Dr. Nitin Kumar Singh

Assistant Professor

Department of Environmental Science and Engineering

Marwadi Education Foundation's Group of Institutions, Rajkot (Gujarat), India

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https://scholar.google.co.in/citations?user=CDf_0vIAAAAJ&hl=en

Citations: **181**; **h-index**: **7**; **i-index**: **4**

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https://www.researchgate.net/profile/Nitin_Singh30

Research Interests

- Design and development of decentralized/onsite wastewater treatment systems.
- Solid and/or fecal waste management using Black Soldier Fly Larvae technology and recovery of value-added products.
- Design and development of advanced aerobic biofilm systems such as Moving Bed Bioreactors and Integrated Fixed-Film Activated Sludge Reactors
- Techno-economic and life cycle assessment of wastewater treatment systems
- Treatment of municipal and industrial wastewaters using commercial and natural coagulants.
- Wastewater treatment by advanced oxidation processes
- Cost-benefit analysis of wastewater treatment systems

Academic Qualifications

Degree	Year of passing	Specialization	Board/University	Marks/CGPA
Ph.D.	2017	Environmental Engineering	Indian Institute of Technology, Roorkee, India	9/10
M. Tech.	2012	Environmental Engineering	Indian Institute of Technology, Kharagpur, India	9.44/10

B. Tech.	2008	Chemical Engineering	Institute of Engineering and Technology, Lucknow (U.P.T.U.)	74.26 %

Internship/Industrial and Field Experience

1. One month long industrial training with "IFFCO" Phulpur, Allahabad (Uttar Pradesh).
2. Three years' experience of commissioning, operation, maintenance, and assessment of a UK based hybrid advanced aerobic treatment system (Sponsored by Department of Science and Technology, India and European Union) under the Indo-European project SARASWATI.
3. Four-month experience of operation, maintenance, and analysis of pilot scale PVA gel media based wastewater treatment system in Jalandhar (Sponsored by KURARAY Limited, Japan and I.I.T. Roorkee).
4. Three-month experience of operation, maintenance, and analysis of PVA gel based nutrient removal system as an option to save Dal Lake, Kashmir (Sponsored by KURARAY Limited, Japan and I.I.T. Roorkee).
5. Development and installation of self-sustainable and smart public toilet at Rohtak, Haryana (as a start-up member of SUKRITI NGO).
6. Detailed project report preparation of STP for Navrachna Society, Roorkee, Uttarakhand.
7. Techno-economic analysis of 20 decentralized wastewater treatment systems in Northern India based on different technologies such as onsite aerobic package, onsite anaerobic package, extended aeration, submerged aerobic fixed film, MBBR, RBC, SBR, WSP, UASB, and MBR.

Job Experiences

1. ***Presently working as Assistant Professor, Department of Environmental Science and Engineering, MEFGI, Rajkot, Gujarat (15 April, 2018 onwards).***

a) Subjects teaching presently

S. No.	Name of Subject	No. of Credits	Department/Branch	Semester/Year/Program
1.	Elements of Chemical Engineering	5	Environmental Science and Engineering	$4^{th}/2^{nd}$/UG
2	Design of Water Treatment Units	6	Environmental Science and	$6^{th}/3^{rd}$/ UG

			Engineering	
3.	Water and Wastewater Treatment Scheme - II	6	Environmental Science and Engineering	1st/2nd/PG
4.	Water Pollution and Remediation	3	M. Sc. Environmental Sciences	1st/1st/PG

b) Subjects taught previos semester(s)

S. No.	Name of Subject	No. of Credits	Department/Branch	Semester/Year
1.	Wastewater Engineering	8	Environmental Science and Engineering	7th/4th/ UG
2	Stoichiometry	5	Chemcial Engineirng	3rd/2nd/ UG

b) M. Tech. Dessertation Guidance (1 No., Department of Env. Sci. and Eng.)

Thesis title: *Textile Industry Wastewater Treatment by Using Moringa oleifera Seed powder*

c) B. Tech. Project Guidance (3 No., Department of Env. Sci. and Eng.)

d) Departmental Portfolio charges: 1) Lab In-charge (2 times); 2) Engineering Exploration; 3) E-cell departmental coordinator; 4) IPR cell departmental coordinator; 5) Class coordinator (UG 1st sem).

e) Industrial visit of B. Tech 7th semester students to Nirma, Bhawnagar, Gujarat.

f) 2 days Faculty Development Program at Marwadi Education Foundations Group of Institutions.

g) 2 conference papers of B. Tech students presented in "6th IWA Regional Membrane Technology Conference (IWA-RMTC2018)" held at Gujarat, India.

h) Designed a ***M. Tech. specialization courses (Water and Wastewater Management).***

2. Program Officer (Technology), Tata Water Mission, Tata Trusts (7 August, 2017 to 26 March, 2018).

Key tasks performed

a) Designed and implemented campaigns with SHGs and NGOs to promote safe drinking water practices in rural parts of the North east states.

b) Stakeholder engagement with state government of Assam and other private organization for WASH alliance which helped in increasing the momentum of Swachh Bharat Mission in the rural areas of North east states.
c) Supported in developing an output based monitoring mechanism for community owned arsenic and iron treating water treatment plant with University of California team.
d) Design and Development of operational matrix for smooth and efficient functioning of Arsenic and Iron removal plant to ensure sustainability.
e) Assessment and implementation of ultra-filtration based water treatment units for Schools at Kolkata, India.
f) Feasibility study of Aquatron Sewage Separator (faecal separating system based on whirlpool, gravitation and surface tension technique) at Hyderabad, India
g) Erection and commissioning of RO based water treatment plant at Vaibhavwadi, Sindhugarh (Maharashtra)
h) Feasibility study of evapotranspiration technology based toilet systems for northeast rural areas.
i) Feasibility study of Jalkalp filter (a modified version of slow sand filter) to address pathogen, iron, arsenic, and turbidity problem in rural areas of northeast states.
j) Feasibility study of Livinguard technology (A textile based disinfection system) to address various problems such as drinking water purification, wastewater treatment, personal hygiene etc.
k) Feasibility study and planning of infrastructure development and wastewater treatment solutions for Nagpur mental hospital, Nagpur (Maharashtra)
l) Feasibility and technical assessment of NUF filtration unit for isolated and hilly locations to address water contamination by viruses, bacteria, and colloidal matters.
m) Troubleshooting and assessment of solid media based water disinfection units (PurAll) at remote location of Mussoorie, Uttarakhand.
n) Feasibility study and technical assessment of Taraltec reactor (a mechanical disinfection unit) to address the problem of rural areas across India.
o) Feasibility study and technical assessment of Vinnovate Puribag (a powdered disinfectant) to address the problem of water contamination in remote and isolated locations in Northeast states.
p) Assessment of Drinking water supply and distribution system in rural areas of Dahod, Gujarat.

q) Troubleshooting and assessment of Tiger toilet units in two villages of Dahod, Gujarat.

r) Feasibility study of solar based water supply distribution system at Kelish village, Aizawl (Mizoram).

s) Review and assessment of toilet units and rainwater harvesting systems in hilly areas (Tuensang town) of Nagaland state.

t) Installation, monitoring, and assessment of a community owned arsenic and iron removal water treatment plant at Nalbari district of Assam state.

u) Testing and assessment of point of use treatment systems (Tata Swachh Filters) at remote and isolated locations of Meghalaya state.

