

RECP Experiences at Diosgein Industry (Jinchuan Fengxing)

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of Jinchuan Fengxing Chemical Co., Ltd. in China.

Achievements at a Glance

Resource Efficient and Cleaner Production (RECP) implemented at Jinchuan Fengxing Chemical Co., Ltd. led to annual savings and increasing benefits of around RMB 19,530,980 (USD 3,130,816) compared with the traditional production process, by investing RMB 100,000,000 (USD 16,130,000). The company also got a fund of RMB 10,000,000 (USD 1,613,000) from the local government.

Compared with the traditional production process, the company has significant reduction in acid use by more than 83%, water use by more than 90%. Thus they reduce 90% waste-water. The waste-water can be treated to meet the national discharge standard using a common wastewater treatment technology. Moreover, the company not only produces diosgein products, but also gains starch products after implementation of RECP measures.

Now, Jinchuan Fengxing Chemical Co., Ltd. becomes the biggest and advanced diosgenin producer in the world with 450 workers, which takes up about 20% of the total world market.



Note: new equipment installed at the plant

Overview

Jinchuan Fengxing Chemical Co., Ltd, managed by a male entrepreneur, was ever a small scale private family owned enterprise with an annual production capacity of 300 tons of diosgenin, and had about 100 workers in 2012. After the implementation of RECP measures, it becomes the biggest and the most advanced diosgenin producer in the world with 450 workers.

The main target of the RECP programme implemented at Jinchuan Fengxing Chemical Co., Ltd. was to achieve the reduction of acid consumption, waste-water generation and COD generation.

The implementation of RECP options allows the company to decrease waste of resources, and treat waste-water to meet the national discharge standard using a common waste-water treatment technology.

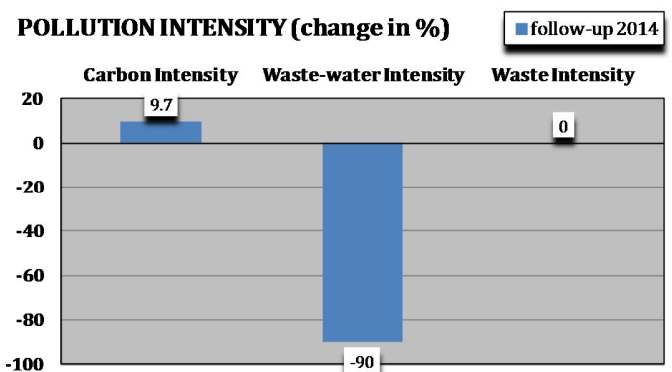
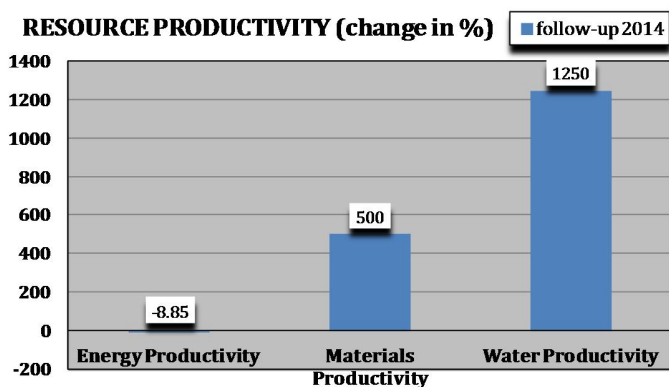
Benefits

The RECP programme was mainly focused on reducing waste-water generation, acid and COD in waste-water through improving the production process. These technique advances including separation and refinement of starch, reuse of acid and mechanical washing of acid hydrolysate. RECP not only enabled Jinchuan Fengxing Chemical Co., Ltd. to achieve savings from the decreased use of energy and resources, but also made it possible for the company to decrease their pollution and to act in a more responsible way. On the other hand, another product, starch was obtained after the RECP programme, making the economic benefit increase greatly.

Absolute Indicator	Change (%) Year 1	Relative Indicator	Change (%) Year 1
Resource Use		Resource Productivity	
Energy Use	9.7	Energy Productivity	-8.85
Materials Use	-83.33	Materials Productivity	500
Water Use	-92.59	Water Productivity	1250
Pollution Generated		Pollution Intensity	
Air emissions (global warming, CO ₂ equivalent)	9.7	Carbon Intensity	9.7
Waste-water	-90	Waste-water Intensity	-90
Waste	N/A	Waste Intensity	N/A
Production Output	700 t/a diosgenin, 8400 t/a starch		

Note: The *absolute indicators* provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The *relative indicators* provide a measurement of changes in resource use/pollution in relation to production output. *Resource productivity* provides a measurement of how much product output can be produced per unit of resource use, from a sustainability perspective, productivity should increase. *Pollution intensity* provides a measurement of how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.

