

Data and Trends

**Environmental Protection
and Safety**

2017



EMS-GRIVORY
EMS-GRILTECH
EMS-SERVICES

Data and Trends 2017

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.

In the annual publication "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 | 2017 | Δ (2001->2017) |
|-----------------------------------|----------------------|-------|------|--------------------------|
| E+S investment share | [%] | 4.7 | 9.0 | + 191 % |
| E+S outlay | [CHF/t product] | 112.9 | 72.8 | - 36 % |
| Energy consumption | [MWh/t product] | 3.5 | 2.0 | - 43 % |
| Waste quantity | [kg waste/t product] | 26.0 | 25.2 | - 3 % |
| Waste water load | [kg TOC/t product] | 0.7 | 0.2 | - 71 % |
| Emission factor | [kg/t product] | 270.9 | 44.4 | - 84 %* |
| Accidents with working hours lost | [pro 1'000 workers] | 50 | 23 | - 54 % |

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

Progress achieved is our incentive for future improvement.
Because 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



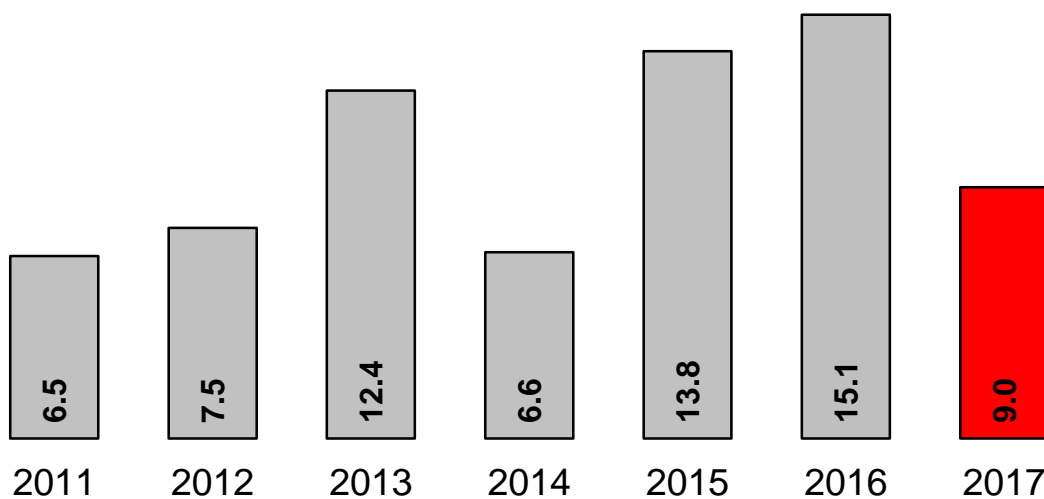
Investments

Investments 2017 - U+S share remains at a high level

Environmental protection and safety is of great importance to EMS. Correspondingly, significant investments were made again in 2017 in environmental measures and optimisation.

Focus was placed on finalisation of work in unloading, storage and transport of raw materials in powder form, modernisation and improvement of packaging and transport of finished products as well as in quality improvements in air quality at the workplace in various production lines through more efficient suction and optimised fresh-air intake.

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



Operating expenses

Further efficiency increases – lowest operating costs since start of monitoring

Outlay for environmental protection consists of operating costs for waste water and exhaust air cleaning systems as well as the cost of waste management.