3. Chemical Engineer, Sugar Division of DCM Shriram Consolidated Limited during the period of July, 2008 to June, 2010.

Key task performed

a) Performance evaluation of Batch crystallizer (Manual Vs. automated) in terms of Capacity utilization, cycle time & Nutch purity.

b) Water management of plant and maximizing the recycling of water without affecting the quality of products and by products.

c) Monitoring and assessment of wastewater treatment plant treating effluent of sugar manufacturing industry.

d) Shift handling in Crystallization section of Plant.

PROFESSIONAL PROFILE

Advisory Board Member

- Next2waste Priavte Limited (An I.I.T. Roorkee incubated Start-up)
- Freshrooms LifeSciences Private Limited.

Ongoing projects

1. Baseline study, sustainability assessment, and upscaling of adsorption based Arsenic, Iron, and Fluoride treating water treatment plants across northeast states.
2. Design and development of Upflow Anaerobic Sludge Membrane Bioreactor.
3. Solid and faecal waste management using Black Soldier Fly Larvae technology.
4. Potential Assessment of ZnO photocatalyst for the treatment of real wastewater generated from a textile industry

5. Textile industry wastewater treatment treatment using *Moringa Oleifera* seeds, a natural coagulant.
6. Municipal and industrial wastewater treatment in a polyvinyl alcohol (PVA) gel media augmented moving bed-sequential batch biofilm reactor (MB-SBBR).

Seminars delivered

1. Wastewater treatment by Integrated Fixed-Film Activated Sludge Process (PhD)
2. Techno-economic assessment of small scale wastewater treatment systems (PhD)
3. Waste Water Treatment by Membrane Bio Reactor (Post Graduate)
4. Design of wastewater treatment scheme for Fertilizer Industry (Post Graduate)
5. Environmental Impact Assessment of Nuclear Power Plant (Post Graduate)
6. Nanotechnology and its impacts on environment (Post Graduate)
7. To Facilitate the Sugar Industry to Reduce Attrition Rate (Job)
8. Fuel Cells (Graduate)
9. Heat Exchanger Design (Graduate)

Reviewers of Journals

- Urban Water Journal (Taylor & Francis)
- Desalination & Water Treatment (Taylor & Francis)
- Journal of Water Sanitation and Hygiene for Development (IWA)
- Water Research (Elsevier)
- CLEAN – Soil, Air, Water (Wiley Online Library)
- Science of Total Environment (Elsevier)
- Journal of Environmental Chemical Engineering (Elsevier)
- Bioresource Technology (Elsevier)
- Journal of Cleaner Production (Elsevier)
- Journal of Water Resource Planning and Management (ASCE)
- Sustainable Energy Technologies and Assessments (Elsevier)
- Environment, Development, and Sustainability (Springer)
- Journal of Water Process Engineering (Elsevier)
- Chemical Engineering Journal (Elsevier)
- Sustainable Cities and Society (Elsevier)
- Environmental Nanotechnology, Monitoring & Management (Elsevier)

- Environmental International (Elsevier)
- Environmental Technology & Innovation (Elsevier)
- Exposure and Health (Springer)
- Powder Technology (Elsevier)
- Industrial Chemistry and Research (ACS)

Technical Society Memberships

1. American Society of Civil Engineering (Membership ID: 10538884)
2. International Water Association (Membership ID: 1601034)
3. Institution of Engineers, India (Membership ID: AM157531-5)

PhD Thesis

Integrated Fixed-Film Activated Sludge Process for Sewage Treatment.

Research Supervisor

Dr. Absar Ahmad Kazmi
Professor
Environmental Engineering Group
Dept. of Civil Engineering
Indian Institute of Technology, Roorkee, India

Master's Dissertation

Zinc oxide mediated heterogeneous photocatalytic degradation of methyl red dye under UV and Solar light.

Research Supervisor

Dr. Anjali Pal
Associate Professor
Environmental Engineering Section
Dept. of Civil Engineering
Indian Institute of Technology, Kharagpur, India

Research Publications

Sl. No.	Author (s)	Year	Title	Complete Reference of Journal	Impact Factor	Citation of paper

					of Journal	
List of SCI publications						
1.	Nitin Kumar Singh, Sandip Saha, Anjali Pal	2015	Solar light-induced photocatalytic degradation of methyl red in an aqueous suspension of commercial ZnO: a green approach	Singh, N. K., Saha, S. & Pal, A. 2015. Solar light-induced photocatalytic degradation of methyl red in an aqueous suspension of commercial ZnO: a green approach. Desalination and Water Treatment 53, 501-514.	1.383	14
2.	Nitin Kumar Singh, Sandip Saha, Anjali Pal	2015	Methyl red degradation under UV illumination and catalytic action of commercial ZnO: a parametric study	Singh, N. K., Saha, S. & Pal, A. 2015. Methyl red degradation under UV illumination and catalytic action of commercial ZnO: a parametric study. Desalination and Water Treatment 56, 1066-1076.	1.383	8
3.	Manish Yadav, Nitin Kumar Singh*, Urmila Brighu, Sanjay Mathur	2015	Adsorption of F on Bio-Filter sorbent: kinetics, equilibrium, and thermodynamic study	Yadav, M., Singh, N. K. Brighu, U. & Mathur, S. 2015. Adsorption of F on Bio-Filter sorbent: kinetics, equilibrium, and thermodynamic study. Desalination and Water Treatment 56, 463-474.	1.383	3
4.	Muntzir Ali, Nitin Kumar Singh, Akansha Bhatia, Shriom Singh, Anwar Khurseed, Absar Ahmad Kazmi	2014	Sulfide Production Control in UASB Reactor by Addition of Iron Salt	Ali, M., Singh, N. K., Bhatia, A., Singh, S., Khurseed, A. & Kazmi, A. A. 2015. Sulfide Production Control in UASB Reactor by Addition of Iron Salt. Journal of Environmental Engineering 141, 6014008.	1.396	2

