

Data and Trends

**Environmental Protection
and Safety**

2016



EMS-GRIVORY
EMS-GRILTECH
EMS-SERVICES

Data and Trends 2016

EMS works sustainably and responsibly. Protection of people and the environment during production and distribution of our high-quality products is a primary concern of the companies in the EMS Group.

With the annual publication of "Data and Trends", we report on current developments and measures in the field of environmental protection and safety and take the opportunity to comment on significant changes and developments. The data refers to the business units EMS-GRIVORY, EMS-GRILTECH and EMS-SERVICES. These companies employ nearly 1000 workers at the production site at Domat/Ems. The graphs show the specific quantities which are used or produced in each case during the manufacture of one ton of finished product. These ratio figures are independent of annual fluctuations in quantities manufactured and allow a volume-independent comparison to be made over a period of several years.

The continuity and sustainability of the measures can be seen particularly clearly in a comparison with the first key index figures published in 2001:

Key index figures		2001	2016	Δ (2001->2016)
E+S investment share	[%]	4.7	15.1	+ 321 %
E+S outlay	[CHF/t product]	112.9	78.5	- 30 %
Energy consumption	[MWh/t product]	3.5	2.0	- 43 %
Waste quantity	[kg waste/t product]	26	25.5	- 2 %
Waste water load	[kg TOC/t product]	0.7	0.3	- 57 %
Emission factor	[kg/t product]	270.9	41.2	- 85 %*
Accidents with working hours lost	[pro 1000 workers]	50	25	- 50 %

* reduction in CO2 due to conversion to steam generation from wood firing in 2007

The progress achieved does not mean that we can rest on our laurels; it forms the basis and motivation for future improvements.

Our goal is and remains continual improvement in all areas.

This is what we work towards – every day!

Dr. Joachim Maigut

Head Environmental Protection and Safety



Investment

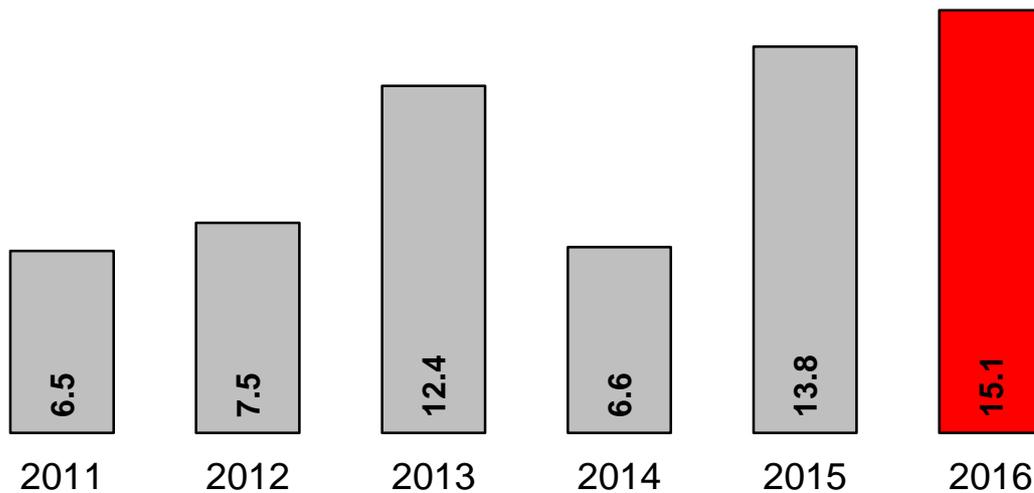
New record year 2016

Investment in environmental protection and safety in 2016 exceeded the record levels of 2015 and lies far above the average of the last years.

Emphasis in 2016 was on improving safety levels during unloading, storage and transport of raw materials in powder form.

Other focus points were improvement of air quality in various production units through more efficient ventilation, cleaning of exhaust air and optimized fresh air intake.

Share of investment for environmental protection and safety (E+S) in % of all investments



