

# Environment and Safety 2010



**Facts and Figures**  
**BruggemannChemical**

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The environment and safety report portrays the progress of environmental protection, product stewardship, process safety, employee health and safety, emergency response, distribution safety and environmental management at our facility in Heilbronn. The document is based on the recommendations of the European Chemical Industry Council "CEFIC" for environmental reporting.

## BrüggemannChemical

We - Brüggemann Chemical KG - are an internationally operating enterprise with almost 140 years of experience. Today we are active in more than 60 countries on all continents. Our corporate headquarter in Heilbronn at the *Neckar River* (figure 1) manages a global sales network that is supported by establishments in the US and in Hongkong. Also our subsidiary, Brüggemann Alcohol Heilbronn GmbH, is located at our site in Heilbronn. This subcompany sells several sorts of ethyl alcohol for almost all applications.



figure 1: Headquarter of Brüggemann in Heilbronn at the Neckar River

As the leading producer of sulphur-based organic reducing agents (trade name: BRÜGGOLIT<sup>®</sup>), we offer a wide range of sulphinic acid derivatives and blends in many physical forms and packaging for our customers. Zinc compounds, predominantly active zinc oxides with very high specific surfaces, complete the product portfolio.

In addition, our role as a producer of polymer additives becomes more and more important. Our additives are of particular importance for the production of high-quality polymer articles. The offered services for our customers range from the support in problem-solving to the elaboration of formulation recommendations as well as comprehensive technical consulting in the field of application engineering. Our service is supported by well-equipped laboratories and technical facilities.

Our products can be adjusted to our customers distinct requests, either by suitable packaging or by modification of chemical syntheses. We also take charge of the application of respective regulatory permissions if necessary.

Our service is completed by our environment and chemical consulting service that we offer to small and medium sized companies. Our business activities include environmental and safety management issues as well as occupational and health issues. For example we provide the preparation of material safety data sheets (MSDS) or support the implementation of European laws regarding chemicals (REACH).

## Environmental Effects and Evaluation of the Environmental Index

**Since the year 2009 our environment-and safety-related processes are monitored using a special index. In 2010, the environmental index (RC) has reached a value of 95.5%.**

Despite all efforts of prevention, the occurrence of adverse effects to the environment during the preparation of chemical substances and mixtures can never be excluded completely. Taking into account a sustainable treatment of resources and environment, however, we are continuously intending to keep these impacts as low as possible

The monitoring of material emissions, wastewater and the resulting waste and safety aspects of our company using an evaluation index started in 2009.

The evaluation of our environmental and safety processes is carried out now by an environmental index number. It should be emphasized that the environmental index in addition to improved transparency also allows the monitoring of historical developments. Therefore, we can respond to deviations selectively taking into account possible causes.

Specifying a company-wide annual goal for this index assures the continuous improvement of our environmental performance.

Basis for evaluation are the following environmental-related processes:

- Compliance to environment and safety regulations
- Environmental protection and system safety
- Occupational Safety and Health protection
- Transport Safety

## Energy Use

The total energy consumption of our site amounted to 28 GWh in 2010. 47% of this demand was covered by steam from district heating, 21% by electricity and 32 % by natural gas.

The total energy consumption increased by around 33% compared to the preceding year. This is ascribed to an increased production volume by 42% in 2010.

In particular, the increased energy-intensive manufacturing of products of the BRÜGGOLIT-series (steam) and the production of zinc compounds (gas) in 2010 led to an increase of the overall energy consumption. For example, the production of BRÜGGOLIT® products increased by about 75% and thus exceeded the production volume of the 2008, the year preceding the economic crisis.

Changes in process engineering, such as the initiation of a paddle dryer and the increased contract manufacture in plastics additives also led to a rise in energy consumption.

The required amount of steam rose by around 45%, electricity consumption increased by 30% compared to the previous year. The demand of natural gas increased by 24%. Figure 2 shows the proportions of steam, gas and electricity in the energy mix.