5.	Nitin Kumar Singh*, Absar Ahmad Kazmi, Markus Starkl	2015	A review on full-scale decentralized wastewater treatment systems: techno-economical approach	Singh, N. K., Kazmi, A. A. & Starkl, M. 2015. A review on full-scale decentralized wastewater treatment systems: techno-economical approach. Water Science & Technology 71, 468-478.	1.247	45
6.	Siddhartha Pandey, Nitin Kumar Singh*, Ankur Kumar Bansal, V. Arutchelvan, Sudipta Sarkar	2016	Alleviation of toxic hexavalent chromium using indigenous novel aerobic bacteria isolated from contaminated sites of tannery industry	Pandey, S., Singh, N. K., Bansal, A. K., Arutchelvan, V. & Sarkar, S. 2016. Alleviation of toxic hexavalent chromium using indigenous novel aerobic bacteria isolated from contaminated sites of tannery industry. Preparative Biochemistry & Biotechnology 46, 517-523	1.241	2
7.	Nitin Kumar Singh*, Absar Ahmad Kazmi, Markus Starkl	2015	Environmental performance of an integrated fixed-film activated sludge (IFAS) reactor treating actual municipal wastewater during start-up phase	Singh, N. K., Kazmi, A. A. & Starkl, M. 2015. Environmental performance of an Integrated Fixed-Film Activated Sludge (IFAS) reactor treating actual domestic wastewater during start-up phase. Water Science & Technology 72, 1840-1850.	1.247	7
8.	Nitin Kumar Singh*, Jasdeep Singh, Akansha Bhatia, Absar Ahmad Kazmi	2016	A Pilot-Scale Study on PVA Gel Beads based Integrated Fixed Film Activated Sludge (IFAS) Plant for Municipal Wastewater Treatment	Singh, N. K., Singh, J., Bhatia, A. & Kazmi, A. A. 2016. A Pilot-Scale Study on PVA Gel Beads based Integrated Fixed Film Activated Sludge (IFAS) Plant for Municipal Wastewater Treatment. Water	1.247	8

				Science & Technology 72, 113-123.		
9.	Nitin Kumar Singh*, Siddharth Pandey, ShriomSingh, Seema Singh, Absar Ahmad Kazmi	2016	Post treatment of UASB effluent by using inorganic coagulants: Role of zeta potential and characterization of solid residue	Singh, N. K., Pandey, S., Singh, S., Singh, S., Kazmi, A.A. 2016. Post treatment of UASB effluent by using inorganic coagulants: Role of zeta potential and characterization of solid residue. Journal of Environmental Chemical Engineering 4, 1495-1503.	NR	1
10.	Khalid Mujamil Gani, Jasdeep Singh, Nitin Kumar Singh, Muntzir Ali, Vipin Rose, Absar Ahmad Kazmi	2016	Nitrogen and carbon removal efficiency of a polyvinyl alcohol gel based moving bed biofilm reactor system	Gani, K. M., Singh, J., Singh, N. K., Ali, M., Rose, V., Kazmi, A. A. 2016. Nitrogen and carbon removal efficiency of a polyvinyl alcohol gel based moving bed biofilm reactor system. Water Science and Technology 73, 1511-1519.	1.247	15
11.	Nitin Kumar Singh*, Absar Ahmad Kazmi, Markus Starkl	2016	Treatment performance and microbial diversity under dissolved oxygen stress conditions: Insights from a single stage IFAS reactor treating municipal wastewater	Singh, N. K., Kazmi, A. A., Starkl, M. 2016. Treatment performance and microbial diversity under dissolved oxygen stress conditions: Insights from a single stage IFAS reactor treating municipal wastewater. Journal of The Taiwan Institute of Chemical Engineers 65, 197-203.	3.849	7
12.	Tarun Kumar, K. S. Hari Prasad, Nitin Kumar Singh	2016	Substrate removal kinetics and performance assessment of a vermifilter bioreactor under	Kumar, T., Hari Prasad, K. S. & Singh, N. K. 2016. Substrate removal kinetics and performance assessment of a vermifilter bioreactor under organic shock load conditions. Water	1.247	1

			organic shock load conditions	Science and Technology 74, 1177-1184.		
13.	Nitin Kumar Singh*, Absar Ahmad Kazmi	2016	Environmental performance and microbial investigation of a single stage aerobic integrated fixed-film activated sludge (IFAS) reactor treating municipal wastewater	Singh, N. K. & Kazmi, A. A. 2016. Environmental performance and microbial investigation of a single stage aerobic integrated fixed-film activated sludge (IFAS) reactor treating municipal wastewater. Journal of Environmental Chemical Engineering 4, 2225-2237.	NR	10
14.	Akansha Bhatia, Nitin Kumar Singh*, Timsi Bhando, Ranjana Pathania, Absar Ahmad Kazmi	2017	Effect of intermittent aeration on microbial diversity in an intermittently aerated IFAS reactor treating municipal wastewater: A field study	Bhatia, A., Singh, N. K., Bhando, T., Pathania, R. and Kazmi, A. A., 2017. Effect of intermittent aeration on microbial diversity in an intermittently aerated IFAS reactor treating municipal wastewater: A field study. Journal of Environmental Science and Health, Part A, 52, 440-448.	1.561	2
15.	Nitin Kumar Singh*, Akansha Bhatia, Absar Ahmad Kazmi	2017	Effect of intermittent aeration strategies on treatment performance and microbial community of an IFAS reactor treating municipal wastewater	Singh N. K, Bhatia A, Kazmi A. A. 2017. Effect of intermittent aeration strategies on treatment performance and microbial community of an IFAS reactor treating municipal wastewater. Environmental Technology, 38(22), 2866-2876.	1.666	4
16.	Nitin Kumar Singh*, Rana Pratap Singh,	2017	Environmental impact assessment of a package type	Singh, N. K., Singh, R. P., Kazmi, A. A. 2017. Environmental impact assessment of a	1.247	0

