



Grenzebach Maschinenbau GmbH
Albanusstrasse 1-3
86663 Asbach-Bäumenheim
Phone +49 906 982 0
Fax +49 906 982 2108
e-mail: info@grenzebach.com
www.grenzebach.com

VIPA
Gesellschaft für Visualisierung und
Prozessautomatisierung mbH
Ohmstr. 4
91074 Herzogenaurach, Germany
Phone: +49.9503.500 56 90
Fax: +49.9503.500 56 91
Mobil: +49.172.833 22 16
Web: <http://www.vipa.de>

High SPEED in solar cell production

Electricity from sunlight – modern solar cells make a huge and important contribution to the production of renewable energy and worldwide the demand for them rises. Tried and tested technology is a pre-requisite for the production of state-of-the-art photovoltaic cells. With their long know how in the field of flat glass production, Grenzebach Maschinenbau of Asbach Bäumenheim, Germany, recommends itself as a supplier of sophisticated technology for the production of coated glass that is used for converting sunlight into electricity. For plant automation and visualisation in their assembly lines for thin-film cells, Grenzebach engineers rely on SPEED7 CPUs and Touch Panels from VIPA.

Electricity from sunlight – photovoltaics

Although already discovered in 1839, over a century went by before sunlight could be transferred to energy. Although it was applied in space travel as early as at the end of the 1950s, many more years passed before industry and private investors used photovoltaic solar cells for energy production. They have become very successful. Whole branches of industry are developing around 'energy from solar radiation'. To meet the global demand, the production of photovoltaic cells is continuously expanded.

Grenzebach engineers are aware of the need for high-quality and high-performance production plants and have the expertise to build these sophisticated lines. The company is one of the world's leading suppliers of complex photovoltaic technologies and has set the goal of optimising cost-efficiency so that in the near future it should be possible to produce solar power even cheaper than nuclear power.

From an agricultural machine repair shop to a photovoltaics specialist

Grenzebach Maschinenbau GmbH started as a repair shop for agricultural machines. This was opened in 1920 by Josef Grenzebach, father of the current supervisory board chairman Rudolf Grenzebach. In 1960, Rudolf Grenzebach founded Grenzebach Maschinenbau in Hamlar, Southern Germany. As a producer of material handling technology, the company first specialised in conveyor belts for gravel, later in systems for dairies and for the furniture industry. In the mid-1970s, Grenzebach eventually went into the production of flat glass systems, and is now one of the world's leading suppliers for this equipment. Very early the company saw the importance and the opportunities that electronics provided for controlling the complex production processes and founded its own electronics department. Grenzebach electronics develops all controls for systems produced by its engineering departments, thus making a large contribution to the company's strong position in the market.

The group presently has six production sites, situated at locations in three continents. In addition to the company's headquarters in Hamlar, the automation specialists in Karlsruhe and the Bad Hersfeld site - focussing on gypsum, building board and veneer technologies as well as process engineering, - Grenzebach operates plants in China and the USA.

Thin-film photovoltaic systems from Grenzebach

The increasing demand for electricity from renewable energy sources goes hand in hand with a rising need for high-performance photovoltaic systems. With its numerous system components Grenzebach has become a reliable and competent partner to the industry. The company's TPV (Thin Film Photovoltaic) system offers a complete manufacturing line for the production of thin film cells and sets new standards in production.

Just as in the IT industry some years ago, the solar energy sector is booming at two-figure growth rates. However, production is held back due to a shortage of the carrier material silicon. Here, glass-based thin-film modules represent an environmentally friendly alternative.

Compared with silicon and considered from an environmental aspect, raw material for glass is far cheaper and more readily available. In new production plants, only three single processes are needed to give float glass its nanometre-thick coating for use as a carrier material. The glass is laminated to make it more durable. Laminating glass is a widely used, normal production process. However, laminating photovoltaic coated glass is challenging, since the glass is black rather than transparent. Thus a new laminating process had to be developed and certified. Background for this development is the economic design of the photovoltaic panels and the reduction of manufacturing costs per Watt peak (Wp) by 35%. The aim - by 2010 regenerative energy shall be competitive with nuclear energy. To achieve this challenging goal, processes are constantly optimised and further developed.