Operating expenses

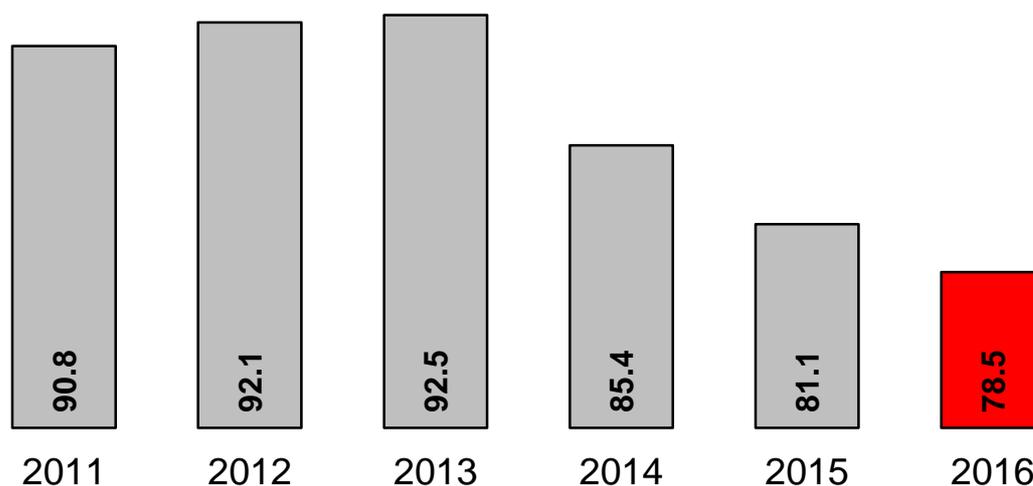
A further increase in efficiency – lowest operating costs ever

Outlay for environmental protection consists primarily of operating costs for waste water and exhaust air cleaning systems as well as the cost of waste management. Operating costs in the field of safety are generated mainly by measures implemented to ensure protection of health, fire prevention, site security and working safety.

In 2016 further cost savings were achieved above all in treatment of waste water and cleaning of exhaust air. Other costs were maintained at the same levels as the previous year although requirements became more stringent in practically all areas.

The share of E+S costs per ton of product sold sank by a further -3% compared to the previous year to reach the lowest value since start of monitoring in 2001. At that time, costs for E+S outlay were recorded as 112.9 CHF/t product.

E+S outlay CHF/t product



Resources

Energy efficiency higher than ever before – 40% share of renewable energy

Consumption of electricity at the production site has dropped continually for years and reached a new lowest level in 2016.

On average in 2016, EMS required 2.0 MWh of energy for each ton of finished product. This corresponds to a reduction of -43% compared to the first year that values were monitored (2001).

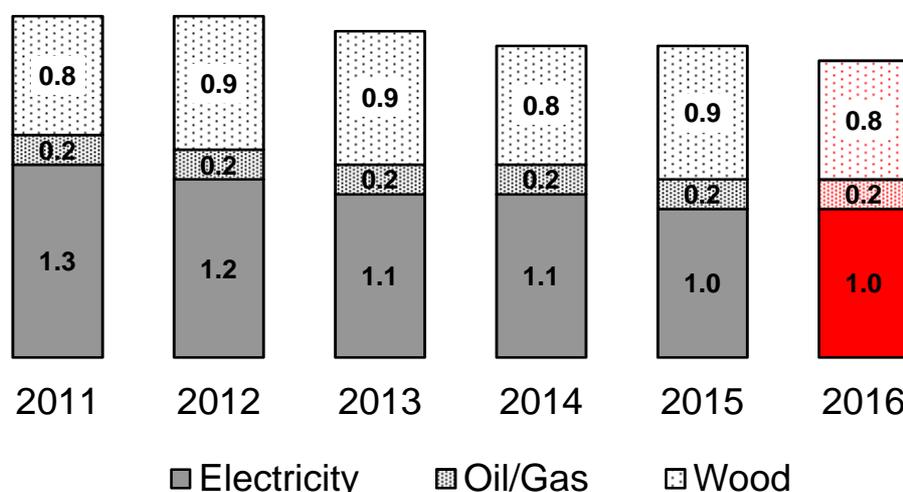
EMS continually searches for further optimisation possibilities and identification of additional potential for cost savings.

Main activities are focused on:

- saving of electricity (above all, drive systems, process heating and lighting)
- limitation of heat loss and reduction of energy required for heating (steam)

Lighting systems indoors and outdoors at the production site have been converted extensively to energy-saving LED technology. The longer operating life of these lighting systems has allowed a significant drop to be achieved in replacement investments and time-consuming changing of lightbulbs. In addition, the LED lights contain no mercury and can be disposed of safely.

Energy consumption in MWh/t product



Manufacturing waste

More waste than last year – 32% recycling share

The comprehensive construction activity and start-up of new production lines caused a temporary increase in waste quantities in 2016.

