m³/day raw sewage discharged into the sea 	<ul style="list-style-type: none"> a) BOD level maintained at required level b) H₂S and NH₃ controlled to 0.5 ppm & 2.0 ppm from 5.0 ppm & 57 ppm respectively
5	Riqqa STP Ministry of Public Works (MPW)	Same as Jahra STP project to increase capacity from 160,000 m ³ to 220,000 m ³ /day	Project is under evaluation	Same targets as Jahra STP

Table 4 – Major Projects in India

S. No.	Project Title & Location	Name of Client & Order No.	Scope of work
SEWAGE TREATMENT PLANTS & PUMPING STATIONS			
1	Field Trial of Sewage Treatment with Bacterial product Persnickety® 713 in 2.2MGD & 3MGD Plant at Vasant Kunj	EE, (SDW) XI KILOKARY SPS : JAL VIHAR: New Delhi – 110024	<ul style="list-style-type: none"> a) To study existing problems of STP & recommend their remedies b) Standard quality of treated effluent with limited consumption of electricity
2	Field trial at 30MGD (initially) and 140MGD (Finally) OKHLA Sewage Treatment Plant	EE (E&M) II, Delhi Jal Board, SDW Okhla, Mathura Road, New Delhi	<ul style="list-style-type: none"> a) To study existing problems of STP & recommend their remedies b) Standard quality of treated effluent with limited consumption of electricity
3	Field Test of Biological Compound for treating Waste Water in Open drains and in River Yamuna	SE, (SDW) IV OKHLA TANK, MATHURA ROAD, New Delhi	To do the remedial measures to control excessive odour emission from STP & Sludge drying beds
4	Procurement and application of enzyme at STP Vasant Kunj	Delhi Jal Board EE, (SDW) V, RRPS: OPP. MAHARANI	Same as above

	Sector 'A'	BAGH, New Delhi	
5	Procurement and application of Bio enzyme at STP Vasant Kunj (Pocket B)	Delhi Jal Board	To study existing problems of STP & recommend their remedies
6	Treatment of (25 +10) = 35 MGD flow at Kondli STP	E.E. (SDW) IV / 2006 / 3178 (WO 104)	1. Removal of odour 2. Reduction of BOD & TSS
7	Treated effluent at Okhla Pumping Station	W. O. 03 / EE / 4FWSDM /07-08	1. Removal of odour 2. Reduction of BOD & TSS
8	Treatment of (25 +10) = 35 MGD flow at Kondli STP	E.E. (SDW) IV / 2006 / 4309 (WO 160)	1. Removal of odour 2. Reduction of BOD & TSS
9	Tertiary Treatment of sewage at Rithala STP Phase-I	DJB/E.E.(SDW)IX/2008/3384	- do-
10	Biological Treatment at STP Rithala Phase-I	DJB/E.E.(SDW)IX/2007-08	- do-
11	Biological Treatment at STP Rithala Phase-I	DJB/E.E.(SDW)IX/2007-08/403	- do-
12	Biological Treatment at 40 MGD STP Rithala Phase-II	DJB/F/EE(SDW)XII/08/196	- do-
13	Annual Operation and Maintenance of Oxidation pond by Bi-enzyme/Bio-remediation treatment process at Nehru Vihar Near Wazirabad	DJB/E.E. (C) Plant/2007-08/W.O./1381	- do-
14	Bio-enzyme/Bio-Remediation process of treatment for Oxidation Ponds in Timarpur (Nazafgarh Drain) Wazirabad	DJB/EE (C)/ Plant/2008/592	- do-
15	Bio-enzyme/Bio-Remediation process of treatment for Oxidation Ponds in Timarpur (Nazafgarh Drain) Wazirabad	DJB/E.E. (C) Plant /2007 Ext./ 4030	- do-
16	Bio-enzyme/Bio-Remediation process of treatment for Oxidation Ponds in Timarpur (Nazafgarh Drain) Wazirabad	DJB/E.E. (C) Plant /2007 W.O./2828	- do-
S. No.	Project Title & Location	Name of Client & Order No.	Scope of work
17	Bio-enzyme/Bio-Remediation process of treatment for Oxidation Ponds in Timarpur (Nazafgarh Drain) Wazirabad	DJB/E.E. (C) Plant /2007/ W.O. /423	-do-
18	Biological treatment of waste/sewage water at STP Ph-I & II Yamuna Vihar	F-06/DJB/SDW-III/YV/2008/3084	-do-
19	Biological treatment of waste/sewage water at STP Ph-I & II Yamuna Vihar	F-07/DJB/SDW-III/YV/2008/2794	-do-
20	Pilot Project using Bio-Remediation process for the	WWF - India	Treatment of Wastewater in Open drains