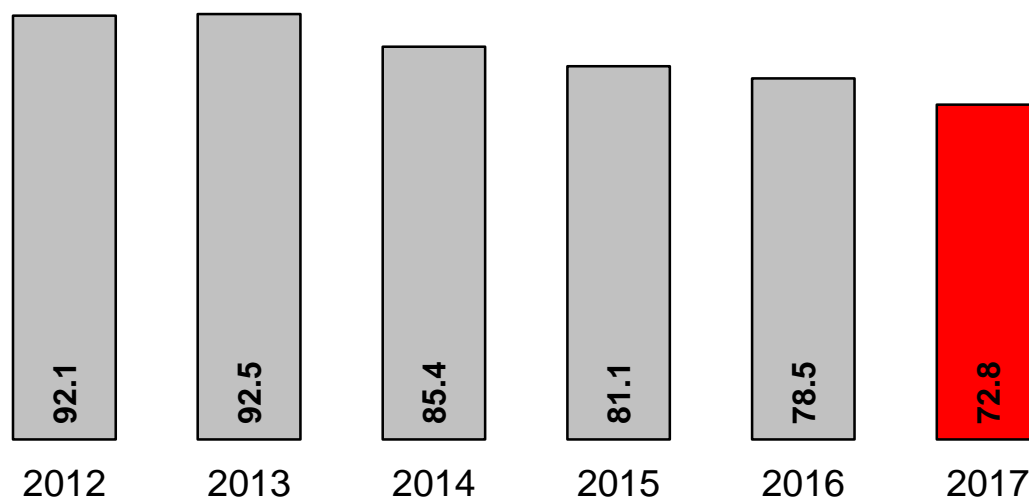
Operating costs in the field of safety are generated mainly by measures implemented to ensure protection of health, fire prevention, site security and working safety.

Through efficiency measures, further cost savings were achieved in 2017 in treatment of waste water and cleaning of exhaust air as well as in the range of protective agents offered.

Other costs were maintained at the same levels as the previous year although requirements became more stringent in practically all areas.

In 2017, the share of E+S costs per ton of product sold sank by a further -8% 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.

U+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. In 2017 it was 1.99 MWh/t which is nearly -3% below the previous year's figures of 2.05 MWh/t. This corresponds to a reduction of -43% of energy required pro ton of finished product compared to the first year when values were monitored in 2001.

In 2017, 40% of energy requirements were covered through use of wood – a climate-neutral and renewable raw material.

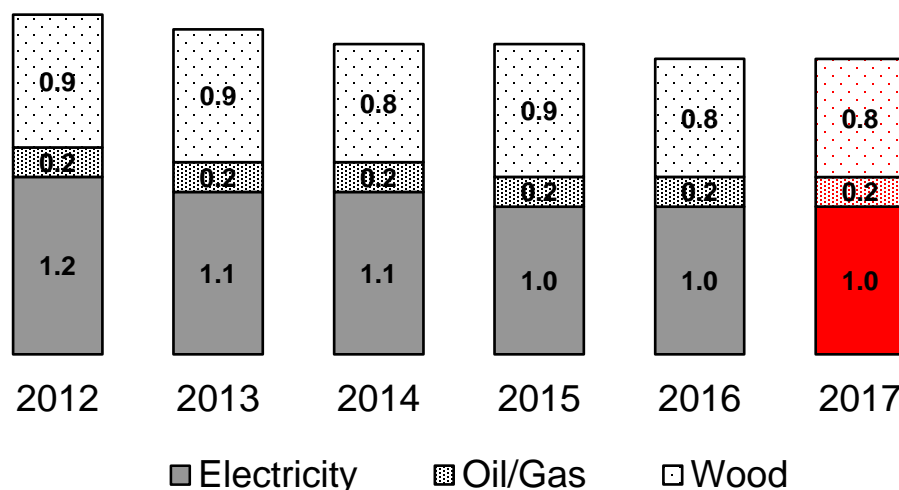
EMS continually analyses further optimisation possibilities and identifies additional potential for cost savings.

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)

In 2017, a total of 2,416 MWh was saved through 17 energy-saving projects. These included projects such as the exchange of lighting in production halls or replacement of energy-intensive bulk consumers.