	Absar Ahmad Kazmi		IFAS reactor during construction and operational phases: A life cycle approach	package type IFAS reactor during construction and operational phases: A life cycle approach. Water Science and Technology, 75, 2246-2256.		
17.	Manish Yadav, Nitin Kumar Singh*	2017	Isotherm Investigation for the sorption of Fluoride onto Bio-F: Comparison of linear and non-linear regression method	Yadav, M., Singh, N. K. 2017. Isotherm Investigation for the sorption of Fluoride onto Bio-F: Comparison of linear and non-linear regression method. Applied Water Science, 7 (8), 4793–4800.	-	-
18.	Nitin Kumar Singh*, Absar Ahmad Kami	2018	Performance and cost analysis of decentralized wastewater treatment plants: A case study from Northern India	Singh, N. K., Kazmi, A. A. 2018. Performance and cost analysis of decentralized wastewater treatment plants: A case study from Northern India. Journal of Water Resources Planning and Management (ASCE), 144(3): 05017024	3.197	2
19.	Nitin Kumar Singh, Siddhartha Pandey, Rana Pratap Singh, Swati Dahiya, Sneha Gautam, Absar Ahmad Kazmi	2018	Effect of Intermittent Aeration Cycles on EPS Production and Sludge Characteristics in a Field Scale IFAS Reactor	Singh, N. K., Pandey, S., Singh, R.P., Dahiya, R.P., Gautam, S., Kazmi, A. A. 2018. Effect of intermittent aeration cycles on EPS production and sludge characteristics in a field scale IFAS reactor. Journal of Water Process Engineering. 23, 230-238.	-	-
20.	Veerendra Sahu*, Suresh Pandian Elumalai,	2018	Characterization of indoor settled dust and investigation of indoor air	Sahu, V., Elumalai, P.E., Gautam, S., Singh, N.K., Singh, P. 2018. Characterization of indoor settled dust	1.433	-

	Sneha Gautam, Nitin Kumar Singh, Pradyumn Singh		quality in different micro-environments	and investigation of indoor air quality in different micro-environments. International Journal of Environmental Health Research 28, 419-431.		
21.	Manish Yadav, Satya Prakash Sahu, Nitin Kumar Singh*	2019	Multivariate Statistical Assessment of Ambient Air Pollution in two Coalfields having different Coal transportation strategy: A Comparative Study in Eastern India	Yadav, M., Sahu, S. P., Singh, N.K. 2019. Multivariate Statistical Assessment of Ambient Air Pollution in two Coalfields having different Coal transportation strategy: A Comparative Study in Eastern India. Journal of Cleaner Production, 207, 97-110.	5.651	-
22.	Nitin Kumar Singh*, Manish Yadav, Rana Pratap Singh, Absar Ahmad Kazmi	2019	Efficacy analysis of a field scale IFAS reactor under different aeration strategies applied at high aeration rates: A statistical comparative analysis for practical feasibility	Singh, N.K., Yadav, M., Singh, R.P., Kazmi, A.A. 2018. Efficacy analysis of a field scale IFAS reactor under different aeration strategies applied at high aeration rates: A statistical comparative analysis for practical feasibility. Journal of Water Process Engineering, 27, 185-192.	-	-
23.	Manish Yadav, Kusum Soni, Bhupendra Kumar Soni, Nitin Kumar Singh*, Babu Ram Bamniya	2019	Source Apportionment of particulate matter, gaseous pollutants, and volatile organic compounds in a future smart city of India	Yadav, M., Soni, K., Soni, B.K., Singh, N.K., Bamniya, B.R. 2019. Source Apportionment of particulate matter, gaseous pollutants, and volatile organic compounds in a future smart city of India. Urban Climate. 28, 100470.	-	-

List of Non-SCI publications						
1.	Manish Yadav, Nitin Kumar Singh, Richa Sinha, Sanjay Mathur, Akhilendra Bhushan Gupta	2015	Performance Evaluation of Community Level Defluoridation Plants: A Case Study from Nagaur and Jodhpur, Rajasthan	Yadav, M., Singh, N. K., Sinha, R., Mathur, S. & Gupta, A. B. 2015. Performance Evaluation of Community Level Defluoridation Plants: A Case Study from Nagaur and Jodhpur, Rajasthan. Nature Environment and Pollution Technology 14, 83-88.	1.621 (ISI)	2
2.	Gita Saini, Shalini Pant, Tanveer Alam, Absar Ahmad Kazmi, Nitin Sharma, Nitin Kumar Singh	2015	Removal efficiency of endocrine disrupting chemicals through chemical coagulation using two different coagulants: AlCl3 and Al2(SO4)3	Saini, G., Pant, S., Alam, T., Kazmi, A. A., Sharma, N. & Singh, N. K. 2015. Removal efficiency of endocrine disrupting chemicals through chemical coagulation using two different coagulants: $AlCl_3$ and $Al_2(SO4)_3$. Journal of Applicable Chemistry 4, 136-143.	1.612 (ISI)	0
3.	Pankaj Banyal, Nitin Kumar Singh, Absar Ahmad Kazmi	2015	Assessment of Decentralized Wastewater Treatment Systems for Sanitation of Small Communities using A Qualitative Approach Methodology: A Case Study from Northern India	Banyal, P., Singh, N. K., Kazmi, A. A. 2015. Assessment of Decentralized Wastewater Treatment Systems for Sanitation of Small Communities using A Qualitative Approach Methodology: A Case Study from Northern India. International Journal of Engineering and Advanced Technology 4, 32-39.	3.84	3
4.	Nitin Kumar Singh, Siddhartha Pandey	2016	Seasonal Assessment of Wastewater Characteristics in Hilly Tourist	Singh, N. K. & Pandey, S. 2016. Seasonal Assessment of Wastewater Characteristics in Hilly	1.621 (ISI)	0

			Place and its Implication in Selection and Design of Wastewater Treatment Alternatives	Tourist Place and its Implication in Selection and Design of Wastewater Treatment Alternatives. Nature Environment and Pollution Technology 15, 673-678.		
5.	Nitin Kumar Singh, Absar Ahmad Kazmi	2016	Techno-economic assessment of MBBRs treating municipal wastewater followed by different supplemental treatment strategies	Singh, N. K. & Kazmi, A. A. 2016. Techno-economic assessment of MBBRs treating municipal wastewater followed by different supplemental treatment strategies. Journal of Indian Water Works Association 2, 89-93.	0	2

Conferences/Symposium/Workshops/Book chapters

S. No.	Title	Type	Place and Date	List of Authors	Conference
Papers (Oral and Poster) published in conference proceedings as Supervisor					
1	Municipal wastewater treatment using Integrated Fixed-Film Activated Sludge (IFAS) technology: Recent progress and future direction elsewhere worldwide	Poster	The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India (10-12 December, 2018)	Rhythm Niranjani, Upasana Jadeja, Nitin Kumar Singh*	The 6th IWA Regional Membrane Technology Conference (IWA-RMTC2018)
2	Performance assessment of drinking water treatment systems: A comparative account of two different membrane material/configuration based and field scale RO plants	Oral	The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India (10-12 December, 2018)	Mohil Dhuliya, Denil Vachhani, Harshil Patel, Nitin Kumar Singh*	The 6th IWA Regional Membrane Technology Conference (IWA-RMTC2018)
Papers (Oral and Poster) in conference proceedings as Presenting author					