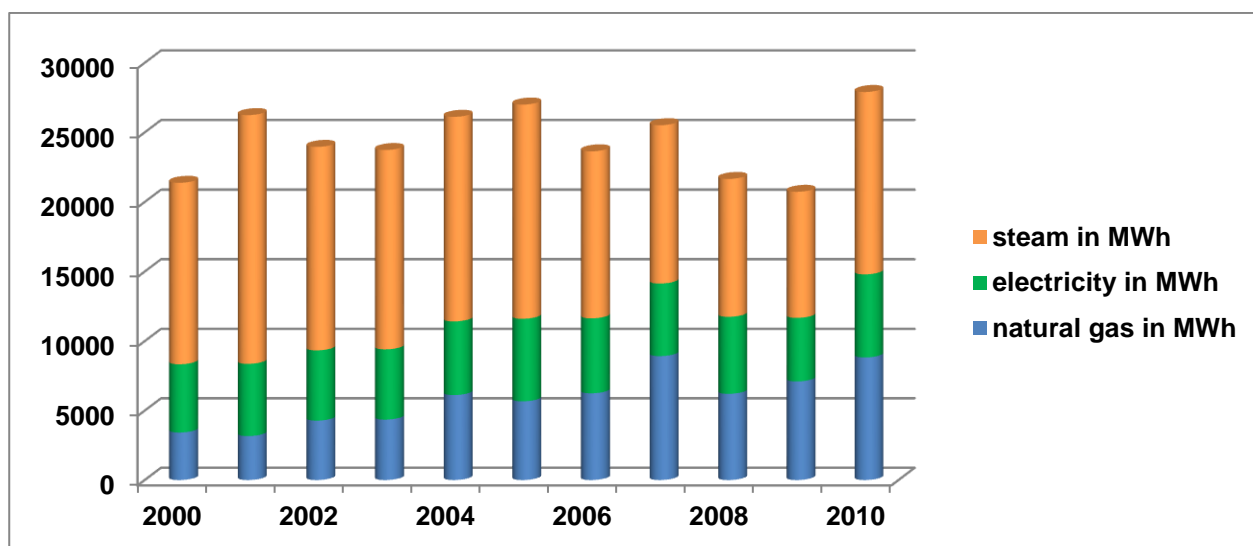


figure 2: Development of energy consumption since 2000

## Water balance

An increased water consumption has to be noticed in the year 2010 for the company.

About 2.218.000 m<sup>3</sup> of river water were taken out of the *Neckar*. The supplied volume of municipal water amounted to 19,000 m<sup>3</sup>. Nevertheless, the sewage volume could be reduced. A volume of approximately 13,000 m<sup>3</sup> of water was discharged by the municipal sewage treatment plant of Heilbronn whereas 1,400,000 m<sup>3</sup> were discharged into the *Neckar*.

In 2010 the amount of river water taken from the *Neckar* increased to 2.218 million cubic metres which is about 33.5% more than last year. The amount of sewage that was directly discharged into the *Neckar* (direct discharge) was approximately 171,000 m<sup>3</sup>. Thus, the volume of water discharged directly increased by 38%.

The supply with municipal water in 2010 amounted to around 19,000 m<sup>3</sup>, which means a reduction by 11.5% compared to the preceding year despite an increase of 42% in the production volume.

The amount of sewage that was discharged indirectly (which is the amount of sewage that is delivered to the municipal sewage treatment plant) was approximately 18.500 m<sup>3</sup> in 2010. This represents an increase by 28% in comparison with the previous year.

Due to a significantly reduced production volume in 2009, the withdrawal of water from the *Neckar* and the direct discharge of sewage into the *Neckar* in this year can't be used as a reference to evaluate the water balance in 2010.

Figure 3 shows the simplified water balance scheme for the year 2010.

