

PACO

WORLD



No. 13 06/2007

Our International
Wire&Mesh Magazine
for Existing and
Prospective Customers

Workforce Experience – A Key to Success

Dear Reader!

How many times have you seen or heard company policy statements that claim “our workforce is our most valuable asset”? Unfortunately this point of view didn’t stop many companies from laying off a significant proportion of their workforce when times got hard.

Particularly the more experienced (and, consequently, the more expensive) have been especially prone to be sent off into early retirement – often with the full support of the state government and the unions. At the same time apprenticeship schemes have been scaled back and the number of students enrolling for teacher training or engineering and IT degree courses is diminishing.

The world economy is now picking up and particularly Germany is seeing an upturn in industry that has been unknown for a number of years. All of a sudden there’s no more talk of unemployment. The major concern is the number of vacant positions that cannot be filled. Everybody is calling for new schemes that will advance general education and vocational training.

At PACO, we have always refused to follow the fashion of systematic downsizing – strategically or regarding personnel levels. The members of our workforce with a vast number of years experience are of particular importance to us. And we have always trained apprentices. The problem we have always had and are still having is finding sufficiently qualified school leavers.

Since our inception, our policy has been to promote a relationship with our employees based on respect and fairness – throughout the bad as well as the good times. This also works to the advantage of our customers – through assured quality, delivery dates that can be trusted and our comprehensive service.

Best Regards


Peter Ruppel
Managing Director



Screen-Printing Against Greenhouse Gases: PACO Makes Its Mark On Photo-Voltaic Cells

Screen-printing is a technology with a long tradition. And screen-printing is also a process that enables advances in number of innovative technologies – including photovoltaics. The conversion of solar energy into electrical current would be almost impossible without screen-printing. And when it comes to screen-printing in high-tech quality, PACO high-precision cloths are often found, wherever you are in the world.

It all started in outer space

The necessity of finding an effective means of supplying electrical energy to satellites in space was the initial motivation for photovoltaic development – back in the fifties. The fundamental idea: to convert the solar radiation that is in plentiful supply in outer space into electrical current. This enabled measuring devices, cameras, transmitters and other instruments to be operated maintenance-free throughout their long service lives in orbit. But a lot of solar energy also finds its way to the earth. That is why photovoltaics is becoming more and more important as a source of CO₂-free renewable energy. An essential requirement for this are the advances made in solar cell technology that are closely connected to the advances made by PACO in screen-printing cloths.

Short excursion into the history of the photo-voltaic cell

When you look at the origins of photovoltaics you will find a lot of extremely

famous names: Alessandro Volta, who has been immortalised by the unit of measurement “Volt”, Alexandre Becquerel, who discovered the photoelectric effect in 1839, this was then systematically examined by Heinrich Hertz and his assistant Wilhelm Hallwachs (1887 Hertz effect), Albert Einstein then explained the photoelectric effect through light particles in 1905 (wave-particle duality) and was awarded the Nobel prize for his work in 1921.

With the satellite Vanguard I at the end of the 1950s, solar cell technology was practically implemented for the first time. Throughout the following decades, the demands from space travel have then subsequently motivated step-by-step improvements.

In Germany, the “act on the sale of electricity to the grid” as well as the “renewable energy sources act” have generated a sudden increase in the demand for photovoltaic systems. With over 1000 MW of installed electrical power in mid 2005, the production of energy from solar radiation has increased in Germany more than a hundred fold in the past ten years.

Solar cells – silicon is the material of choice

Just the same as with computer chips, silicon serves as the basis material for solar cells. Or to put it more simply, you could say sand. In other words, the raw material for silicon is as plentiful as sand on the seashore. Unfortunately, however, it’s not as easy as that: to turn

Continued on page 2



Screen-Printing Against Greenhouse Gases

Continued from page 1

sand into pure silicon that can be cut into fine slices called wafers, a number of complex manufacturing processes are necessary. Depending on the exact processing sequence, three different qualities of silicon wafer are produced: monocrystalline, polycrystalline and amorphous.

