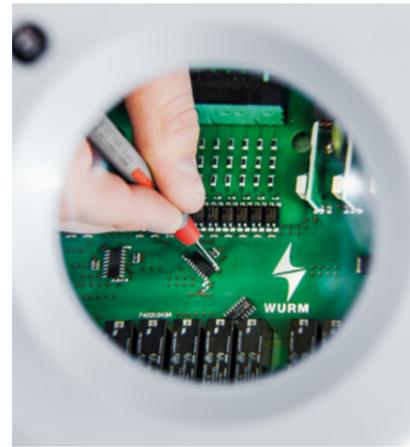
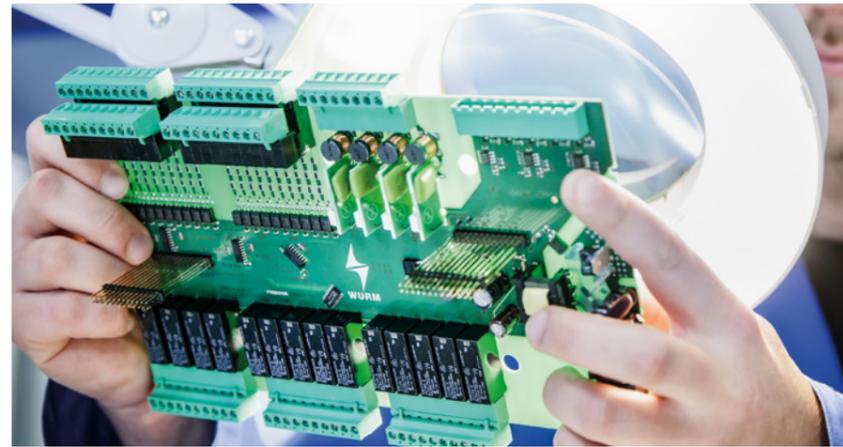




BY CONVICTION

Wurm relies on European Printed Circuit Boards





FAIR CIRCUIT BOARDS

WE ARE COMMITTED TO EUROPEAN CIRCUIT BOARDS

The trend towards energy-efficient and resource-saving system solutions in industrial refrigeration technology has been ongoing for years. The focus here has been on energy-efficient operation and the choice of refrigerant in particular.

As an independent supplier of control systems, we have created a broad range of solutions together with our customers and in this way also contributed towards resource-saving plant operation. We always view plant technology as a whole here and aim to view the process of the system in a holistic way.

As part of this holistic approach to the development of sustainable system solutions, we have analysed a field that has hardly been regarded at all in recent years: our own device development and the components used and their origins.

A central role here is played by bought-in printed circuit boards (PCBs). The choice of suppliers worldwide is massive - particularly low-cost products come from Asia.

Through our own research we have been able to prove that the pure manufacturing costs of PCBs for our operational purposes in Asia or Europe are very similar. However, there is a serious difference in requirements of environmentally friendly manufacture. These extra costs for the purpose of environmentally friendly production (e.g. comprehensive waste water treatment plants) are reflected in higher sales prices for European PCBs.

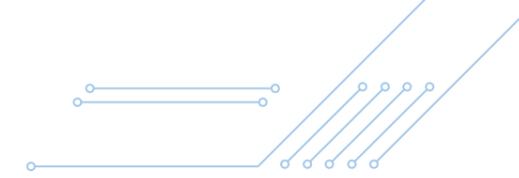
Unlike semiconductor products such as processors, the freedom of choice of manufacturer or manufacturing location still exists for circuit boards.

We have decided to manufacture all our standard products only with European PCBs that correspond to our own demands for sustainable and environmentally friendly manufacture and fulfil or exceed current EU guidelines.

We also feel obligated not only to make high demands on our suppliers, but also to implement these in our own production. We have kept to

the decision we made when our company was founded to locate our production exclusively in Germany. In addition to production from carefully selected partners, a large proportion of our products is also manufactured at our own location in Remscheid.

Our aim with these decisions is to contribute not only to plant planning and operation being executed with a view to sustainability aspects, but also to the choice of materials and individual parts being made with the same sense of responsibility. The production location of Germany is for us the basis for the manufacture of high-quality and sustainable products.



DIRTY GAME

HOW GERMAN MANUFACTURERS SUFFER BECAUSE OF ASIAN MANUFACTURERS

Printed circuit boards (PCBs) are the foundation of electronic units. The electronic components are positioned and soldered onto the PCBs. They are manufactured in a complex procedure with aggressive chemicals and a multitude of technical processes.

In Europe, this process takes place with a very high degree of automation and comes with high costs for the disposal of the waste it produces and the processing of the waste water. One main advantage for the Chinese competition in terms of costs is seen to be the processing and discharge of waste water. European manufacturers each operate waste water processing plants that cost several million euros in order to

fulfil the demanding environmental requirements and raise the quality of the water to drinking water standard before discharging it.