1	Assessment of an Integrated Fixed-Film Activated Sludge Reactor Treating Sewage under Various Operational Conditions in India	**Oral**	Haifa, Israel; 14-18 October, 2018	Nitin Kumar Singh, Absar Ahmad Kazmi	15th Specialized Conference on Small Water and Wastewater Systems & 7th Specialized Conference on Resources Oriented Sanitation (IWA)
2	Performance and cost analysis of decentralized wastewater treatment plants: A case study from Northern India	**Oral**	Tezpur University, India; 23-24 June 2017	Nitin Kumar Singh, Absar Ahmad Kazmi	International Symposium on Sustainable Urban Environment (ISSUE 2017)
3	Lessons learned during start-up of Integrated Fixed-Film Activated Sludge (IFAS) reactor treating domestic wastewater	**Oral**	Institute of Environment and Water Resource Management Universiti Teknologi Malaysia, 21-23 March, 2015	Nitin Kumar Singh, Absar Ahmad Kazmi	2nd IWA Malaysia Young Water Professionals Conference 2015 (YWP15)
4	Techno-economic assessment of small scale wastewater treatment systems	**Poster**	Yashwantrao Chavan Academy of Development Administration Baner Road, Pune (M.S.), India; 21-23 April, 2016	Nitin Kumar Singh, Absar Ahmad Kazmi	International Conference on Innovations in Sustainable Water and Wastewater Treatment Systems (ISWATS)
5	A Pilot-Scale Study on the Performance of PVA-Gel Based Moving Bed Biofilm Reactor for Actual Sewage in India	**Poster**	JNU, New Delhi, India, 18-20 December 2013	Nitin Kumar Singh, Jasdeep Singh, Vipin Rose, A. A. Kazmi	The 1st International Forum on Asian Water Environment Technology (IFAWET)
Papers (Oral and Posters) in conference proceedings as co-author					

1	Environmental impact assessment of different operational scenario of package type IFAS reactor	**Oral**	UPE Study of Ecology and Economy of Rajasthan, University of Rajasthan, Jaipur; 16-18 February, 2017	Rana Pratap Singh, Nitin Kumar Singh, Dharmendra Yadav, Komal Jayaswal, Absar Ahmad Kazmi	International Conference on Environmental Impact on Biodiversity, Sustainability and Quality of Life
2	Environmental impact assessment of a package type IFAS Reactor treating municipal wastewater	**Oral**	SSN College of Engineering, Chennai-603110, Tamil Nadu; 23-24 February, 2017	Rana Pratap Singh, Nitin Kumar Singh, Komal Jayaswal, Absar Ahmad Kazmi	International Conference on Recent Advancements in Chemical, Environmental & Energy Engineering
3	Alleviation of toxic hexavalent chromium using indigenous novel aerobic bacteria isolated from contaminated sites of tannery industry	**Oral**	Bangkok, Thailand; 26-28 November, 2014	Siddhartha Pandey, V. Arutchelvan, K. R. Venkatesh, Nitin Kumar Singh	The 11th International Symposium on Southeast Asian Water Environment (SEAWE11)
4	Hexavalent Chromium Reduction By Novel Bacteria Isolated From Tannery Industry In Tamil Nadu, India	**Poster**	Kathmandu, Nepal, 26-30 October 2014	Siddhartha Pandey, Nitin Kumar Singh, V. Arutchelvan, Sudipta Sarkar	IWA Specialist Conference on Global Challenges for Sustainable Wastewater Treatment and Resource Recovery
5	Enhanced Biological Nitrogen Removal In PVA-Gel Based MBBR - A Novel Option To Save Dal Lake	**Poster**	Kathmandu, Nepal, 26-30 October 2014	Jasdeep Singh, K.M. Gani, Nitin Kumar Singh, Vipin Rose, A. A. Kazmi	IWA Specialist Conference on Global Challenges for Sustainable Wastewater Treatment and Resource Recovery
6	Context specific upscaling of a hybridized-submerged	**Oral**	November 23-25, 2017	David Pryce, David Armstrong,	ICSDC 2017: International Conference on

	aerated filter (HySAF) wastewater treatment system in developing countries			Lewis O'Brien, Nitin Singh, Absar A. Kazmi, Fayyaz. Memon	Sustainable Development in Civil Engineering; Jamshoro, Pakistan
Paper accepted and in Proceeding (but not presented); Other Events and Workshop attended					
1	Pilot scale experiment with an intermittently-aerated IFAS reactor treating municipal wastewater: process behaviour and performance	**Oral**	Indian Water Work's Association's Pune, India; 19-21 January, 2016	Nitin Kumar Singh, Absar Ahmad Kazmi	Smart Water Solutions For Smart Cities
2	A Pilot-Scale Study on Performance of PVA Gel Beads Based Moving Bed Biofilm Reactor for Domestic Sewage Treatment	**Poster**	Abu Dhabi, United Arab Emirates; 26-30 May, 2014	Nitin Kumar Singh, Jasdeep Singh, Vipin Rose, Absar Ahmad Kazmi	The 11th IWA Leading Edge Conference on Water and Wastewater Technologies
3	A Pilot-Scale Study on Integrated Fixed Film Activated Sludge Reactor for Municipal Wastewater Treatment	**Poster**	New Delhi, India; 20 November, 2014	Nitin Kumar Singh, Absar Ahmad Kazmi	Knowledge Expo, 2014
4	Supporting Consolidation, Replication and up-scaling of Sustainable Wastewater Treatment and Reuse Technologies for India	**Poster**	New Delhi, India; 20 November, 2014	Nitin Kumar Singh, Absar Ahmad Kazmi	Knowledge Expo, 2014
5	Workshop on Arsiron Nilogon	NA	10 September, 2017	-	Department of Chemical Sciences, Tezpur University
6	Arsenic in Drinking Water and it's Manifestations on Health	Workshop	27-28th November, 2017	Nitin Kumar Singh	Safe Water Centre for Healthy Assam in Collaboration with Arsenic Knowledge & Action Network and

					Fluoride Knowledge & Action Network, Nalbari (Assam)
7	Novel Sanitation Approaches and Emerging Trends in Wastewater Treatment System (NSA 2017)	Workshop	19-21 December, 2017	Nitin Kumar Singh	BITS Pilani, K K Birla Goa campus

Book Chapters

1. Yadav, M., Singh, N.K., Gautam, S. 2018. Commercial coal mining in India opened for private sector: A boon or inutile, pp. 105-115; Pollutants from Energy Sources, Characterization and Control (ISBN - 978-981-13-3281-4), Springer Publications. Energy, Environment, Sustainability series.