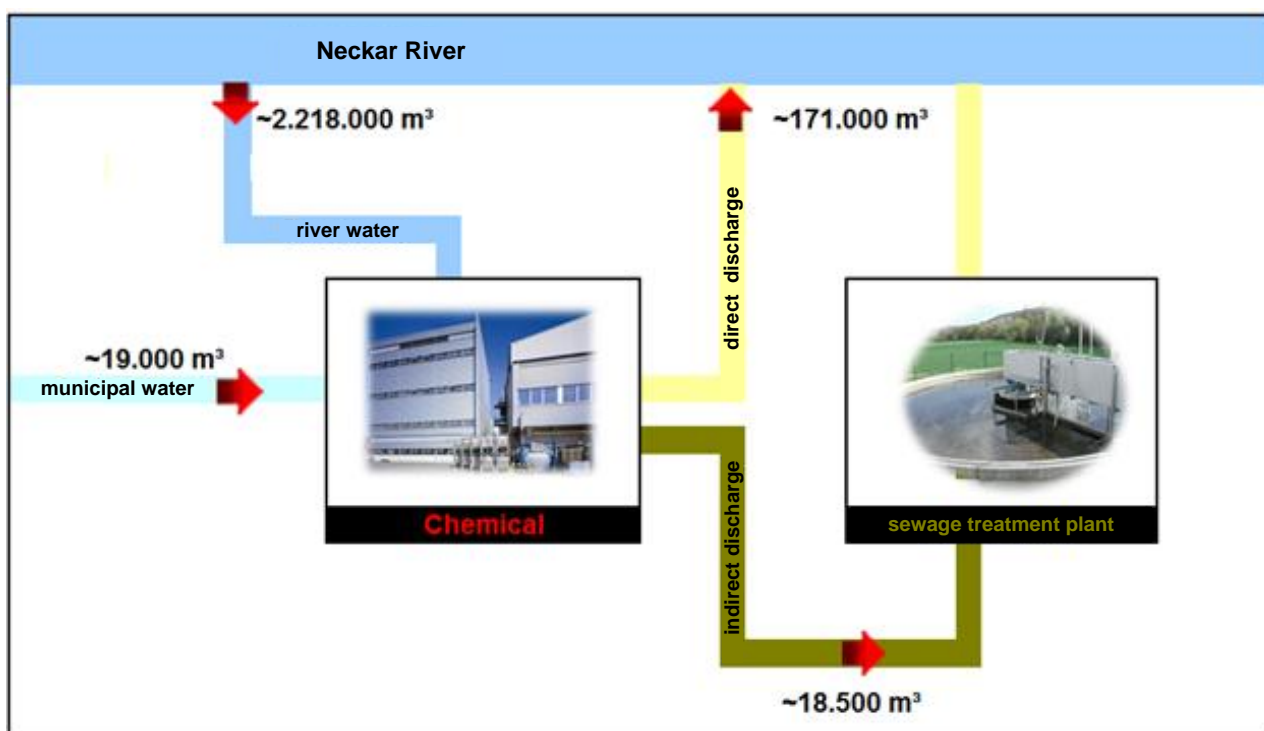


figure 3: Water Balance 2010 (simplified scheme)

## Sewage

As in previous years we observe water pollution to be on a very low level. The controls conducted by the authorities showed no exceedance of given legal limits for relevant sewage ingredients like COD or zinc. This also applies for the thermal loading of the *Neckar*.

Since 1997 the COD discharge (chemical oxygen demand) could be reduced significantly. In 2010 the average COD-load of sewage discharged into the *Neckar* added up to approximately 11 mg/l. The overall COD-load was around 1.7 t. This means an overall load which is above the 2009 level with results from a higher water consumption in 2010. See also Figure 4.

### Chemical oxygen demand in t/a

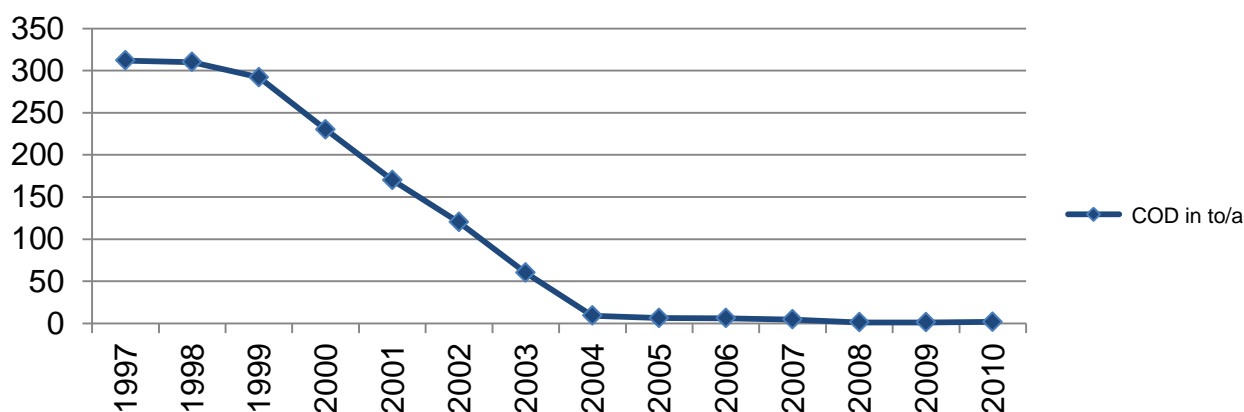


figure 4: COD-load at direct discharge

Beside COD, the only remaining relevant pollutant in the sewage from the production of industrial chemicals is zinc<sup>1</sup>. The average concentration in the directly discharged sewage in 2010 was 0.1 mg/l. Therefore the concentration lies below the legal limit of 2 mg/l as in the past years. The overall zinc load into the *Neckar* sums up to approximately 5 kg (figure 5 **Fehler! Verweisquelle konnte nicht gefunden werden.**).

