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# Ningbo Fecal Sludge Harmless Treatment and Resource Utilization Project

Region	Asia and the Pacific
Award Scheme	Dubai International Award
Start Year	2017
Sustainable Development Goals	Goal 11 - Make cities and human settlements inclusive, safe, resilient and sustainable

## Summary

Ningbo, rich in accumulated humanities, long history of culture, is known as the Town of Academician. Because of the superior geographical position, Ningbo is the original Oriental Port of Maritime Silk Road. With developed economy, livable environment, harmonious society, Ningbo has won "National Civilized City" for four times, and be named "Culture City of East Asia" in 2016.

## Background and Objective

Before 2006 the situation of fecal sludge collection system in Ningbo was not sound, with outdated facilities, low mechanization and poor collection efficiency. The fecal sludge treatment capacity is insufficient without deodorant facilities, advanced technology. The service scope of Ningbo Biochemical Treatment Plant was Haishu, Jiangdong and Yinzhou District, with 68,000 tons per year fecal capacity.

## Actions and Implementation

1. In order to improve the disposal efficiency of fecal sludge, we have upgraded the treatment line, adopted international advanced processing system and improved the technological level. The processing equipment mainly contains two fecal sludge (and those with oil) treatment lines, two kitchen waste processing line and one set of deodorization equipment; There are five units in the factory, including the preliminary treatment unit for fecal sludge, the preliminary treatment unit for kitchen waste, the flocculation dewatering unit, the ABR unit for anaerobic digestion and oxygen consumption, and the deodorization unit. In addition, there are two systems, namely residues transport and squeezing system and control system. The central control system (Automation) is adopted to manage the process, thus the project is operated automatically and the whole process is controlled. 2. In order to fulfill the resources utilization of the fecal residues, we refer to China's relevant national standards of "Disposal Methods of Sludge for Municipal Wastewater Treatment Plants - Mud for Landscaping" (GB/T 23486-2009) to identify the composition of fecal residues. After tested by the comprehensive professional testing institutions recognized by CNAS, we confirm that the treated residues could be used for amelioration of soil which would be used to plant cash crop, such as fruits and vegetable. 3. In order to prevent the disease spread, the odor diffusion and the environmental pollution, the entire process of collection, transportation and disposal of fecal sludge is fully sealed. In order to reduce the impact on the residents, according to the goal of building a garden type plant district, we will increase the airtight, deodorization equipment and plant lawn, shrubs, trees and so on. According to the goal of building "a garden type plant district", we have installed the airtight deodorization equipments and planted lawn, shrubs, trees and so on. By doing so, "Neighborhood Avoidance Effect" is eliminated. 4. In order to ensure the depth of research and application of the resources, Ningbo University and other research institutions and institutions has provide technical support for the project, Cixi vegetable base of Ningbo has carried out the practice of resources utilization of fecal residues. We have been working together with all stakeholders to build "production, study and research" base of fecal sludge treatment. What is particularly worth mentioning is that our factory has already been designated as "Zhejiang Province ecological civilization education base".

## Outcomes and Impacts

1. Lower operating costs. By improving the equipment to extend the life cycle of device, strengthening scientific management, and decreasing the operating costs, the fecal sludge treatment cost is currently only \$4.01/ton. Through the resources utilization of fecal residue, \$118.9 thousand could be saved per year compared with the previous disposal. 2. Diverse utilization of the fecal residues as a resources. In the vegetable base in Cixi of Ningbo, the practice of resources utilization of fecal residues shows that the soil organic matter layer of saline-alkali increased 10 centimeters after composting fecal sludge. And planting broccoli in the improved soil increased 2000kg/yield, one acre can increase revenue nearly \$1.3 thousand. Through the cooperation with organic fertilizer company, we have founded that organic fertilizer which is produced by secondary processing such as high temperature fermentation, drying filter



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ect.,can be applied directly to crops.The indicators of organic fertilizer is in accordance with China's national standards and is superior to the ordinary organic fertilizer. 3.Biochemical Treatment Plant of Ningbo was named "Zhejiang Province ecological civilization education base" by Environmental Protection Bureau of Zhejiang Province;was named "Publicity and Education Base for Environmental Sanitation" by Federation of Trade Unions of Ningbo and the Bureau of Administration and Law Enforcement.With the education on environment,the public consciousness of environmental sanitation has been enhanced,and the traditional impression (dirty, smelly, tiring)of fecal sludge industry is also changed,thus the social status of the sanitation workers has been effectively improved. 4.By implementing the education on ecological environment and promoting the activity of "Making Fecal Residues into Thousands of Families",we have persuaded many families to use the fecal residues for green plants and to share the gains of the resources utilization of the fecal residues.By strengthening the government investment,improving social concerns, and working together with all stakeholders,we have made the fecal sludge harmless and resourceful,and reached the goal of sustainable development of the environment.