Awards and Achievements

- 1st prize in '***Summer Innovation Challenge***' under "***Student Start-up & Innovation Policy***" by ***Government of Gujarat*** (Honorable Chief Minister). The theme was wastewater purification and title of the proposed design was "**Design and study of a fixed-media based IFAS reactor for efficient removal of nitrogen, phosphorus, and emerging contaminants from municipal wastewater**".
- Awarded **BIOTHON (Hackathon of Biotech Solutions for State Problems)** project under the aegis of Gujarat State Biotechnology Mission, India for the research titled "***Design and development of a poly vinyl alcohol (PVA) gel beads based moving bed biofilm reactor (MBBR) for sewage treatment: A sustainable and robust solution for future smart cities''*** under the theme '**Swachh Bharat'.**
- Awarded **BIOTHON (Hackathon of Biotech Solutions for State Problems)** project under the aegis of Gujarat State Biotechnology Mission, India for the research titled "***Design and Development of a Rotary Drum Composter: A Robust and Sustainable Solution for Municipal Waste Management''*** under the theme '**Swachh Bharat'.**
- **Certificate of Participation** in '***Summer Innovation Challenge***' under "***Student Start-up & Innovation Policy***" for the submitted proposal ***"Assessment of aquifer potential in Rajkot township area & Designing of a rainwater harvesting structure near ESE campus, Marwadi University, Rajkot."***

- Best Poster presentation award in IFAWET, 2013 at JNU, New Delhi
- Awarded GATE scholarship for M. Tech program at IIT Kharagpur
- Awarded MHRD scholarship for PhD program at IIT Roorkee
- Awarded Department of Science and Technology travel grant for attending a conference in Kuala Lumpur, Malaysia
- Won 2nd prize in "SRIJAN" in MECHFEST, 2005 at IET Lucknow
- Funded by DST, India for visiting England (UK) for discussion on small scale wastewater treatment systems developed by HYDROK, UK and development of WISDOM software with University of Exeter, UK.
- Awarded Zilla Swachh Bharat Prerak [ZSBP] fellowship funded by joint initiative of The Tata Trusts & The Ministry of Drinking Water & Sanitation, Government of India.
- Approved for partial funding from HYDROK, UK to present paper at International conference in France.
- Awarded Department of Science and Technology, India travel grant for attending a conference in Haifa, Israel.
- One PG student's team proposal selected in SIH 2019, Hardware edition.

Computer Skills

- MS office, excel and power point
- Origin Lab (Graphic software)
- SimaPro (Life cycle analysis software)
- SPSS (Statistics analysis software)

Special Skills

Adaptable to diverse working environment, Constructive writing skills, Optimistic approach towards problem solving, Goal oriented, Committed towards duties, Punctual and a good team leader.

Instrumental Skills

- Atomic absorption spectrophotometer
- TOC analyser
- Gas chromatography and Mass Spectroscopy
- Ion chromatography

- Spectrophotometer
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Declaration

I hereby affirm that the above information is true to the best of my knowledge.

Place: Rajkot (Gujarat) (Nitin Kumar Singh)

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Efficacy analysis of a field scale IFAS reactor under different aeration strategies applied at high aeration rates: A statistical comparative analysis for practical feasibility

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IFAS reactor
Treatment efficacy
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ABSTRACT

In the present research study, a field-scale integrated fixed-film activated sludge reactor treating municipal wastewater was examined under three cyclic aeration on/off periods (also known as intermittent aeration), applied at a aeration rate of 110 m^3/h (capable to maintain bulk dissolved oxygen in the range of 4.5–5.0 mg/L). The whole experimental campaign was divided into four operational phases (continuous aeration followed by three aeration on/off cycles, expressed in terms of ratio of aeration on/off time, Period I: 150/30 min, Period II: 120/60 min, Period III: 90/60 min). Each experimental run was studied at a hydraulic retention time of 11.1 h and mixed liquor suspended solids concentrations as 2 ± 0.2 g/L. The treatment performance results showed that high rate assisted in achieving the desired performance under applied intermittent aeration conditions. Except nitrogen removal, other performance parameters such as chemical oxygen demand, biological oxygen demand, total suspended solids, ammonia nitrogen, and phosphorus were found to be least affected by on/off control applied in Period I and could cope up with Indian discharge standards. Whereas, Period II and III were not found to be appropriate with respect to desired performance. With respect to nutrient parameters, nitrogen and phosphorus removal rates were significantly deteriorated with increasing aeration off times. A statistical comparison of different operational phases, using analysis of variance and Turkey Post Hoc test, was also done to check the similarity/dissimilarity of applied strategies. The results revealed that period I and continuous aeration phase were quite similar in terms of all performance parameters.

1. Introduction

Rapid urbanization, growing energy needs, and stringent discharge standards in developing countries have led to the development of more robust as well as resilient wastewater treatment [1]. Various biological systems based on different configurations (combination of anaerobic, aerobic and anoxic zones) are already implemented across the world [2]. Among these, aerobic treatment systems are becoming more prevalent now a days due to their remarkable efficacy and robustness [3]. However, some operational and maintenance needs, such as energy requirement, poses major barriers in the application of these systems [4]. As on date, various operational strategies have been practiced to make the biological treatment systems more sustainable and operationally viable. Intermittent aeration (IA) is one of successfully adopted strategies which has been received comprehensive attention in low as well as high income countries [5,2]. In spite of field applications of IA strategy, most of systems are not able to meet the requirements of local and national environmental regulatory bodies. There are many reasons, which included consistent efficiency and system potential utilization. One of the important aspect of intermittent aeration is maintaining trade-off between energy reduction and treatment efficiency achieved. Besides, limitations of operational resources particularly in developing countries and simultaneous stringiness of discharge standards has also led to the search of the more robust and resilience treatment systems.