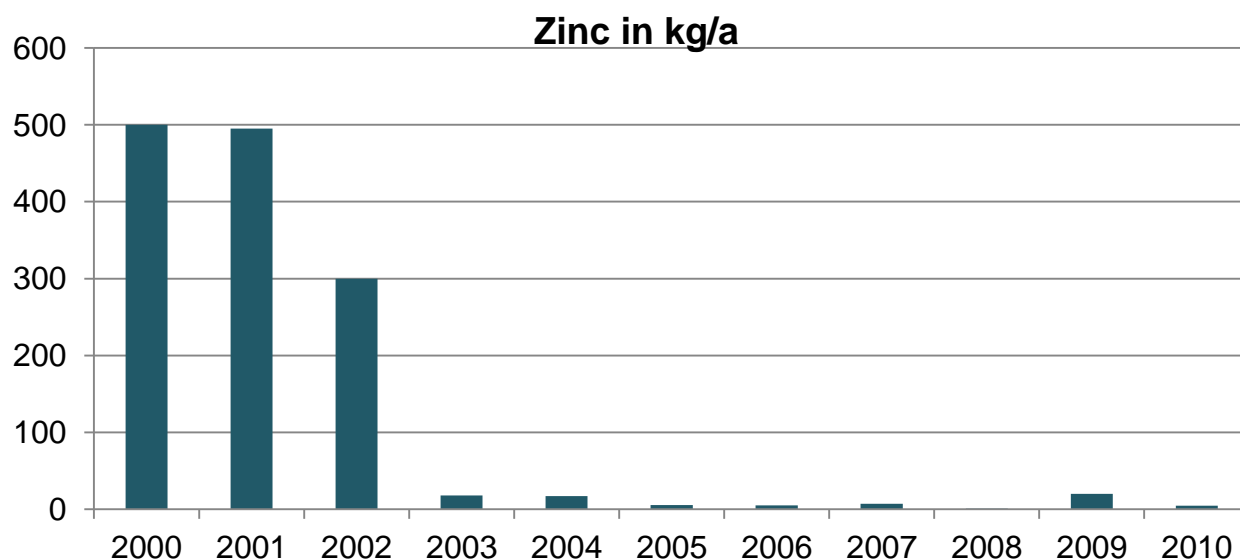


figure 5: Discharge of zinc into the Neckar from production processes that are relevant for sewage

<sup>1</sup> During the production of plastic additives only approximately 60 m<sup>3</sup> of waste water occur, mainly caused by purifying processes. This is virtually not significant for the total water balance.

## Air Emission

In total about 3.5 tons of non-air-compounds were emitted from our facilities<sup>2</sup> into the atmosphere in 2010 which is similar to the preceding years. Still the emission of dust which results from the combustion of fuels make up the largest part of the total emission.

Concerning the emissions in 2010 there are no significant variations compared to the previous years (see figure 6).

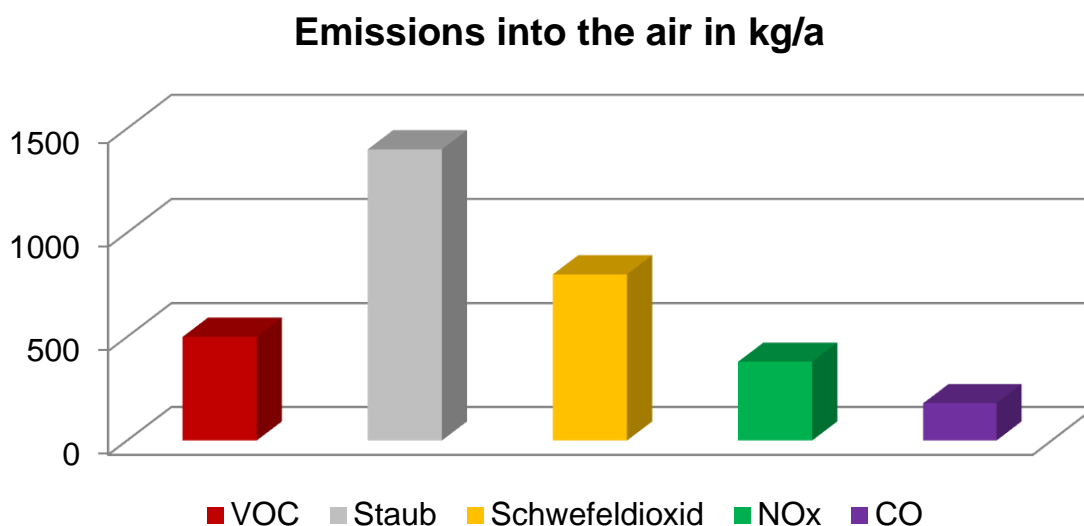


figure 6: Emissions into the air: non-air-compounds in kg/a

The composition of the emissions is presented in figure 7. The dust emissions basically contain zinc compounds. Methanol and formaldehyde make up the essential part of the VOC emissions.

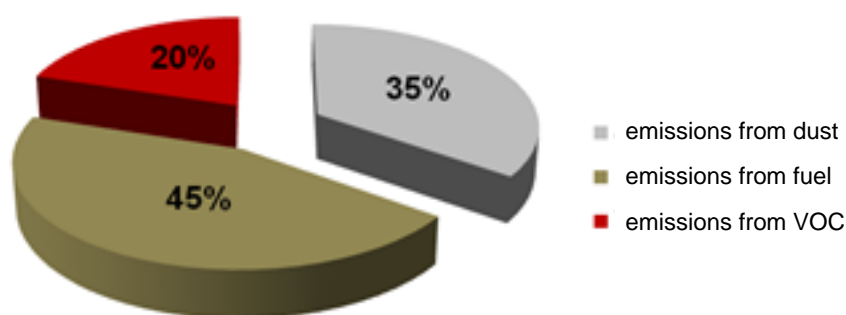


figure 7: Distribution of the emissions in 2010

The emission-measurements taken in 2010 proved the compliance or even the undercut of the mass flow or concentration limits specified in licensing decisions.

<sup>2</sup> Facilities requiring a license according to German environmental rules.