Energy consumption in MWh/t product



Manufacturing waste

Significant drop in hazardous waste quantities – 31% recycling share

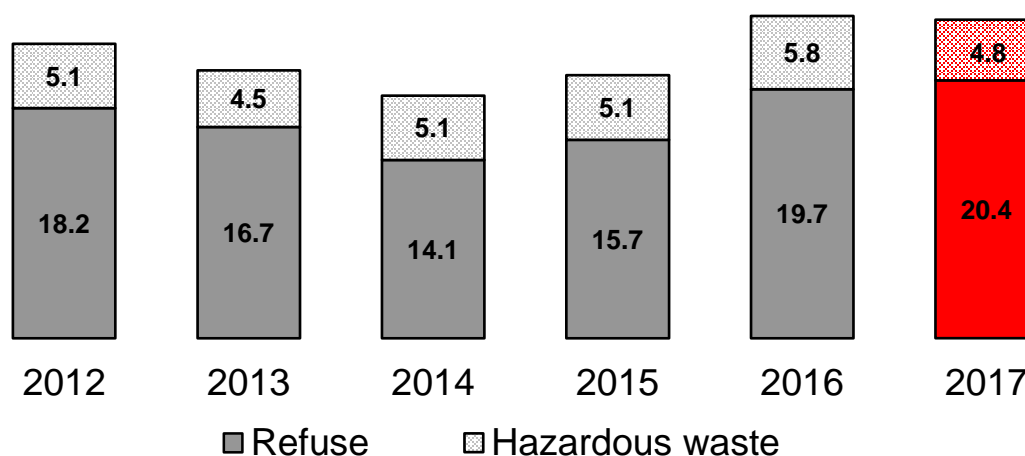
In 2017, a total of 1550 tons of recyclable materials such as metal, glass, wood, paper and packing materials were separated from the waste for recycling. This corresponds to a slight increase of +1.4 % compared to 2016 (1525 tons).

This means that the recycling rate is very high: 31% of all waste materials were recycled in 2017.

The major part of the remaining waste material is plastic waste which has a particularly high heating value and is used to a great extent 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 was significantly reduced in 2017 (-10%). This was due above all to an increase in process stability on the production lines which allowed a reduction in hazardous waste to be achieved. 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 96% - a new record

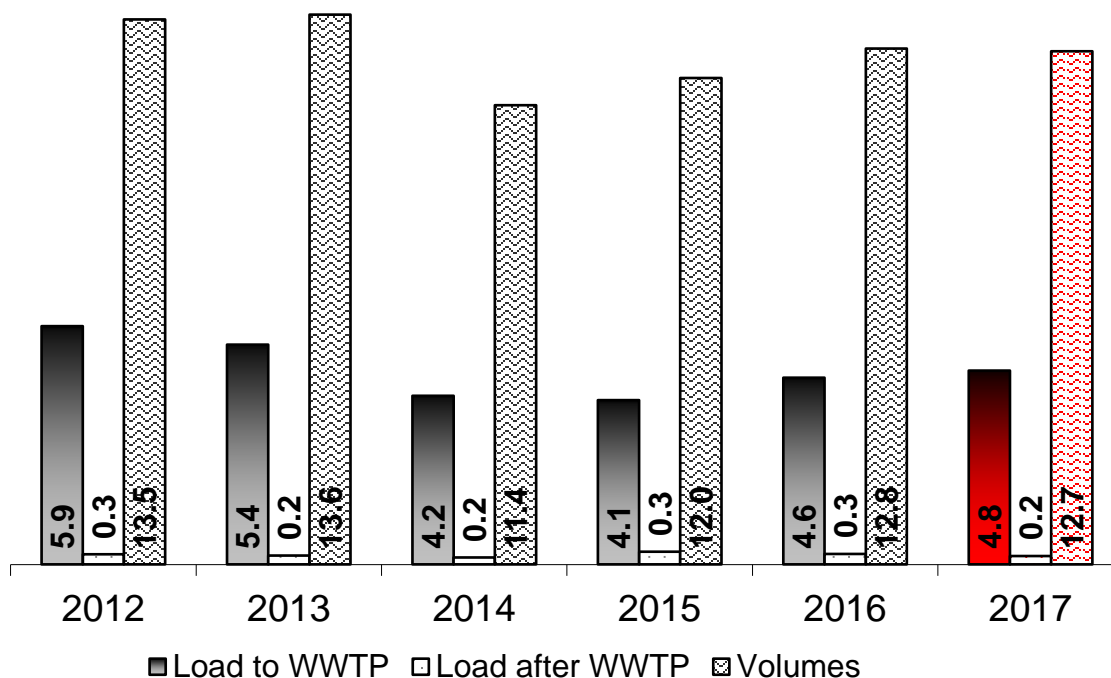
The graph shows the development of waste water volumes and waste water load before and after processing at the company's own treatment plant. As the water load is made up mainly of organic material, this is shown as TOC (total organic carbon).