Since last two decades research on integrated fixed-film activated sludge systems has been geared up all over the world and it has become attractive option for municipal as well as industrial wastewaters

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Effect of intermittent aeration cycles on EPS production and sludge characteristics in a field scale IFAS reactor

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IFAS
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Extracellular polymeric substances
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ABSTRACT

In the present study, an integrated fixed-film activated sludge (IFAS) bioreactor was subjected to dissimilar intermittent aeration (IA) cyclic operations, and its effects were investigated on extracellular polymeric substances (EPS) production, sludge characteristics, and specific power consumption. A total of three IA cycles (IA1, 150 min aeration on and 30 min off; IA2, 120 min aeration on and 60 min off; IA3, 90 min aeration on and 60 min off) were evaluated in the present IFAS reactor. Specific EPS production (mg/g of suspended solids) was found to be following the increasing trend with respect to the non-aeration to aeration time ratio, whereas, the sludge production followed the reverse trend. The amount of bound EPS was observed to be much higher (6–10 times) than soluble microbial product (SMP) in each intermittent aeration phase. During all the investigated IA cycles, the pilot was observed to be significantly affected in terms of biomass characteristics, which was also confirmed by increasing trends of sludge volume index (SVI) and filamentous index (FI) values. In-situ monitoring and measurement of reactor operation parameters such as pH, oxidation reduction potential (ORP), and dissolved oxygen (DO) was also done in all IA cycles. A maximum of 27.05% reduction in electrical energy was observed in highest non-aeration period cycle.

1. Introduction

All the biological wastewater treatment systems (suspended and/or attached) produce a complex mixtures of high-molecular-weight substances i.e. polymers secreted by microorganisms, produced from cell disintegration, and adsorbed substrate from wastewaters [1], which are known as extracellular polymeric substances (EPS). These materials play a consequential role in enhanced settling of biomass, and helps them to form the microbial clusters in a wastewater treatment system. The prime components of EPS mixture include macromolecules such as carbohydrates and proteins, which exerts influence on bio-chemical characteristics of microbial consortium [2]. Furthermore, the two forms of EPS exist at outer surface of microbial cells which can be categorized as bound EPS and soluble EPS [3,4]. As the classification term implies, the bound EPS are closely attached with microbial cells, whereas soluble EPS are those compounds which are either loosely bound with cells or dissolved into the mother solutions [5]. In spite of significant research on EPS, many other factors play important role which could influence the composition and production rate of EPS in environmental systems. This quantitative as well as qualitative variation in constituents of the extracted EPS may be attributed to various factors such as type of wastewater, biomass conditions, operational parameters, bioreactor type, and extraction method etc. [3]. Among the various important operational parameters of bioreactors, solid retention time, shear rate or aeration intensity, and aerobic or anaerobic conditions were found to be affecting the EPS production and composition as well. However, the results published in literature are slightly contradictory as some reported increasing trend while others observed the decreasing trend of EPS production with similar change in operating conditions [5,6–9]. To date, although ample amount of literature is published about EPS quantification methods but more studies are required to investigate their roles in the biological wastewater treatment systems under different operational conditions. Therefore, to gain confidence about the fate of EPS it is important to conduct more studies under stressed conditions to investigate the behaviour of biomass with respect to EPS production.

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Performance and Cost Analysis of Decentralized Wastewater Treatment Plants in Northern India: Case Study

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Abstract: In this study, a techno-economic analysis of 16 decentralized wastewater treatment plants (WWTPs) based on various technologies was performed in northern India. Six elements including treatment performance, land use, capital investment, operation and maintenance, cost of treatment, and electricity consumption are discussed in this study. The technologies assessed are extended aeration (EA), moving bed bioreactor (MBBR), sequential bioreactor (SBR), rotating biological contactor (RBC), on-site package (aerobic and/or anaerobic), and membrane bioreactor (MBR). The results indicate that the treatment efficiencies of all cluster-type WWTPs differed significantly from on-site anaerobic package (AnP) types. On the other hand, the treatment efficiencies of on-site aerobic package (AP) systems were reasonably comparable to those of cluster-type plants. The land use for on-site package treatment systems was estimated between 0.125 and 0.8 m^2 per population equivalent (pe) and higher than for cluster-type WWTPs, which require between 0.039 and 0.159 m^2/pe. The data collected from this study show that package plant treatment costs are high compared with those of cluster types, ranging from US$0.0676 to 0.1045 ($\pm$10%) and from US$0.0353 to 0.1891/m^3 ($\pm$15−20%), respectively. Cost-benefit analysis (CBA) was undertaken for all the WWTPs and among the considered environmental benefits nitrogen removal contributed to the most. Moreover, the operation of WWTPs was found to be economically viable even without the sale of treated water, except for one AnP plant. For all plants evaluated, specific power consumption (SPC) was found to vary between 0 and 1 kW/m^3. **DOI: 10.1061/(ASCE)WR.1943-5452.0000886.**

Author keywords: Cost-benefit analysis; Performance evaluation; Wastewater treatment; Cost utilization; Energy consumption; India.

Introduction

For the last three decades, developing countries, especially in Asia, have faced many challenges in wastewater management (Diaz and Barkdoll 2006). One of the biggest is financial constraints in establishing treatment systems. The cost of wastewater treatment plants (WWTPs) has brought economic pressure on environmental engineers and policy makers to design cost-effective and environmentally sound treatment systems to control water pollution (Tecle et al. 1988; Shabman and Stephenson 2000; Tsagarakis et al. 2003; Sato et al. 2007; Rousseau et al. 2008; Mburu et al. 2013). In the past, treatment system selection was mostly biased toward treatment performance, but in practice, the long-term viability of a system depends on the capital investment and operation and maintenance (O&M) costs. Furthermore, the limitations of treatment objectives such as effluent quality and usable byproducts, and available resources including land availability, investment costs, operational costs, and energy requirement also increase the complexity of the problem (Poch et al. 2004; Flores-Alsina et al. 2010).

In the last two decades, decentralized WWTPs have been reported to be more appropriate and cost-effective than centralized systems, especially for small communities (Butler and MacCormick 1996; Wilderer and Shereff 2000; Paraskevas et al. 2002; Massoud et al. 2009; Woods et al. 2012; Wong et al. 2016; Allison and Kaminsky 2016). Several wastewater treatment technologies are available but choosing an appropriate one is still very challenging, especially when the selection is more biased toward resource availability and local conditions (Brown 1991; Paraskevas et al. 2002; Engin and Demir 2006; Libralato et al. 2012; Mburu et al. 2013; Singh et al. 2015). Although all technologies have benefits and drawbacks, a timely integrated assessment is needed with respect to local conditions (Wicklein 1998; Kalbar et al. 2012). The lack of performance and/or cost utilization data in developing countries can also lead to selection of inappropriate systems in relation to local conditions and/or financial, social, or cultural acceptability (Poch et al. 2004; Hamouda et al. 2009; Flores-Alsina et al. 2010; Moller et al. 2012; Molinos-Senante et al. 2012, 2014). Because of this, selection of an appropriate wastewater system enabling sustainable development presents a challenge to national, regional, and local design agencies. Selecting an appropriate wastewater treatment technology according to a set of resources and constraints in developing countries such as India is an earnest need of the hour. Despite this fact, it has received less attention than environmentally or technologically focused assessments. On the other side, various researchers have assessed techno-economic efficiency of WWTPs in developed countries (Hernández-Sancho et al. 2010, 2011; Sala-Garrido et al. 2012; Molinos-Senante et al. 2014; Guerrini et al. 2015). India, being a developing country, has closely followed most of the advances in wastewater technologies of developed countries. However, the implementation of these technologies at full scale is largely influenced by the availability of resources and local conditions of developing countries. Besides, in an era in which technological developments are taking place at a high pace, there is a