## Waste Disposal

The waste volume amounted to about 433 tons in 2010. Thus, the volume of waste increased compared to the year 2009. This is due to the 42% increase in production volume. Furthermore, solvent-containing wastes from contract manufacturing performed in the field of plastics additives contributed to this rise.

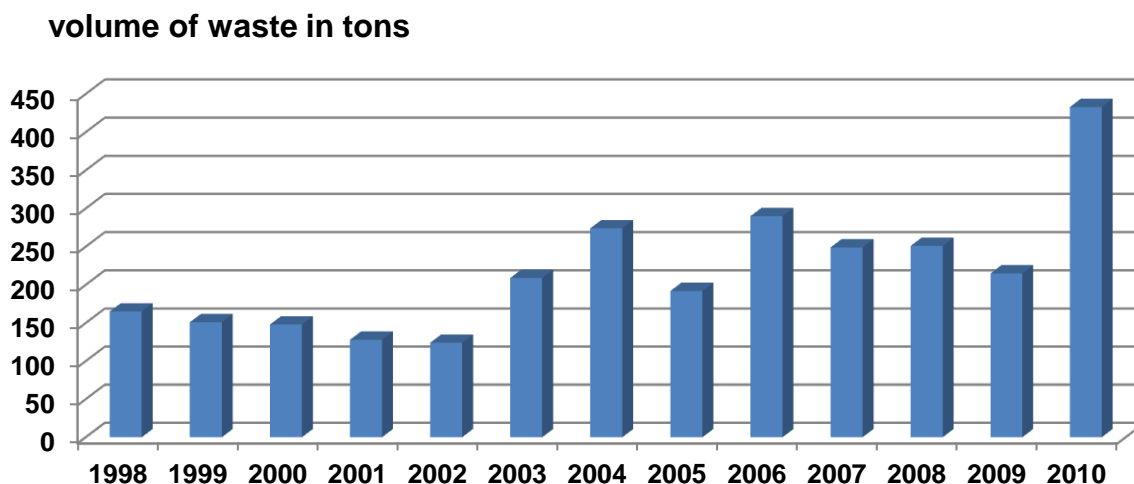


Figure 8: Development of the waste volume since 1998

Compared to the year 2009, the quantity of waste has doubled in volume. The volume increase is mainly attributable to the increase in production and the increased contract production in the field of plastic additives. There were around 190 tons of waste containing solvents from contract manufacturing.

Figure 8 shows the development of waste volume since the year 1998.

The increased production volume in the year 2010 correlates with the increased volumes of waste. A direct relation can be recognized concerning the non-hazardous waste. Thus, the increased quantity of raw and auxiliary materials led to an increased amount of packaging waste like paper, cardboard and wood. The hazardous waste, however, arose largely in the context of contract production. Its volume increased significantly in 2010. It originated in 2010, nearly 190 tons of waste containing solvents. This represents an increase of approximately 140% compared to 2009.

With 69%, the main part of the waste volume is attributed to the hazardous waste. The volume increases to an overall value of 298 tons which means an augmentation of 76% compared to last year. The quantity of non-hazardous waste was 135 tons which represents an increase by 20%.

See also figure 9.

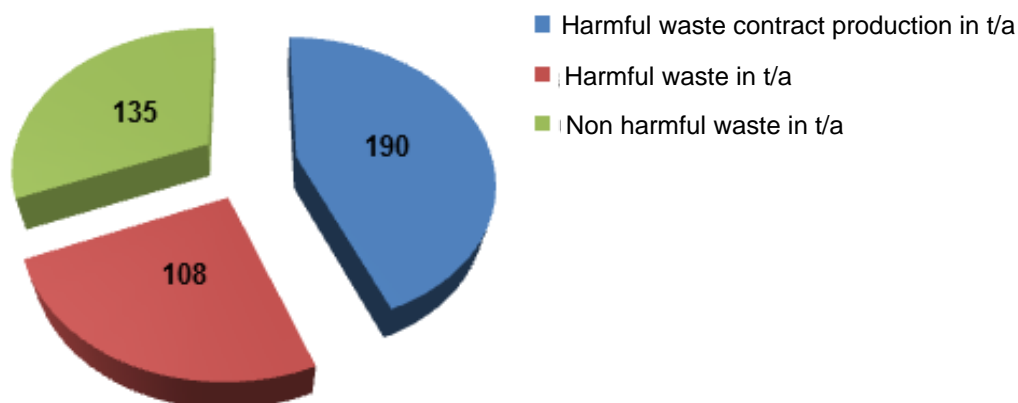


figure 9: Categorization of waste in 2010

## Distribution Safety

**In 2010 about 6.100 tons of dangerous goods left our factory by truck, ship and airplane. As in prior years no notifiable transport accidents happened.**

Overall, about 29.000 tons of chemicals were delivered from our production plant by road, railway, air and ship. The distribution of stored goods that stem from the production of 2009 as well as the augmentation of the production in 2010 resulted in a higher distribution volume.