Efficiency is of primary importance

Solar cells made of monocrystalline silicon (c-Si) provide the highest efficiency on a large-scale of more than 20%. However, a lot of energy is required for their production. Polycrystalline cells (mc-Si) have an efficiency of more than 16% and offer the best trade-off between price and performance. Both qualities are known as thick-film cells. Thin-film cells are made of amorphous (a-Si) and crystalline or microcrystalline (μ c-Si) silicon. Their efficiency is in the region of 5% to 7% and more. A particular advantage is their almost limitless availability even for production in the terawatt scale.

For silicon wafers (semiconductors) to be able to turn sun rays into electrical energy they first have to be doped and then metallically coated. When short wave radiation such as ultraviolet light from the sun hits the wafer, electrons will be released from the coating – in each case leaving behind a hole. The released electrons then randomly wander around looking for a new hole to drop into. This effect, that causes the electrical current to flow, is known as electron-hole pair generation and recombination.

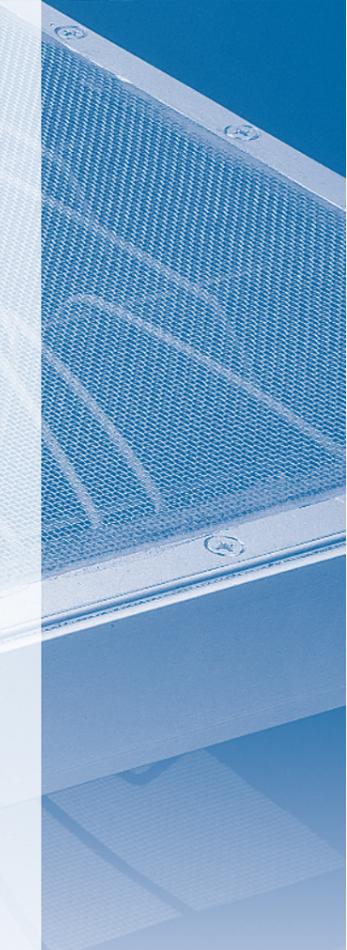
A true performer: PACO screen-printing cloths for solar cells

To dope the silicon wafers used for solar cells, the metalloids boron as well as phosphorous are used. Following this, a screen-printing process is used to superimpose razor-thin metallic contacts of aluminium or silver onto the front and reverse sides of the wafer. As this step in the process requires the utmost precision, the quality of the screen-printing cloth and frame plays an absolutely decisive part.

PACO has been developing and manufacturing metal wire cloths for the doping and electro-plating of solar cells using emulsion or film technology for more than 15 years. With the continuous development of high strength cloths PACO has made an important contribution to the increases in performance of solar cells.

Particularly the development of the PACO SD cloth and its enhancement to produce PACO SD-AM have set com-

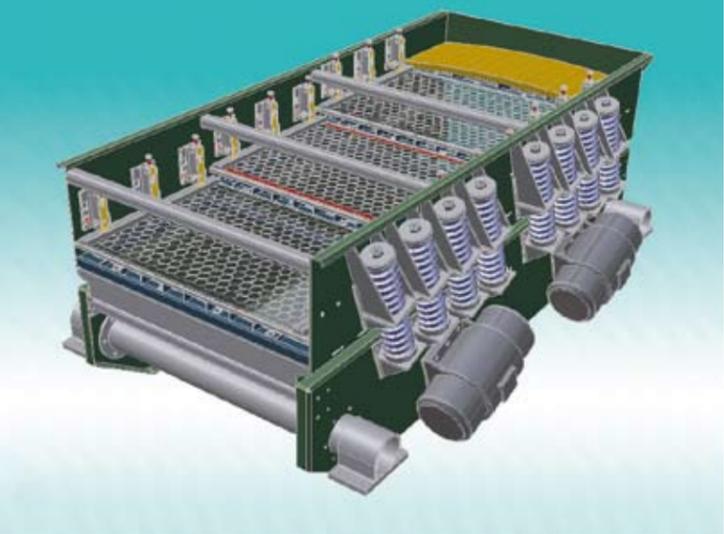
pletely new standards for screen-printing cloths respecting register accuracy, layer thickness precision, processing performance and working lifetime. The reason for this is the very high elastic limit which enables a particularly high screen tension. Consequently, the distance between the screen-printing screen and the print substrate can be minimized, thereby providing optimum register accuracy and longer lifetimes. All of this not only leads to higher quality solar cells, but also optimized performance. Whatever the case, PACO always likes to be around when the sun is shining – and on into the future as well.



