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RECP Experiences at Vale S.A. – Usina de Vargem Grande

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 Vale S.A. – Plant of Vargem Grande in Brazil.

Achievements at a Glance

The implementation of RECP in the company Vale SA, Vargem Grande Plant, generated several improvement actions where two initiatives are highlighted: the first is related to the effluents generation reduction with losses of raw materials and the second is related to reduce electricity consumption with lighting due to behavioral changes. These two actions have provided an annual cost savings of US $ 167,607.00 and demanded a total investment of US $ 4,582.00. The environmental benefits achieved covered the reduction of energy consumption, reduction of water consumption, reduction in the generation of effluent and reduction of ore fine's losses.

Overview

Vale is the world's leading producer of iron ore and pellets, and second largest nickel producer. Operating through offices, operations, holdings and joint ventures, it is the second largest diversified mining company in the world and the largest in the Americas by market value. Headquartered in Brazil, operates in 38 countries on five continents and employs more than 115,000 people, including employees and contractors, worldwide.

The Plant of Vargem Grande Mine, founded in 2001, is one of the iron ore processing plant of Vale and has 300 employees. All processing of the plant is carried out wet, being generated, on average, 17.6 Mt of products annually, including pellets Lump Ore and Hematitinha, Sinter Feed and Pellet Feed Fine, the latter supplies the pelletizing plant in flow continuous.

The processing of the products is accomplished by means of steps: feed, screen classification stacking, desliming, concentrate thickening, flotation, filtration, sludge thickening, and as auxiliary all maintenance.

Benefits

In the Vargem Grande plant the screening is performed wet and a major concern in the classification of products is the efficiency of this phase (separation quality that sieve provides). If the formed pulp is very dense, occurs clogging of the meshes which difficult classification and causing the over sized contamination. Before the implementation of RECP, the low efficiency of the washing product screening system hindered the screening performance, demanding large consumption of water and promoting the overflow of the washing tank. The focus of the RECP implementation was to map the gaps and look for ways to reduce losses from the tank overflow, as these are environmentally significant, had not yet been properly mapped, they provide cost reduction opportunities, allow the capture of measurable quantitative data and generate major negative visual impact.
Change driven: Item prioritized in the inventory of waste and effluents of the Vargem Grande plant due to high volume of sludge (water + ore) generated in the screening step being sent to the dam.

Figure 1: Before Cleaner Production: Large volume of sludge being sent to the barrage of Vargem Grande

Picture after cleaner production is not avaible

Another check performed in the implementation of RECP was the percentage of lamps lit during the daytime operation of some areas in the Vargem Grande Plant. Except for the areas of transporters and compressors, where there isn't natural lighting and lamps sectors must remain constantly connected, other locations may optimize the lighting use. With a behavioral change, using the lighting system only when necessary, there will be a reduction of about 40% of the time of use, practically doubling the life of the lamp and reducing consumption. This change was motivated by the easy implementation, with immediate returns.

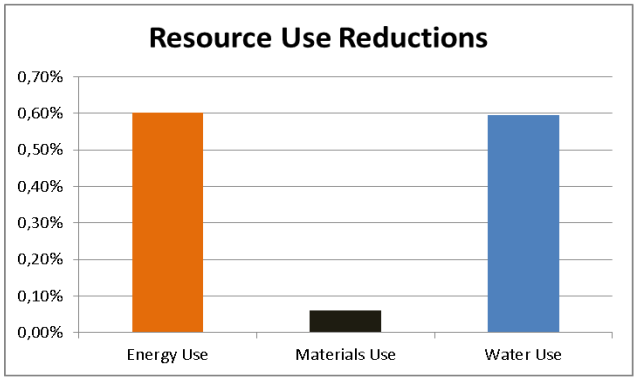
Figure 2: Before Cleaner Production: lamps lighted during the daytime period

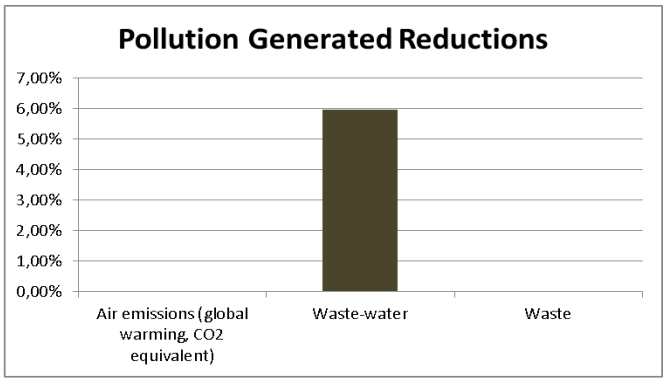
Figure 3: After Cleaner Production: With a behavioral change, it uses the illumination system only when necessary