Dangerous goods make up about 21% of the overall distribution volume which is an increase by 7% compared to 2009 (figure 10). Since the start of our systematic reports within the Responsible Care Program in 1994, also in 2010, no accidents with release of chemicals were observed.

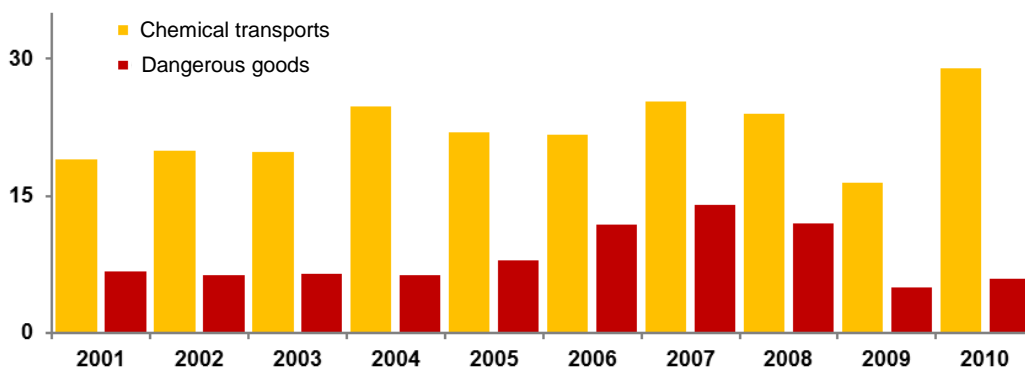


figure 10: Transport of chemicals and dangerous goods in 1000 tons

The transport of dangerous goods can be divided into the following dangerous goods categories:

- class 3 flammable fluid substances <<1 %
- class 4.2 self-igniting flammable substances 32,2 %
- class 8 corrosive substances 9,8 %
- class 9 environmentally hazardous substances 58 %

The transported amount of flammable liquids remained unchanged last year. However, about 12% more flammable products were transported by hazardous materials transportation. The quota of transported corrosive substances also increased slightly by 4%. The quota of environmentally hazardous substances increased by 11% compared to the last year.

The predominant part of all transported dangerous goods is transported by truck on the road. The subsequent transport is carried out by container ships and airplanes. Rail traffic is still no factor in our overland transport of chemicals. In 2010 approximately 98% of our dangerous goods were brought to their destination per truck and thus per land. The quota of sea freight with about 135 tons increased slightly. An increase of 15 tons was recorded in air freight (figure 11).

However, the 15-fold increase compared to 2009 has only minimal impact on the proportion of air freight in the distribution of dangerous goods.

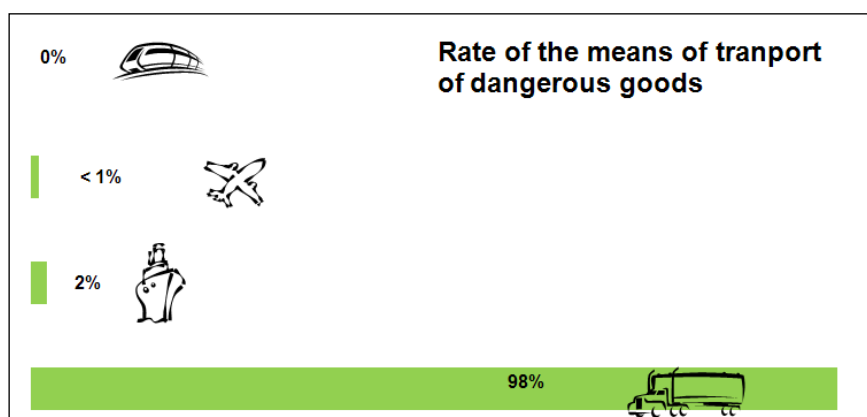


figure 1: Distribution of the means of transport of dangerous goods

## Safety at work and Prevention of Accidents

**In 2010 six occupational accidents occurred in our company. Two of them were reportable work accidents. This is the lowest accident rate since 2005.**

The number of workplace accidents has been halved in 2010 compared to the previous year. Two accidents occurred during handling of hazardous substances. Three accidents were caused by mechanical action (figure 2). The inactive period due to the accidents amounted to 39 working days.

### Accident causes

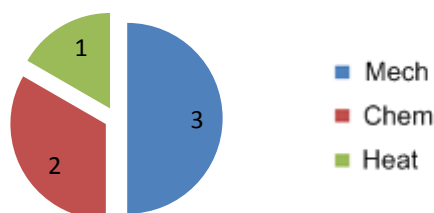


figure 2: Reportable and non reportable work accidents

This means that 8 accidents occurred per 1 million man-hours, respectively 12 accidents per 1000 workers. We were below the average of all BG chemical companies.

Unlike previous years, the accidents are not accidents due to FSS (accidents that are associated with falls, slipping and stumbling).