As market leader with over fifty years experience and specific screen-printing know-how – in conjunction with its own screen-printing technology centre and dedicated in-house loom manufacturing capability – PACO has all of the requirements to continue as an innovation partner for photovoltaics and other leading-edge technologies.

World Exclusive

Pure Performance: PACO MA-G 10 Screening Machine



The PACO MA-G 10 is a powerhouse that is predestined for use in areas where other screening machines can no longer effectively separate.

A few weeks ago, following a number of years of planning and development work, PACO shipped the first MA-G 10 screening machine built at their own mechanical engineering facility. For the first time ever, a screening machine is now available that can separate even heavily agglomerated bulk material particles or materials that tend to get trapped. This is enabled by high acceleration values in conjunction with a uniquely high filter oscillation and PACO metal wire cloths and screen frames that have been specially developed to withstand the extreme physical load that they are under. Patents are pending for the PACO MA-G 10 screening machine.

Extending the boundaries of screening technology

There are certain materials that regularly test the limits of existing screening technology. This is particularly the case when the particles to be separated have a strong tendency to stick to each other – due to humidity or heavy oil, for example.

Conventional screening machines generally have to admit defeat. And even ultrasonic screening technology is often powerless in such situations:

the generated amplitude of the screen, in the region of 0.1–0.2 mm, is simply not enough. In addition, the currently attainable acceleration rates also prove to be insufficient. Screening machines that are considered to be state-of-the-art attain a maximum screening acceleration of 6.39 g. This is however too low for the separation of heavy oil and sand mixtures or heavily agglomerated fine particles.

The new “formula 1” screening technology

The PACO MA-G 10 screening machine offers true high performance – in every respect. With acceleration values of 10.5 g and an amplitude of 4.4 mm with a throw of 8.8 mm, the PACO MA-G 10 is at the moment world-wide in a class of its own. This gives the user advantages that, until now, were completely unobtainable. High screen acceleration is particularly important for the fine screening of media with a tendency to agglomeration. As the material being screened has a very low mass, the screen oscillation (amplitude) has to throw it as high in the air as possible. In this way, the impact when it hits the screen will effectively break it up so that it can be conveyed through the screening machine. The larger the screen acceleration, the higher the specific extrusion capacity.



Whereby the falling particles have to hit the screen just at the moment that this reaches its maximum speed on the way back up. The maximum relative impact speed between the particles and the screen will ensure an optimum separation, even of fine powders, heavy oil and sand mixtures or any other materials that tend to be strongly stuck together. This also applies to the de-watering of products with residual moisture.

Extensive development from the machine to the screen

The MA-G 10 is a joint development between PACO and STF Maschinen- und Anlagenbau GmbH Aicha, that among other things is a specialist for separating technology. Beyond its mechanical engineering contribution in the course of the MA-G 10 project, PACO carried out extensive development work in the specialist areas of screen cloths and screen frames. They had to find an optimum compromise between the wire material and the type of weave. A parallel development aim was that the screens used in the screening machine were capable of attaining a long lifetime and required minimum maintenance. After a long series of screening tests with problem materials had convincingly confirmed that the high aims of the PACO MA-G 10 developers were able to be fulfilled, the first machine was able to be shipped to its destination in an oil producing country. The machine will go into series in the third quarter of 2007. In the MA-G 10, PACO and STF see further proof of the innovative potential and global competitiveness of medium-sized enterprises in this country.