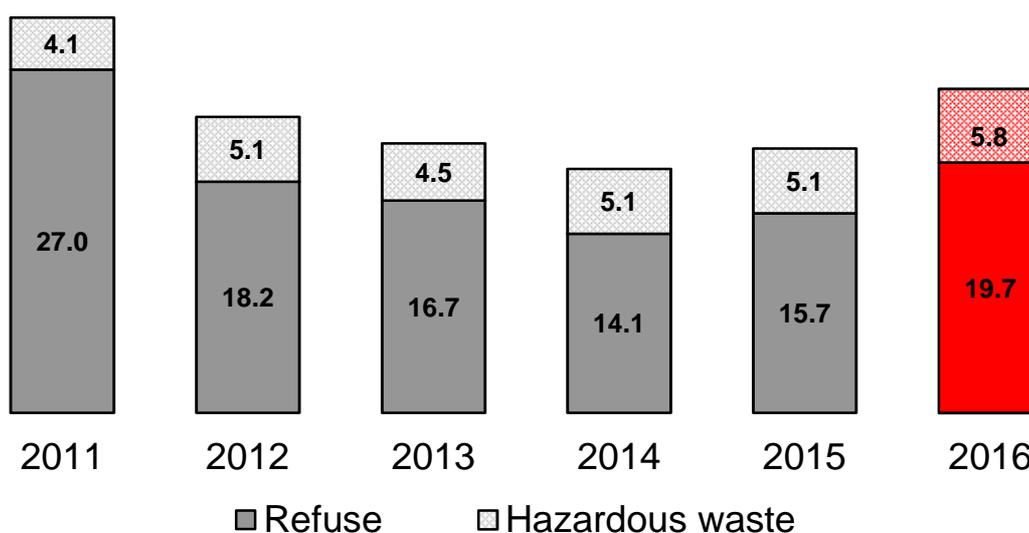
A total of 1526 tons of recyclable materials such as metal, glass, wood, paper and packing materials were separated from the waste for recycling. This is an increase of +11 % compared to 2015 (1374 tons).

This means that the recycling rate is very high: 32% of all waste materials were recycled in 2016.

The major part of the remaining waste material is plastic waste which has a particularly high heating value and is used mainly for incineration purposes. As a secondary fuel, above all in energy-intensive plants in the cement industry, it replaces fossil fuels such as oil or gas. Only refuse with a lower heating value is disposed of together with household waste in an incinerator plant.

The amount of hazardous waste remained stable at the previous year's level. All hazardous waste is disposed of solely by authorized disposal companies and only at specialized facilities located in Switzerland.

kg refuse/t product



Waste water

Cleaning efficiency increased to 94%

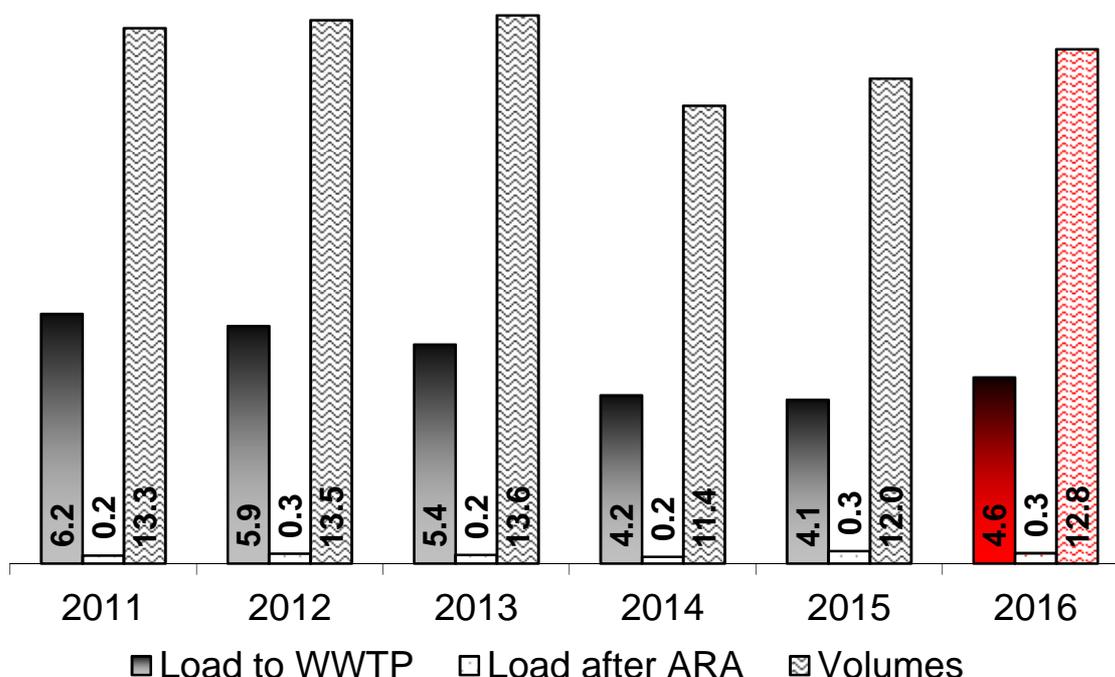
The graph shows the development of waste water volumes and waste water load before and after processing at the company's own treatment plant. As the water load is made up mainly of organic material, this is shown as TOC (total organic carbon).