One reason for this may include the introduction of the accident cause analysis (ACA) in 2010. With the implementation of this method to raise awareness of staff and loading the elimination of tripping or slipping points strongly progressed.

Based on the work accidents in previous years it was decided in 2009 to implement a method for analyzing the causes of accidents in the company. The selected method is used to analyze the totality of the causes of work accidents and near misses and dangerous situations to take protective measures.

### Cause of accident report

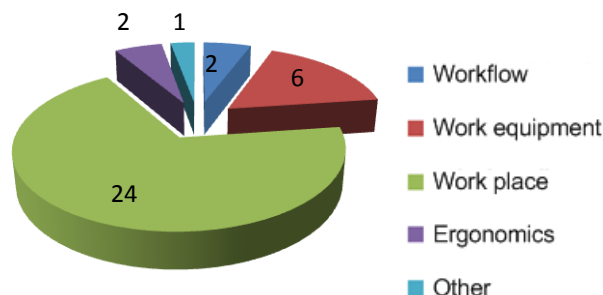


figure 3: accident reports in 2010

All company employees are advised to report so called near misses and dangerous occurrences to the specialist for occupational safety and.

Received messages that were collected by conversations with the respective employee are processed in order to initiate corrective action.

In 2010, 35 reports were forwarded.

The majority of reports comprised unsafe workplaces (eg. commuting or tipping hazards). The reports were followed by appropriate activities or measures. (see figure 13)

In 2010 on-site-inspections of the ASA-team<sup>3</sup> took place on a regular basis. The team consists of the professional for occupational safety, the company's safety representatives as well as representatives of the works council. The main focus of the inspections lay on the production and laboratory areas. Whenever dangers could be identified during these inspections the appropriate safety precaution measures were taken.

<sup>3</sup> Internal group with meetings on occupational health and safety

## Industrial Safety and Health Care

**In 2010 the main focus lay on continuing the activities initiated in previous years concerning precautionary measures to maintain the health of our employees.**

In 2010 the periodic working place measurements were carried out in those working areas where hazardous substances resp. air pollutants can occur. The number of measurements was reduced, because we have demonstrated in the recent years for certain jobs permanently secured compliance with the limits.

A total number of 13 workplaces in the production areas and in the warehouses were monitored. At 12 workplaces measurements concerning dust and at one workplace measurements concerning hazardous substances were carried out. As in the previous year no violation of legal air limits could be observed.

In 2010 the compliance of the noise limit values were controlled on 23 workplaces. No respective thresholds were exceeded. In addition, in the shipping sector were carried out vibration measurements at the used forklift. Since the allowable limits were exceeded, the forklifts will now be retrofitted with air-suspended seats.

In the context of a site inspection concerning labor protection law aspects, the representatives of the professional association and the government of Baden- Württemberg were presented the innovations in the field of occupational safety and health. Our company consistently made a positive impression on the authorities.

For the sixth time in succession the influenza vaccination was offered to our employees. Participation was compared to the previous year. (2009: 65 employees) As in previous years the vaccination was carried out by the BAD-Team (our company's medical service).

In addition, previous medical examinations for a total of 47 employees also took place in 2010.

In 2010 the Brüggemann Group launched the operational Health Management with two "health days".



We conducted a staff survey to find out which health measures are useful. Based on the results of the survey were developed in cooperation with AOK-Heilbronn and the BAD a program with health-promoting measures. The program includes inter alia back training, gym subsidies and smoking cessation.



12 employees participated in the corporate run challenge in Heilbronn. The employees ran in the pouring rain the 5.4 km route.

The Brüggemann-teams started together with about 1300 other runners. Team spirit and fun were more important than the target time. In fact, contrary to all fears there were no losses to be complained and both teams reached the aim completely. However, the running experience of the team members varied from professionals to occasional runners.

## Operating Breakdowns, Major Accidents and Incident Precaution

In 2010, no major accidents occurred in our company. In addition, no malfunctions with impacts exterior to the plant area had to be recorded.

The company BrüggemannChemical is subject to the extended obligations of the major accident directive respectively the Seveso-II directive, because toxic and environmentally hazardous substances can be present above the upper limits of the threshold values. That is why the company possesses a comprehensive documentation. The required documentation consists of an emergency plan, a major-accident prevention policy, and a safety report.

The documents need to be updated whenever changes have been made which are considered to be relevant regarding major accidents, for example if processes are modified or the substance inventory changes.



We started in 2010 to revise the safety report of the company completely.

If certain criteria are met, we report events to the appropriate authorities. Each alarm must therefore be defined. Either it is classified as not reportable or it is classified as a reportable event. Reportable events are events in categories D1-D4. In these categories it is possible that effects occur beyond the factory site. The surrounding neighborhood to the company may perceive these effects then. D2, D3 or D4 cases is called a fault, a D1 event is called a reportable malfunction.