Visit us online!
www.paco-online.com

PACO Sieving Technology: Fibreboard – “Test of Fire” for Precision Screening

There are things in our everyday lives that are so commonplace that we don't give them a second thought. One of these is fibreboard. This is, nevertheless, a technologically demanding product that can be put to a huge number of mass-market or specialised uses. One of the main reasons for its popularity as a low-priced building material is the highly developed processing technology used to manufacture it. This is where PACO comes in, with their powerful sieving products.

Wood particles – the coarse come inside and the fine go to the surface
The production of fibreboard starts with the controlled crushing of wood – mainly coniferous wood. The wood particles produced in this way are then heated to dry before being sorted: coarser particles will be put into the middle layers of the board and the finer particles in the covering layers at the top and bottom. According to their specifications, the particles are then mixed with liquid resin, formed into a sheet and pressed together to form the boards. Finally the boards are conditioned, trimmed and sanded. Today this all occurs in a continuous process on state-of-the-art production lines; meaning that each stage, including sieving, has to be highly reliable and have long equipment lifetimes.

PACO sieving cloths and frames for the fibreboard industry
The special demands that the fibreboard industry place on their sieving technology include clear classification and extreme resilience against thermal and mechanical loads. When the particles leave the dryer they still have a temperature of 120°C. That is why PACO sieving cloths are stuck to the frames with a special heat-resistant two-component adhesive and are then additionally spot welded. This is necessary to prevent the detachment of the cloth and the resultant production stoppages.

The sieving and selection of the wood particles is carried out by large tumbler screening machines with a screening area of more than 10 m². These have of a number of screening decks placed above each other that each consist of several individual screening frames. The metal screening frames that PACO produce have screening cloths with a wire thickness and mesh size that is individually tailored to each specific stage of the screening process.

Long lifetimes and a reliable re-screening service
A characteristic feature of PACO screens are their long lifetimes. The extreme stress placed on the individual components in the fibre board production line means that sieve frames have to be periodically re-screened. To simplify

this necessity, PACO provides a complete service consisting of transport, specialised packaging and re-screening. At the PACO factory the screen frames are completely reconditioned. First of all the sieve cloths are separated from the frames. The frames are then carefully cleaned to remove all traces of the adhesive that was originally used. The desired

replacement cloth is then selected and brought to a special workstation where it is inserted into the frames, stuck and spot-welded. For the durability of the cloth and long lifetime of the screen it is important that the cloth is evenly held in the frame in all directions. That is why PACO use a specially optimised technology to re-screen their frames.



The qualitative harmony between sieve cloth, frame and screening is an important feature of PACO screens for the fibreboard industry.

PACO at the FilTech Wiesbaden, Germany: Where the “Who is Who” of Filtration and Separation Gets Together

The FILTECH, which is held every two years in Wiesbaden (near Frankfurt/Main), has established itself as the largest European conference and exhibition for filtration and separation technology. The fact that the areas covered are very close to PACO's core competencies meant that it was at the top of the list of shows that we wanted to be at in 2007. Together with our sales partner Doering GmbH we were among the exhibitors between 27th February and March 1st – with a very promising response.