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Treatment performance and microbial diversity under dissolved oxygen stress conditions: Insights from a single stage IFAS reactor treating municipal wastewater

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ABSTRACT

In the present study, assessment of a single stage integrated fixed film activated sludge (IFAS) reactor treating municipal wastewater and subjected to various dissolved oxygen (DO) stresses, is done in terms of treatment performance and changes in bio-chemical characteristics of activated sludge. Results obtained from experimental revealed that the DO concentrations of 0.5, 2.5, and 4.5 mgL^{-1} affected significantly the performance of IFAS reactor. The optimal DO concentrations for the efficient removals of organics, nitrification, denitrification, and total nitrogen were recorded as 4.5, 4.5, 2.5, and 2.5 mgL^{-1}, respectively. Biological phosphorus removal (BPR) efficiency of pilot deteriorated significantly at high DO (4.5 mgL^{-1}) levels. Insignificant variation in SVI values (190–245 mLg^{-1}) was observed at different DO phase experiments. The macromolecular composition) of activated sludge was also determined in terms of lipids, proteins and polysaccharides content. Moreover, activated sludge characterization results revealed that the dominance of micro fauna (ciliated protozoa) and microorganisms (gram characteristics) was different at different DO levels. Overall, the optimal DO concentration was suggested as 4.5 mgL^{-1} for the IFAS system as it not only achieved high organics removal efficiency and but also minimized the sludge production with high sludge retention time.

1. Introduction

In the last 20 years, activated sludge/biofilm hybrid system, also called integrated fixed film activated sludge (IFAS) reactor have been established as a simple-yet-robust, flexible and compact solution for municipal and industrial wastewater treatment. To date, various treatment configurations of IFAS technology such as aerobic, anoxic or anaerobic have also been documented in literature at lab, pilot and full scale levels [7,12,14,16,23–25]. Although IFAS technology based systems have shown their great potential in developed countries but its applications in developing countries are still in infantry phase either due to less practices or fear from using these technologies [1,5,6,19]. As reported by various researchers, the primary objective of IFAS systems, is to sustain under stresses conditions such as varying dissolved oxygen concentrations, flow, and organic loading rates [2,10,18]. Among the aforementioned stresses, dissolved oxygen (DO) concentration is an important operating parameter in aerobic biological treatment which determines the overall efficiency of oxidation, nitrification, denitrification, and nitrate accumulation treatment system. DO levels not only affects the removal efficiencies of pollution governing parameters, but also shows the impact on the characteristics of microbial communities [30,31,9,33,28,17].

As IFAS technology based processes involve a large amount of biomass, which require a requisite amount of DO levels in the aerobic zone, this system needs to be critically analyzed at low to moderate DO levels (0.5–4.5 mgL^{-1}). In literature, a range of 2–3 mgL^{-1} is generally suggested for IFAS systems but actual requirement must be governed by the removal of priority pollutants [21,22]. On the other side Hitherto, several lab scale IFAS systems have been investigated at low to high DO conditions in the aerobic zone to achieve the maximum capacity of the system, but it would not also be wrong to say that the results of lab scale studies are rarely applied to full scale systems. In general, literature data are contradictory and performance results are not for practical applications under low and high dissolved conditions. Finally, we hypothesize that microbial abundance and diversity are influenced by oxygen availability, which is key to understanding process resilience in future applications of IFAS system.

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A review on full-scale decentralized wastewater treatment systems: techno-economical approach

Nitin Kumar Singh, A. A. Kazmi and M. Starkl

ABSTRACT

As a solution to the shortcomings of centralized systems, over the last two decades large numbers of decentralized wastewater treatment plants of different technology types have been installed all over the world. This paper aims at deriving lessons learned from existing decentralized wastewater treatment plants that are relevant for smaller towns (and peri-urban areas) as well as rural communities in developing countries, such as India. Only full-scale implemented decentralized wastewater treatment systems are reviewed in terms of performance, land area requirement, capital cost, and operation and maintenance costs. The results are presented in tables comparing different technology types with respect to those parameters.

Key words | decentralized systems, performance indicators, small community, sustainability indicators, wastewater

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INTRODUCTION

Rapid growth in population, urbanization, industrialization, and demand of energy has drawn attention of many researchers towards the scarcity of clean water. Globally, billions of people are suffering due to inappropriate sanitation and wastewater treatment and unavailability of useable water. The situation is particularly grave in smaller towns (or peri-urban areas) and rural communities in developing countries. Worldwide, around 40% of the population lacks basic sanitation and 25% of the developing country urban dwellers lack access to sanitation services, with a much higher percentage for the rural populations of developing countries reaching up to 82% (Ho 2005; Massoud *et al.* 2009; Chong *et al.* 2012). The adverse effect of this situation on hygienic, environmental and ultimately social aspects is well documented (Abegglen & Siegrist 2006; Fach & Fuchs 2010).

Limited financial resources demand environmental engineers to design environmentally and economically sustainable wastewater treatment systems. From an economic perspective in particular, the differentiation in centralized and decentralized systems is of relevance. A definition of both types of system as well as an overview of their respective advantages and disadvantages can be found in Starkl *et al.* (2012). This paper focuses on decentralized wastewater treatment systems, which are often considered as more sustainable options as compared with centralized alternatives, in particular in small towns and peri-urban areas as well as rural communities in developing countries (Nanninga *et al.* 2012). Further, many centralized treatment plants have been found to be unable to cope with stringent environment legislation in developing countries (Schories 2008). Consequently, over the last decade many researchers have studied various decentralized options for wastewater management, for example, Beausejour & Nguyen (2007), Galvao *et al.* (2005), Fane & Fane (2005), Starkl *et al.* (2007) and Meuler *et al.* (2008). Some of the typical advantages attributed to decentralized systems are that they can be installed without requiring a huge budget especially at isolated locations or that they save money otherwise required for a sewerage network and increase the possibility of reuse of treated water without extra expenditure required for the water supply network (Massoud *et al.* 2009; Wang 2014).

The objective of this paper is to summarize the information available in literature on full-scale decentralized wastewater treatment plants worldwide. The review will help in identifying current knowledge gaps with respect to decentralized wastewater management.

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