Grenzbach's plants achieve an annual output of around 65 Megawatts. The new generation of machines shall reach the 15-fold output, thereby exceeding the 1-Gigawatt mark for the first time.

These complex process sequences require high-performance, high-speed automation technology - which has to be economically viable - combined with user-friendly, modern visualisation. Ideal conditions for SPEED7 CPUs and Touch Panels from VIPA.

SPEED in plant automation

While constructing TPV systems, it became clear that in order to ensure a problem-free production process, a high-performance network of control systems is required. A total of 15 decentralised process sections are to be controlled, centrally monitored and visualised on all operating and control stations. To meet these high requirements, the design engineers at Grenzbach Maschinenbau chose the SPEED7 CPUs from VIPA.

After having carried out extensive tests, Grenzbach was convinced of the high performance of this PLC system with the world's fastest processor for programming with STEP7 (hard PLC). In fifteen decentralised process sections, the TPV system is controlled by using the 315SN/NET CPU. Via integrated Ethernet CP343 lean processors, the CPUs communicate with each other and also with the redundant CPU type 317SN/NET master controls. Up to 64 parameterisable connections are processed by the CPU type 317SN/NET. Equally impressive is the SPEED7 processor technology. The large integrated main and load memory offers sufficient storage space for the programme and the data. If required, it can be expanded to up to 8 MB at any time using Memory Configuration Cards (MCC) – without having to change the CPUs. A further key factor is the good price/performance ratio of the SPEED7 CPUs, as numerous PLC systems are allocated to each machine. The peripheral area is equipped with VIPA modules. The digital and analogue IO modules from the identical 300V system ensure a user-friendly connection of sensors and actuators. Additionally, a number of special Siemens S7-300 modules, e.g. function modules or communication processors, can be operated in mixed operation with VIPA CPUs, which makes the SPEED7 system an all-round control system.

Grenzbach also relies on the quality of VIPA when it comes to visualisation. Every TPV system is equipped with a total of 22 control and monitoring panels. Each panel is fitted with a 10.4" touch panel, ensuring sufficient overview and control. The Ethernet networking allows monitoring and control of the entire production process from any of the workstations. Visualisation is provided by SCADA / HMI's Movicon software, which is standard in VIPA touch panels and used many thousand times worldwide. The user-friendly and ergonomic development interface for SCADA and HMI applications creates projects simply and quickly, without limitation of variables. During dimensioning and commissioning

processes, a VIPA support team specialising in Movicon offers specialist advice and support. The ideal combination of visualisation and PLC components, together with the advantage of having a central point of contact for both systems distinguish VIPA, making it the ideal partner.

About VIPA

In the past two decades VIPA GmbH has developed from a specialist in Siemens-compatible modules to a competent supplier of complete PLC systems. VIPA's commercial success is due to the fact that the company has improved existing products and successfully launches new, pioneering technologies. As a 'lateral thinker' in the automation sector, VIPA has created solutions which, today, are standard in the industry and are used by a number of well-known customers worldwide. With its highly-motivated staff, the company is constantly improving quality and service, and enjoys a high level of customer satisfaction. This is gained by questioning existing products, re-working them or developing completely new products from them. A growing network of high-performance partners – both national and international – helps to provide overall solutions to satisfy almost all customers' requirements.

All VIPA systems are programmable with Siemens STEP®7 or with VIPA's own WinPLC7 programming tool. VIPA's 300S and 300V systems use the Siemens S7-300® design, which allows combined operation of VIPA CPUs with Siemens modules, for example. The 100V, 200V, 300S and 300V are centralised and decentralised control solutions. A number of CPUs are available for centralised use. The portfolio of VIPA GmbH is rounded off by its high-performance touch panels for industrial and building automation.

*Author: **Udo Richter**, Key Account Manager of VIPA GmbH*

*Author: **Markus Blattner**, Project Manager of Grenzebach Maschinenbau GmbH*