Internationally recognized date
The FILTECH 2007 attracted more than 100 exhibitors from around the world. And the list of participating companies is like a “Who is Who” of the international filtration and separation technology industry. This meant that PACO had to exhibit as well. The solution of presenting ourselves together with our sales partner Doering GmbH on a joint stand proved to be extremely successful. We would like to take this opportunity of thanking the Doering representatives for the wholehearted and convincing way that they presented the PACO range. The interest shown by our visitors was particularly large. These came from Germany, a number of other EU countries, Asia, North and South America as well as Africa. As Jens Doering commented: “In particular, the quality of the visitors was important. The interest shown for the displayed products was completely across the board.” The organizers of the FILTECH also emphasized the comprehensive character

of their conference and exhibition which includes all aspects from conventional mechanical fluid separation through gas purification to diaphragm separation processes. The fields of application ranged from technology for mineral raw material processing and continued through power engineering, chemicals, pharmaceuticals and biotechnology to environmental engineering, water purification and water harvesting. As all of these areas are also covered by PACO's range of products our active participation at the FILTECH 2009 is already as good as certain.

PACO at the FILTECH 2007 in Wiesbaden – presented by the sales partner
left Marco Galeazzi (Doering)
right Roland Kirchner (PACO).



PACO. EXPORT.REPORT.

CHEMEXPO and PHARMAEXPO Mumbai: Growth Market India – PACO is Already There

India has developed to become an extremely successful location for the chemical, biotechnology and pharmaceutical industries. World-class research and development capabilities, extremely well-schooled specialists and a highly developed technological infrastructure are attracting more and more investors into a country that is rapidly becoming an economic force of global importance. PACO also sees India as a particularly promising market and always shows its presence whenever there is a suitable opportunity. This was the case at the exhibition and conference event CHEMTECH & PHARMA WORLDEXPO 2007 in Mumbai (Bombay).

Top class show on the subcontinent
Together with its Indian sales partner Girolls, PACO participated for the first time as an exhibitor at the CHEMTECH & PHARMA WorldExpo International Exhibition & Conference on Chemicals, Petrochemicals & Process Engineering. This was held between the 6th and 10th February 2007 in Mumbai (formerly Bombay).

The organizer of this exhibition and conference, that takes place every two years, is the Confederation of Indian Industry (CII). The event is always opened by a top level member of the Indian government. The exhibition as well as the PACO / Girolls stand were both extremely well visited. There was ample opportunity for numerous discussions with existing and potential new customers that all showed considerable interest in the PACO range.

Engagement with an excellent outlook
By being present with their products on the Indian market for more than 15 years now, PACO has been able to witness at close quarters the continual development of the country to become one of the world's leading trade nations. Experts predict that it won't be long before India becomes the world's third largest economy. The foundation for this success was laid at the beginning of the



Peter Ruppel (left) with the sales partner Girolls at the CHEMTECH & PHARMA WorldExpo in Mumbai, India.

nineties with the deregulation of general business conditions, the privatisation of state companies and the opening up of the market to foreign trade. All of this has resulted in rapid economic growth in India. Other factors that make India particularly attractive to foreign investors are the comparatively low level of wages and the high number of qualified English-speaking specialists. With a population of approximately 1.1 billion, India also has an enormous domestic market, which will continue to grow. For investors from abroad, such as PACO, the comparative predictability of legal decisions, such as those relating to intellectual property rights, is also extremely important. This all adds up to make India a country with a tremendous growth potential for the PACO group.



Bits and Pieces:

The Tale of the Shepherd and the Management Consultant

Once upon a time there was a shepherd that tended his sheep on a meadow in a particularly lonely part of the countryside. All of a sudden he saw a cloud of dust on the horizon that moved toward him at an alarming rate. It stopped just in front of him and as the dust began to settle a shiny new crossover SUV appeared. A young and dynamic man jumped out, sun-tanned and dressed from head to foot in designer clothes – pin-stripe suit with stiff white collar and spotted tie. He purposefully walked towards the shepherd and spontaneously asked: “My good man, if I guess how many sheep you have, will you give me one of them?”

The shepherd gazed at the young man and then at his sheep and casually answered: “Yes, why not? It’s a deal.”