	wastewater treatment at 5 mid Sewage Treatment Plant in Jajmau, Kanpur under WWF India's Living Ganga Programme		
21	Pilot Project using Bio-Remediation process for on-channel treatment of the wastewater on select stretch of the drain (Kalyanpur-Singhpur Nallah in the city of Kanpur) under WWF India's Living Ganga Programme	WWF - India	Treatment of Wastewater in Open drains
22	Bio-remediation treatment of 9 MLD oxidation ponds at Sector-54, Noida	Noida Authorities, UP/2919, M/o S.T.P-54	1. Removal of odour 2. Reduction of BOD & TSS
23	A/A to Boundary wall and approach to bldg. & Antenna yard at H.F. Station A.F.C.C. Race course camp, New Delhi	55 (385)/A-3/R. Mandal/2008-09/5266	Civil construction of a new boundary wall
24	Replacement of Asbestos roof sheets with CGI Sheets in E & Q block DSC Line, Depend Hutments, New Delhi	55 (378)/A-1/R. Mandal/2008-09/5550	Civil work
25	Cleaning of Sewer Water through Bio-remediation and maintenance of Baija Tal Water Quality at Gwalior	INTECH/NHD/GWL/WO-05	1. Removal of odour 2. Reduction of BOD & TSS
26	Running the sewage treatment plant with ABR technology & biological product (Persnickety®713) for bioremediation at Vashinaka Chembur for twelve months	MMRDA/ED/TCBD-II/R&R/STP/950/09/	O/M of STP
27	Cleaning of blockage in sewer lines, chambers and its smooth operation at MMRDA colony (Jagannath complex), Dahisar (w) with ABR technology & biological product (Persnickety®713)	MMRDA/ED/MUIP/R&R/JAGANNATH/SEWARAGE/107/09	Opening of sewer lines with ABR
28	Plumbing work for separate drinking system for MMRDA's existing building in BKC	MMRDA/ED/MAINTENANCE CELL/PLUMBING WORK/OB/08	Plumbing works
29	To run the sewage treatment plant with ABR technology with biological product	MMRDA/ED/TCBD-II/APLR/R&R-STP/1406/08	O/M of STP
30	OPERATION & MAINTAINENCE OF PUNAM NGR. STP (0.8 MLD)	MMRDA/ED/MUIP/R&R/PUNAM NGR/STP MAINT/08(2) 339	O/M of STP

S. No.	Project Title & Location	Name of Client & Order No.	Scope of work
31	To treat the incoming flow (2 MLD capacity) and reduction of sludge at Majas R & R septic tank with ABR technology and biological product (Persnickety®713)	MMRDA/ED/MUIP/R&R/MAJA S/ SEPTIC TANK/08/	O/M of STP
32	Operation & maintenance of sewage treatment plant (1.5 MLD)in Kokri agar, Wadala with ABR technology & biological product (Persnickety®713)	MMRDA/ED/EE/KAW-STP/08/	O/M of STP
33	To make the sewage treatment plant (STP) functional and its maintenance (0.80 MLD) in Kokri agar, Wadala with ABR technology with biological product (Persnickety®713)	MMRDA/ED/MUIP/R&R/POONAM NGR./STP MAINT/08/	O/M of STP
34	Operation & maintenance of sewage treatment plant (1.5 MLD)in Kokri agar, Wadala with ABR technology & biological product (Persnickety®713)	MMRDA/ED/EE/KAW-STP/08/	O/M of STP
35	Repairing of bore well submersible pump in new training school building at Anushakti Nagar, Mumbai-94	MMRDA/EP&SS/ESS(V)TSH/08/151	Mechanical maintenance
36	Operation of old & new sewage treatment plants and new sewage pump house (SPH) and maintenance of new STP & New SPH at Anushakti Nagar	MMRDA/DCSCE/GSS/AMC/WO-02/2009/09	O/M of STP & SPH
37	Pre-monsoon protection works viz. Cleaning of roof terraces, service shafts, storm water drains, Nallahs, culverts, under TTM-III unit at Anushakti Nagar	MMRDA/DCSEM/HEAD,ESD/TM-III	Building O/M works
38	Pre-monsoon protection works viz. Cleaning of storm water drains, Nallahs, culverts roof terraces under TTM-I unit at Anushakti nagar	MMRDA/DCSEM/HEAD/ESD/TM-I/42	Building O/M works
39	Providing & fixing water supply lines to additional water heaters at Nandadevi, Kanchenjunga, Dhavalgiri & Annapurna bldgs. Under Kanchenjunga unit, at Anushakti nagar, Mumbai	MMRDA/DCSEM/HEAD/ESD/KANJUN/13	Building O/M works
HORTICULTURE PROJECTS			