RECP Profile



Note: The RECP profile provides a visual overview of resource productivity and pollution intensity shown as change in % compared to the baseline values. Environmental performance is improved when resource productivity increases and when pollution intensity decreases.

Resource Efficient and Cleaner Production (RECP)

Resource Efficient and Cleaner Production (RECP) entails the continuous application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment.

RECP addresses three sustainability dimensions individually and synergistically:

- Production efficiency

> Through improved productive use of natural resources by enterprises

- Environmental management

> Through minimization of the impact on nature by enterprises

Human development

> Through reduction of risks to people and communities from enterprises and supporting their development



Success Areas

The results were achieved through the implementation of the following measures:

- Reducing the generation of COD by separating starch prior to acid hydrolysis.
- Gaining starch products by separating and refining starch.
- Decreasing the use of acid by reusing acid.
- Reducing the use of water by applying multiple countercurrent washing steps.
- Realizing automated management.
- Improving production processes with the purpose of reducing losses.

TABLE 2: OPTIONS IMPLEMENTED

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Separation and refinement of starch 1. Reducing the generation of COD 2. Gaining starch products	645,200	2,032,380	N/A	14,700 tons of COD reduced
Concentration and reuse of acid 1. Reducing the consumption of acid 2. Reducing the residue acid in waste water	483,900	1,016,190	Reduction of acid consumption by 10,500 tons	10500 tons of acid in waste water reduced
Multiple countercurrent washing steps 1. Reducing the use of water	1,613,000	4,113,150	Reduction of water consumption by 2,520,000 m ³	2,520,000 m ³ waste water reduced

Approach taken

In China, the major producers of diosgenin are small-scale enterprises and discharge a great deal of wastewater. The waste-water with high acidity and high content of organic pollutants is difficult for treatment, and the treating cost is quite high. Therefore, the Discharge Standard of Water Pollutants for Sapogenin Industry (GB 20425-2006) is hardly met. It is worth noting that the diosgenin production distributes in the water resource of the middle line of the South-to-North Water Transfer Project, one of the largest trans-century projects in China. And the water of this area will go to Beijing. To protect the water resources, Chinese government has shut down the majority of diosgenin production factories.



RECP Experiences



Jinchuan Fengxing Chemical Co., Ltd. also used the traditional process to produce diosgenin, so it would be closed if not carrying out RECP transformation. In this context, the owner of the company pushed over the traditional production line, and wanted to establish a new CP line. Firstly, China National Cleaner Production Center (CNCPC) helped the company build a new production line with the RECP process (output 200t/a) in 2012. After that, the company saw the benefits of the implementation of RECP. So in 2013, a new RECP production line (output 700t/a) which had a higher RECP level was built with the help of CNCPC. At the same time, the company got the support of funds (supported by the Ministry of Environmental Protection (MEP), National Development and Reform Commission (NDRC), Ministry of Industry and Information Technology (MIIT)) to implement these improvements.

RECP programme has enabled the company to reduce the waste of starch, acid and water, harvest starch product, reduce waste water generation, and reduce acid and COD in waste water. The work at the company illustrates that a backward and heavy-polluting industry can survive to meet the strict environmental requirements and create a better future through a series of technical innovations.

Business case

Although the programme was mainly focused in reduce waste of materials and minimize generation of waste, an indirect positive consequence was also obtained, which has enabled the company to treat waste-water to meet the national discharge standard using a common wastewater treatment technology. RECP not only allows companies to achieve savings from decreased resource use and benefits from by-product, but also decreases pollution to the environment.

Testimony Box
China National Cleaner Production Centre (China NCPC)
The China National Cleaner Production Center (China NCPC) was established in December 1994, by the Ministry of Environmental Protection and today provides not only comprehensive support for CP activities in China, but also technical support for CP training and consulting in the Asia-Pacific region and other neighboring developing countries. In addition, the China NCPC also supports the Ministry of Environmental Protection (MEP), the National Development and Reform Commission (NDRC) and the Ministry of Industry and Information Technology (MIIT) in policy advice and promotion of CP in China.
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English Abstract (where applicable)
N/A

ABOUT RECP EXPERIENCES

Through the joint Resource Efficient and Cleaner Production (RECP) Programme, the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) cooperate to improve the resource productivity and environmental performance of businesses and other organizations in developing and transition countries. The Programme is implemented in partnership with the Global Network for Resource Efficient and Cleaner Production (RECPnet). This series of enterprise success stories documents the resource productivity, environmental and other benefits achieved by enterprises in developing and transition countries through the implementation of RECP methods and practices.

These successes were achieved with the assistance of the National Cleaner Production Centres, which are part of RECPnet established with support of the UNIDO and UNEP. The success stories employ the indicator set described in *Enterprise Level Indicators for Resource Productivity and Pollution Intensity*, UNIDO/UNEP, 2010. The primer with accompanying calculator tool and further case studies are available at www.recenet.org, as well as on www.unido.org/cp and www.unep.fr/scp/cp.