In China, the natural river and ground water network is mainly used for disposal. Several Greenpeace studies show that the values of heavy metals in the relevant areas such as the Pearl River Delta exceed the permitted limits by several factors: and these limits are already considerably higher than those set in Europe. State support from the Chinese government also contributes to an imbalance among competitors.

Many PCB manufacturers in China today are very large companies that supply Apple,

Hewlett Packard, IBM and many other renowned manufacturers – also in Europe. They produce PCBs of very high quality and sell them at way below the price of products of similar quality from Germany. In order to avoid taking part in a ruinous price war, German providers have so far tried to find alternative profitable business areas in the manufacture of highly specialised solutions.

Legally, there is not (yet) any destructive competition in the European circuit boards market. Chinese producers' prices are not below their marginal costs, which is a sign of this unfair procedure. German manufacturers' marginal costs are about 46.07 % of the entire cost of the PCB.

	PH VALUE	COPPER [µg/l]	LEAD [µg/l]	MANGANESE [µg/l]
DRINKING WATER LIMIT GERMANY	6.6 – 9.5	2,000	10	50
LIMIT CHINA	6 – 9	2,000	1,000	5,000
PEARL RIVER READING (CN)	1	36,800	2,470	19,200

Source: Birgden, K. et al. (2009): Hazardous Chemical Pollution; Greenpeace International (Amsterdam)



Since the Chinese manufacturers' price deviates from that of German manufacturers by a maximum of 50 percent, it can not be below the marginal costs of Chinese companies.

However, the term "Chinese destructive competition" certainly has its justification. The method of Chinese competitors of entering European markets with dumping prices and pushing out domestic manufacturers, as is the case with photovoltaics, is a massive risk for many branches of the industry. And the price difference here is not, as is often assumed, based on labour costs, but rather on the costs of environmental protection.

The downfall of the photovoltaics industry in Europe has already shown what fatal consequences this has: as soon as no PCBs are being produced in Europe any longer, there will be a massive brain drain and a whole branch will collapse. Market research in Germany and a survey

of a sample of German PCB manufacturers show that there are currently still about 68 German manufacturers. In 1995 there were about 175. In addition to these there are a large number of distributors that purchase their products from Asia, and in particular China, and sell in Germany.

One of the central findings of the survey is the confirmation of the high quality of Chinese circuit boards. At the same time, the low personnel and material procurement costs, and the massive support of the industry by the Chinese government, are rated as an undoubted competitive advantage. In a detailed interview, one German manufacturer also explains very plausibly how the environmental damage, deliberately accepted by the Chinese circuit board industry, contributes crucially to the unequal competition. This means there is a direct connection between destruction of the environment and (market-destroying) dumping prices.

But as long as environmental protection is not consistently enforced and companies are in a position to discharge their waste water cheaply into the surrounding waters, the price advantage of Chinese providers of up to 50% will continue.

The losers in this literally dirty game are, however, not only the German PCB manufacturers, but also and above all the environment and the Chinese people. Their agriculture is already suffering considerably from the pollution burden in rivers that have been contaminated. And not least, the heavy metal from the rivers has reached the global water system, via the South China Seas into the world's oceans and into the human food chain.

THE RIGHT WAY

WHY ENVIRONMENTAL PROTECTION AS CARRIED OUT BY EUROPEAN MANUFACTURERS IS RIGHT

Circuit boards are manufactured by means of an expensive chemical method in various production steps. Many of the methods are wet chemical and create burdensome process water that cannot be released into the sewer system untreated. This concerns above all the galvanic baths, in which electrolytic metal deposition is used to copper-plate the through-connections of multilayer circuit boards.

Since the waste water amounts are usually considerable, the plant operator must deal with the waste water problems in a plant that employs galvanic procedures in Germany. The baths and waste water generated have substances that sometimes differ greatly and present potential danger to the environment.