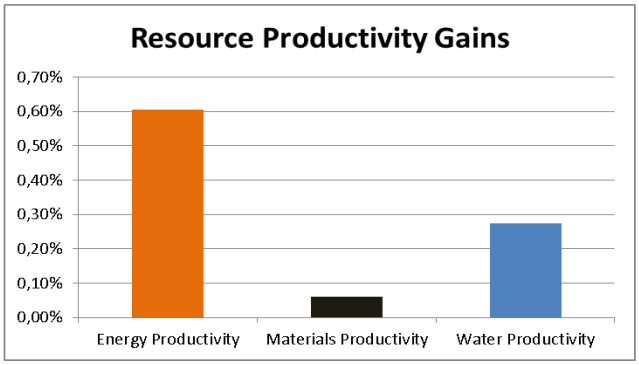
Absolute Indicator	Change (%) Year 1	Relative Indicator	Change (%) Year 1
Resource Use		**Resource Productivity**	
Energy Use	-0,602%	Energy Productivity	0,61%
Materials Use	-0,06%	Materials Productivity	0,06%
Water Use	-0,596%	Water Productivity	0,27%
Pollution Generated		**Pollution Intensity**	
Air emissions (global warming, CO_2 equivalent)	N/A	Carbon Intensity	N/A
Waste-water	-5,98%	Waste-water Intensity	-5,98%
Waste	N/A	Waste Intensity	N/A
Production Output	N/A		

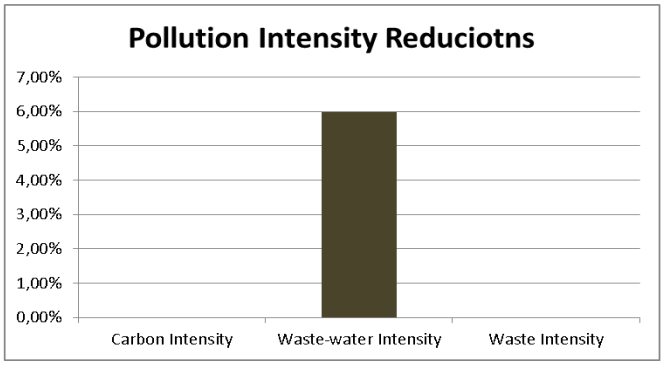
Note: The absolute indicators provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The relative indicators provide 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









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 set of actions taken to improve the indicator index that measures the amount of water used to make the ore washing in the sieves were:

- Maintenance and/or replacement of the nozzles of the water sprays of screens to increase the pressure and cleaning efficiency

- To analyze the mechanical condition of bombs aimed at maximizing water pressure in the supply line of water of screens and pumping the reuse dam water

- Install pressure monitors in the lines

- Standardize operating conditions, to work in an ideal pressure.

The set of actions taken to improve the index of unnecessarily lighted lamps included:

- Visual examination of the need for illumination of sites

- Practice of weekly audits to quantify the number of lit lamps

- Switch off the lighting in the daytime hours.

- Awareness to behavioral change

- Preparation of procedure guiding for switching on / off the lamps.

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)
Replacing of the nozzles of water sprays of screens and Installation of pressure monitors lines	US$ 4.582,00	US$ 143.200,00	Reduction in energy consumption 135,351.00 kWh Reduction in water consumption 30,000.00 m³ Reduction in ore fine's losses 12,300.00 t	Reduction in effluent generation 300.782,00 m³
Behavioral change, using the lighting system only when needed	0	US$ 24.407,00	Reduction in energy consumption 280.429,19 kWh	

Approach taken

From the design of flow charts and analysis of inputs and outputs of the phases of the plant's processes, areas were identified most likely to implement RECP actions, leading to identification of the most important focus for the case studies. One of the focus identified as RECP potential was screening step consisting in size classification or separation of a material into two or more particle size fractions through a perforated surface. Another focus of research was related to lighting, due to the number of lamps lit during the daytime operation in some sites of Vargem Grande Plant, this fact was identified as a potential application of the RECP method. It was identified that the lighting systems were turned on 24 hours a day, resulting in a waste of energy and reduced lamp life.

Testimony Box
National Cleaner Production Centre (NCPC)
The SENAI National Cleaner Technologies Centre was created in July 1995, upon the accepted candidature of SENAI Rio Grande do Sul to nest the National Cleaner Production Centre of Brazil, through a UNIDO/UNEP call for candidate institutions to establish a NCPC in developing countries. CNTL was the 10th NCPC implanted in the world and the 1st in Latin America. Since 2002, we are the national focal point for Cleaner Production matters by appointment of the Brazilian Government to UNIDO/UNEP. SENAI CNTL integrates the network of Units of SENAI-RS, a branch of SENAI (National Service of Industrial Education), a nationwide institution with a tradition of 62 years of professional education and services for industries. CNTL responds for the technical coordination of the Cleaner Production Network of CNI (the National Confederation of the Industry).
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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 (RECP*net*). 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 RECP*net* 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.recpnet.org, as well as on www.unido.org/cp and www.unep.fr/scp/cp.