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

Through various improvements in the water treatment process, the cleaning performance was increased again by another +2% compared to previous year. The cleaning efficiency reached an impressive 96% for all organic compounds in the waste water. This means the pollution potential after treatment in the waste water plant is lower than ever before.

The 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

CO₂ slightly above previous year – organic compounds still at a lowest level

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.

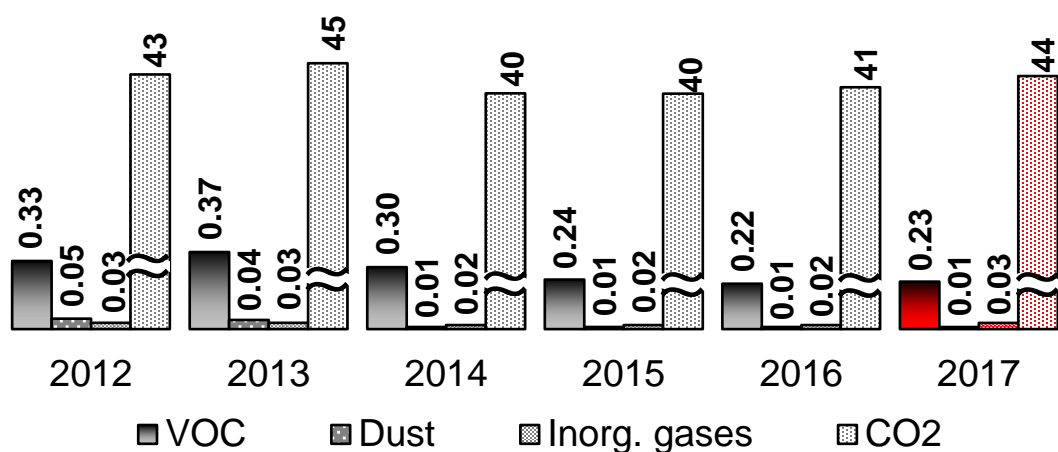
The following substance classes are relevant for EMS-CHEMIE AG:

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

The evaluation shows that emissions at the work site created during the production process remained stagnant in 2017 at practically the same level as in the previous year. Emission of CO₂ showed a slight increase of um +8% compared to 2016 due to the significantly longer heating period in 2017.

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, 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]



Working safety and protection of health

A further reduction in work-related accidents – new record low

The number of work-related accidents involving lost working hours per 1000 employees was further reduced by 2 compared to 2016. This means the number of accidents has reached an all-time low of -54% compared to the start of monitoring in 2001

Accidents in 2017 were mainly bagatelle with only a short loss of working hours. Some individual accidents caused by tripping involved a higher loss of working hours due to knee injuries.

The accidents mainly occurred during manual work and while walking around. The most common minor accidents involved injuries to hands and fingers. Accidents resulting in a higher loss of working hours generally involved injuries to the lower limbs. As a drop in the number of accidents involving climbing aids was achieved in 2017, the prevention campaign "Safe Step Up" will be continued in 2018.



In addition to this campaign, dangers at various workplaces will be systematically catalogued during safety audits and work-place risk analyses, before being removed or resolved.

In a further campaign planned for 2018, employees will be sensitized to handling of high-pressure air in order to reduce noise pollution, energy consumption and the risk of injury.

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