In addition to processing our industrial waste water, the water treatment plant (WWTP) treats domestic waste water from the local towns of Rhäzüns, Bonaduz and Tamins

Due to the additional production capacity installed in 2016, the amount of waste water and organic waste arriving at the water treatment plant also increased. Various improvements in cleaning of the waste water have allowed us to achieve a +2% increase in cleaning efficiency. The cleaning efficiency reached an impressive 94% for all organic compounds in the waste water.

Sewage sludge resulting from the cleaning process is dried on site. This has made it possible to reduce the quantity of sludge to be transported to the drying plant at Chur by around 4200 tons – this corresponds to a saving of 190 truckloads each year!

Load in kg TOC/t product
Volumes in m³/t product



Air emissions

Volatile organic compounds reduced by -20% – new record!

In order to allow a comparison of the values, exhaust air emissions are given as an emission factor. These show which air emissions are released into the air per ton of product manufactured.

The following substance classes are relevant for EMS-CHEMIE AG:

- Ø Volatile Organic Compounds (VOC): Solvents or secondary products from the manufacturing processes for our performance polymers.
- Ø Dust: Mainly fine particles caused by abrasion during the manufacturing process of the granules and from solid raw materials.
- Ø Inorganic gases: Mainly nitrogen oxide generated during combustion of natural gas for heating purposes and from rail transport at the site.
- Ø CO₂: Released during combustion of natural gas or heating oil for heating purposes.

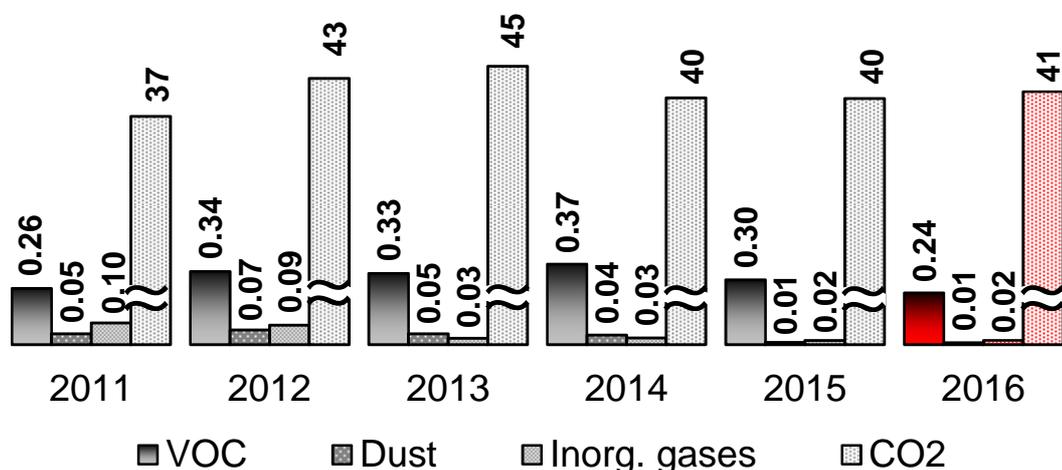
The evaluation shows that manufacturing-related emissions at the production site were reduced again in 2016.

Above all, emissions of highly volatile organic materials were greatly reduced.

Compared to 2015, VOC in exhaust air was again -20%. This is a new and absolute record low level.

EMS-CHEMIE AG has been committed to sustainable climate protection for many years. With voluntary participation in the project of the Swiss Energy Agency program (a collaboration platform between the Swiss government and Swiss industry), we commit ourselves to active reduction of CO₂-emissions and optimization of energy efficiency. The target agreement is recognized by Swiss federal and cantonal authorities and partners from industry.

Emission factor [kg/t product]



Health and safety

Further reduction of work-related accidents with working hours lost

The number of work-related accidents involving lost working hours per 1000 employees was reduced by 1 case compared to 2015. Minor accidents with no loss of working hours remained at the same level as in the previous year.

Like the minor accidents, accidents involving working hours lost were generally bagatelles with very short absence times.

The accidents occurred mainly during work outside of the actual production work processes such as work to resolve interruptions, cleaning, maintenance work or walking around. The most common cause for accidents was impact (banging or hitting) followed by tripping and falling.

The longest absence was caused by a fall from a climbing aid ("3-step"). To prevent this kind of accident, the prevention campaign "Safe Step Up" ran throughout the production site in 2017.



The safety audit system introduced in 2015 was also continued. This systematic approach records unsafe conditions and activities and makes it possible to recognize and resolve hazardous situations and activities before accidents occur.

Work-related accidents with loss of working hours / 1000 employees