## Gender and Social Inclusivity

1.The project of fecal sludge harmless treatment and resources utilization in Ningbo has accumulated a lot of experiences.This project has greatly improved the environment for the residents,with highly operational and replicable.Ningbo' exemplary role is obvious, more than 30 cities, such as Hangzhou,Wenzhou,Ma'anshan,Dongguan,are now learning from Ningbo. 2.Promote the activities of "Making Fecal Residues into Thousands of Families".The prospect of resources utilization of fecal residues is very bright.Ningbo biochemical treatment plant has conducted activities on the resources utilization of fecal residues,which includes using it for family green plants,deodorizing the fecal residues by suitable bacteria,packaging the fecal residues into small bags for citizens.These activities have become a good example of improving the human settlement environment in the city. 3.This project has good environmental and social benefits,and has attracted wide attention from both domestic and local media.More than 20 media including Zhejiang TV, Ningbo TV,People Daily Site,etc.,reported this project.Some of media,such as Ningbo Daily,Ningbo TV,deeply reported"Publicity and Education Base for Environmental Sanitation",and good publicity results have been achieved. 4.The "Publicity and Education Base for Environmental Sanitation"has become a "Golden Name Card" in Ningbo,which provides educational base for public citizens.More than 30,000 people have visited the base,including youngsters,civil servants,peer company workers ect.,

## Innovative Initiative

1. Ningbo Biochemical Treatment Plant actively has improved the process of fecal sludge harmless treatment and realized the stability and highly automation of fecal sludge treatment technology. The efficiency and processing capacity have also been enhanced obviously. Such progress is essential for the timely process of fecal sludge in public toilets, and thus the project has made positive contribution to residents and the environment of living. 2. Working together with universities and research institutions to explore the latest technology in the resources utilization of fecal residues. Demonstration and leading effects have realized in saving ecological resources and facilitating development of ecological agriculture. 3.The value of the fecal residues has been fully excavated, and they are not any more "garbage".They can also be utilized for the amelioration of saline-alkali soil in coastal areas, and thus they have high agricultural benefits. 4. By vigorously promoting the gains of the resources utilization of fecal residues,we have publicized the concept of "turning waste into treasure", and enhanced the public consciousness of environmental protection and responded to the concept of national green development.

## Resources devoted to delivery

No. Title Source Author Publication Title Volume Number Date Page Number 1 A Feasibility Study on the Application of Urban Scattered Human Feces as Fertilizer to Vegetable Cultivation publication Lu Wenzhou ,Qiao Yuxiang,YU Ning, Shi Ronghua,Wang Guangming Environmental science ISSN 0250-3301 Sep 15,2015 11 Edit 2 "Fecal sludge becomes a popular "online star" – Biochemical treatment plant: Due to limited production, we have to supply on quota and beg for pardon by citizens" newspaper Wang Lan ? Wang Peipei Ningbo Daily CN33-0003 May 12, 2017. A3 Edit 3 "Ningbo's decentralized fecal agricultural resource utilization demonstration project has been accepted, fecal sludge is expected to double the crop yield" newspaper Wang Lan?Wang Peipei Ningbo Daily CN33-0003 May 3, 2017. A5 Edit 4 "Ningbo's decentralized fecal utilization demonstration project has been accepted, citizens can take fecal sludge home free from charge" website Lu Jiaying?Wang Peipei Xinhua Zhejiang channel 1 May 2, 2017. 1 Edit 5 A story about "fecal sludge"!Ningbo is awarded with National Grand award for its Fecal sludge Treatment Technology newspaper Wang Peipei Ningbo Daily CN33-0003 Jan 14, 2016. 1 Edit 6 A Story about "fecal sludge"! Ningbo is Awarded with National Grand Award for its Fecal Sludge Treatment Technology website Wang Peipei Zhejiang channel 1 Jan 14,2016 1 Edit 7 Fecal Sludge Residues Enhance the Soil Fertility of Mud-flat Saline-Alkali Soil-The yield per mu of Broccolis Increases almost CNY9, 000 newspaper Zhang Dan, Fan Yiqi Ningbo Daily CN33-0003 December 10, 2012. A3 Edit 8 Witness: Welcome the 18th CPC National Congress, Study "get closer to grass-roots, turn style, change style" newspaper Zhang Liang ,Zhang Jin,Yan Qihua Modern Golden Paper CN33-0062 October 2, 2012. 1 Edit 9 The First Sanitation Publicity and Education Base is Open to the Public for Free newspaper Liu Bo?Lin Wei?Fan Yiqi Southeast Business Paper CN33-0091 October 9, 2012. A3 Edit 10 One farm owner from Ningbo Cixi used"fecal sludge"to modify the mud-flat saline-alkali soil website Zhang Dan, Fan Yiqi Zhejiang channel of people 1 Dec 10, 2012. 1



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## Conclusion

In the process of fecal sludge harmless treatment and resources utilization in Ningbo, City Management Bureau of Ningbo has issued the “Opinions of Septic-tank Management in Ningbo” ([2009]55). With practical works, Ningbo Biochemical Treatment Plant has made a series of policies and run operation management regulations. Moreover, in order to ensure the safety and stability of the factory, and also protect the workers’ personal safety during the process of work, Ningbo Biochemical Treatment Plant has formulated fire prevention, anti-virus, anti-electricity and other safety operated regulations and emergency guidances in details.