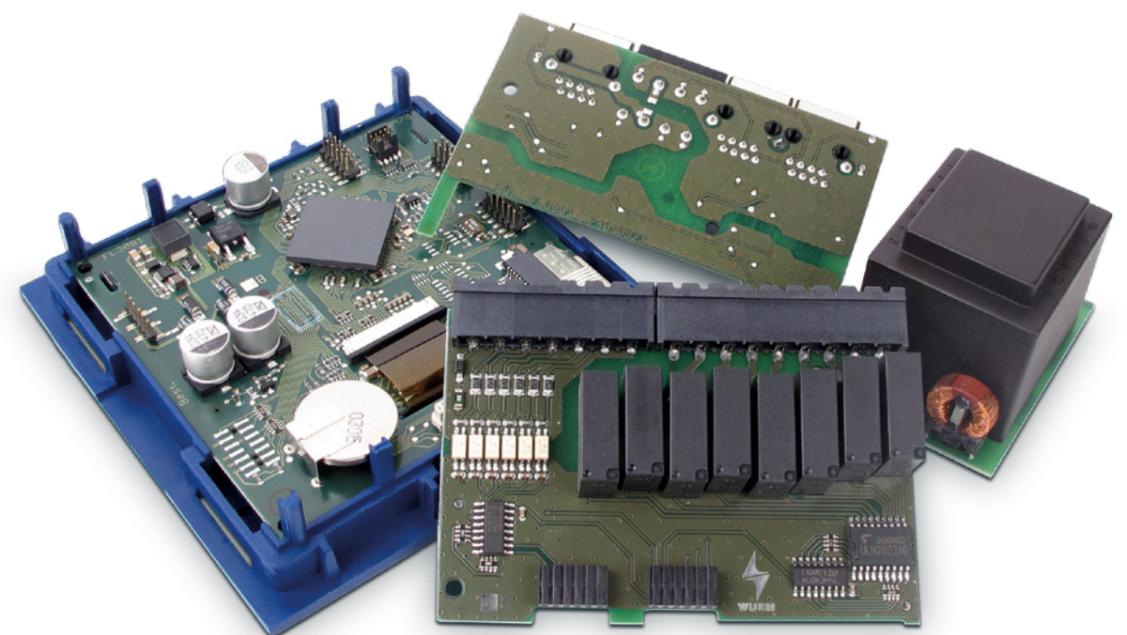
In Germany and the European Union there are various regulations and laws that oblige circuit board manufacturers to treat their waste water: a permit is required for circuit manufacturers to discharge waste water into the public sewer system in accordance with the German Water Resources Act (Wasserhaushaltsgesetz, WHG). This applies to all plants that handle and process metal.

The permit is issued by the water authority, which will then check the discharged waste water for its quality at regular intervals.

Additionally, there are the respective municipal waste water statutes that define complementary requirements for the discharge of industrial waste water. Even though these vary from

municipality to municipality, concrete limits for pollutants are prescribed. Plants that discharge industrial waste water must check adherence to the legal discharge requirements on their own responsibility. The measures required for this in each case (tests, examinations, measurements and evaluations) and the control mechanisms and devices required for it are set out in the appendices to the German Self-Control Regulation (Eigenkontrollverordnung, EKVO).

Circuit board manufacturers continue to be bound to the international regulations Reach and RoHS. Wurm is not bound by these conditions: we have, however, deliberately made a decision to adhere to them voluntarily.



SETTING AN EXAMPLE

OUR BIGGEST MANUFACTURER SHOWS US THE WAY

As a medium-sized company we take our responsibility to society and the environment very seriously. Sustainability is our standard. This means that we set the highest standards for

all our activities as a company in terms of adhering to ecological and ethical standards as well as legal and normative directives. In view of the increasingly complex structures along the goods

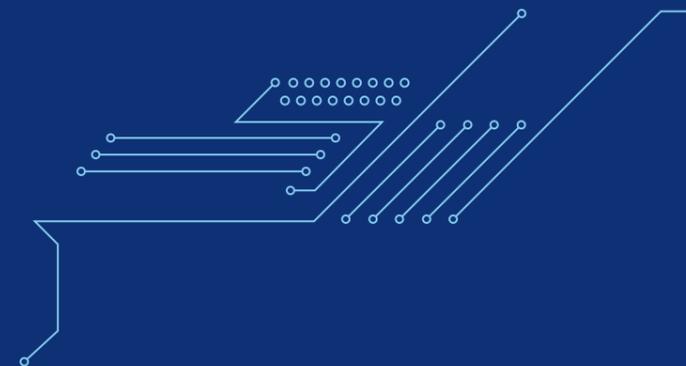
flow, obliging our business partners to sustainable action is also indispensable. Our biggest supplier of PCBs, KSG, sets a fine example here!



FACTS AT A GLANCE

WURM RELIES ON EUROPEAN PRINTED CIRCUIT BOARDS

- Wurm has decided to manufacture all catalogue products using only European PCBs that fulfil our own requirements regarding sustainable and environmentally friendly manufacture and fulfil or exceed current EU guidelines.
- Circuit boards from Asia damage the environment. Asian providers often circumvent environmental standards and discharge their waste water into the natural waters surrounding their production plants.
- In addition to production by carefully selected partners, a large part of our products is manufactured at our own plant at the Remscheid location.
- With these decisions we want to contribute not only to plant project planning and operation being carried out with a view to sustainability aspects, but also the choice of materials and individual components themselves already being made with an appropriate degree of responsibility.
- In Germany, circuit board manufacturers must conduct time-consuming and expensive waste water processing. This is legally regulated and is tested regularly.





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