40	Waste Water Treatment and its Re-utilization for Horticulture purpose in Lodhi Garden (R/M of Anoxic Bio-Remediation Reactor for treatment of sewage/unfiltered water)	NDMC/E.E. (SP)D/01/2009-10	To produce pollution free Treated Effluent from sewage for horticulture purposes
41	Waste Water Treatment and its Re-utilization for Horticulture purpose in Lodhi Garden (R/M of Anoxic Bio-Remediation Reactor for treatment of sewage/unfiltered water)	NDMC/E.E. (SP)D/03/2007-08	-do-
42	Waste Water Treatment and its Re-utilization for Horticulture purpose in Lodhi Garden	NDMC/E.E. (SP)D/02/2007-08	-do-
S. No.	Project Title & Location	Name of Client & Order No.	Scope of work
43	D/O Land for Aastha Kunj in Distt. Green at Kalkaji providing biological treatment of raw sewer for small tank size 21mx7m1.5m in Shambhoo Dayal Park	F54 (646) 07/A/SED-3/DDA/440	Sewage treatment for horticulture purposes
44	Construction, Design, Drying, Operation and Maintenance of STP	GDA/UP/305/Horticulture/09	To produce pollution free Treated Effluent from sewage for horticulture purposes
45	Construction, Design, Drying, Operation and Maintenance of STP	GDA/UP/425/Horticulture/09	-do-
46	Construction, Design, Drying, Operation and Maintenance of STP	GDA/UP/110/Horticulture/09	-do-
47	Work of development of lawn and its maintenance at R&R Kokari agar, Wadala	ED/DLKA/08/	Maintaining lawn with ABR treated sewage
48	Providing Biological Treatment for Raw Sewer for maintaining green area at Aastha Kunj* extended for 1 more year	EE, SDE-3/DDA/AASTHA KUNJ/NEHRU PLACE [BEHIND MTNL BLDG./ New Delhi – 110019]	1. Removal of odour 2. Reduction of BOD & TSS
49	Treatment of raw sewage through Biotechnology (Enzyme) at SPS Tuglakabad.	Delhi Jal Board EE, (SDW) V, RRPS: OPP. MAHARANI BAGH, New Delhi	To design, construct, operate and maintain a Bioremediation STP with 0.25 MGD capacity & reuse treated effluent in irrigation
50	Treatment of 3 MGD flow in Oxidation ponds at Timarpur	Delhi Jal Board, W. O. 46	1. Removal of odour 2. Reduction of BOD & TSS 3. Reduction of accumulated sludge more about 50%
52	Yamuna canal water at CPWD site	W. O. 01 / EE / 4FWSDM /07-08	To remove odour from irrigation water
RIVER BED CLEANING & TREATMENT			

53	Bioremediation of Sludge collected at desilting of Mithi River, Mumbai	W. O. 1 for Mumbai Municipal Corporation	To treat 50,000 m ³ sludge of Mithi River
INDUSTRIAL WASTEWATER TREATMENT			
54	Bioremediation of Wastewater generated from hotels Mahabaleshwar Hill Station Municipal Council	W.O. 4/585/007	To bring down the quality of treated wastewater within limits of MPCB to reuse in irrigation
55	Bioremediation of sewage, Panchgani Hill Station Municipal Council	W.O. 6/66/2007-08	To bring down the quality of treated effluent within limits of MPCB to reuse in irrigation