Major accidents or operating breakdowns with injuries to persons or environmental impacts did not occur on our site in 2009. An overview of recent years are provided by the following table 1.

table 1: Events on the Brüggemann area since 2005

<b>event</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
<b>incidents (D2-D4)</b>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>
<b>reportable malfunctions (D1)</b>	<i>1</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>

Non-reportable incidents are usually present when the event doesn't lead to any effect outside the plant boundaries which implies that the event cannot be realized by the immediate neighbours (D0). As part of the Responsible Care initiative of the VCI a system for non-reportable incidents will be established within the near future.

## Product Stewardship

**The first registration period for high-volume substances under “REACH” ends in 2010. Five substances were successfully registered at the European Chemicals Agency by Brüggemann Chemical. Also, the notification of substances in Taiwan was successful.**

The REACH regulation, which represents a major reform of European chemicals legislation requires the safe use of chemicals in all application areas. First, REACH requires the registration of substances and the provision of physical, chemical, toxicological and ecotoxicological data. The extent of required data depends on the quantity of the substance manufactured and imported.

Depending on this, we must also provide extensive data regarding the exposure of humans and the environment to substances. Necessary for this is an exchange between all participants in a supply chain.



Secondly, REACH requires from the manufacturing industry in general a common approach to registration.

The data of a substance that is manufactured by several companies in the EU or imported into the EU, is generally needed to be submitted within a joint submission (in a sense “joint registration”) to ECHA (European Chemicals Agency in Helsinki). These companies are obliged to interchange the existing knowledge about a substance and combine it into a joint registration dossier.

The SIEF (Substance Information Forum) in this case forms the platform for the exchange of data. A so-called lead registrant must collect all data and information about the substance and to create the data set.

It also provides the necessary communication amongst the other companies and coordinates financial balance between all data holders. These are companies which possess the relevant data to register a substance.

Brüggemann Chemical has managed to finish all dossiers for large volume of materials (>1.000 t/a) on time before the registration date 30.11.2010.

For two materials, specifically for Basic zinc carbonate and sodium hydroxymethanesulfinate the company also took occupied the role of the Lead Registrant.

Brüggemann Chemical has also registered the produced substances zinc oxide, zinc sulphate and sodium hydrosulfite.

By means of this registration, the company also makes sure that special forms or formulations of these substances can be marketed furthermore.

In the context of our Chemical and Environmental Consultancy Service for small and medium sized companies we provide support concerning REACH. For further information please refer to our homepage.

In addition to the European registration in 2010, a variety of substances was reported into other international materials inventories. We ensure that the products manufactured by Brüggemann can be sold virtually worldwide.

Besides the realization of legal directives like REACH Brüggemann Chemical obliges itself to improve continuously safety, health and environmental standards. Beyond legal obligations the company committed itself to make product and process development sustainable and to conserve resources.

Apart from REACH and responsibility activities, self-obligations of the industry associations are taken into account in the context of product liability and resulting actions are implemented.



## Environment and Safety Management, Self-obligations

During the audit of our management system by DQS in 2009 no deviation was assessed. All measures that resulted from the official inspection according to the major accident directive were implemented.

In our integrated management system, the aspects quality, environmental protection, plant, transport and occupational safety are unified. In addition, the safety management system requirements according to the major accident directive and measures for the compliance with voluntary agreements of the respective industrial associations are taken into account, as well. The applied policies of quality, safety and environmental protection are confirmed by the certification of our quality management system according to DIN ISO 9001 and of our environmental management system according to DIN ISO 14001.



During the audit in 2010 there were no discrepancies noted.

The topic of the annual inspection by the controlling authority according to § 16 of the major accident directive comprised the fire detection. A tour around the site, as well as the examination of the respective documentation revealed some deviations.

The measures resulting from the audit were already realized.

The realization of self-obligations and voluntary agreements are still substantial parts of our business objectives. Self-obligations are legally non-binding commitments of companies or company associations to the state that comprise the achievement of particular (environmental) aims by concrete measures. By self-responsible action under the guiding theme of sustainability we want to guarantee a standard that is not only orientated at legal demands. The following list shows the voluntary self-obligations and agreements which apply to BrüggemannChemical:

- 1986 VCI/VCH: Code of behaviour concerning the export of dangerous chemicals.
- 1991 VCI: Responsible Care – the chemical industry's self-obligation for environmental protection, health and safety.
- 1998 TEGTEWA: Self-obligation for the classification of textile auxiliaries relevant to water pollution.
- 2000 VCI: Participation in the voluntary initiative: 'Information Office Safety Data Sheet – ISI'.
- 2005 VCI: Voluntary measures of the German chemical industry and the chemical trade companies to prevent the proliferation of chemicals that might be abused for the illicit manufacture of narcotic drugs.
- 2008 VCI/VCH/Phagro/ABDA/VDD/ZZF: Declaration of BME and VCI/VCH/Phagro/ABDA/VDD/ZZF about voluntary measures of trade and industry concerning the sale of certain chemicals that can be used to manufacture explosives.