The man immediately rushed back to his SUV, got out his notebook, linked it up via bluetooth to his mobile phone, logged into the internet on the NASA homepage, scanned the meadow on which he was standing with a GPS satellite navigation system and counted the sheep within seconds using a special evaluation software. He then got out a high-tech portable laser printer and printed a 150 page report containing numerous Excel spreadsheets, countless mathematical formulas and high-resolution PDFs of the satellite photos. He proudly presented the

shepherd with his results: “You have exactly 1586 sheep here.”

The shepherd nodded in agreement and said: “Yes, you’re right. There are exactly 1586. Choose yourself a sheep and take it with you.”

The young man didn’t need any further encouragement. He grabbed an animal from the herd and loaded it into the back of his SUV.

The shepherd watched all of this while nonchalantly puffing away at his pipe. Finally he said to the young man: “If I guess what you do for a living, will you return the livestock that you have just taken?”

The young man looked slightly perplexed, pondered briefly and replied rather self-confidently: “Sure, no problem. Well, what do I do for a living then?”

The shepherd took his pipe out of his mouth and said: “I bet you’re a management consultant.”

The young man looked rather baffled and started to stutter: “How did you know that I’m a management consultant – for more than 14 months now.”

“Easy.”, said the shepherd. “First you came here although no one had called you. Secondly, you wanted paying for telling me something that I already knew. And thirdly, you have absolutely no idea of what I do here. So I suggest that you give me back my dog, get in your soft-roader and try your luck elsewhere.”

entrance and reception area to provide additional space for meeting and conference rooms. In the top storey there will also be enough room for a generously

proportioned canteen. The rebuilding work is scheduled to last six months. At the moment, we’re all looking forward to when it’s finished!

Creating Space: The PACO Headquarters in Steinau is Being Expanded!

The extension of the PACO headquarters in Steinau is in full swing. Visitors and staff can all look forward to a generous number of spacious new rooms.

eighties. Since then, however, progress and expansion has brought about a lot of changes. This is not only reflected in the continual increase in the number of staff. Advances in office communications technology has created its own demands – particularly in terms of their space requirements. That’s why we are not going to accept compromises and cramped conditions anymore: the expansion of the PACO administrative headquarters is an important move forwards that will not only satisfy current space demands but also allow for further growth in the future.

An architectural face

Statement architecture is not usually a trademark of medium-sized manufacturing enterprises like PACO. We prefer to draw attention to ourselves through our innovations, powerful production technology, attention to quality and customer relations. But when we do eventually get round to doing something about our office buildings, it’s well worth making them look good. Notwithstanding this, we don’t want to contradict Louis Sullivan’s famous catch phrase: “form follows function”. After structurally surveying the plant, it was decided to add a storey to an existing industrial building connected to the present offices. This extra floor will have a length of 50m and a width of 5 m to create 250 m² of additional office space. The redevelopment will also completely change the face of the

For many years PACO has given priority to investments in its production and storage areas. Now it’s the turn of the administration. After increasing office space at the plant in Herolz, the company headquarters in Steinau is now being expanded. The more than forty staff employed there can look forward to having more room to work in. And our customers and visitors will also benefit from the new reception area and conference rooms.

Building for a new dimension

PACO’s development as a company has been accompanied by continuous growth. The increase in turnover in the 2006 financial year alone amounted to more than 15% – even though general market conditions were no means easy. In contrast to this, the basic layout and available floor area of the administration building hasn’t altered much since the

Steinau an der Straße: The Only Cross Country in the World Dedicated to the Brothers Grimm

The course of the international Brothers Grimm Run leads from Hanau to Steinau an der Straße – from one Brothers Grimm town to another Brothers Grimm town, so to speak. Hanau is the birthplace of Jacob as well as Wilhelm Grimm and Steinau is where the fairy tale collectors and linguists spent their childhood. Five stages, each named after a Grimm fairy tale (Little Red Riding Hood,

Sleeping Beauty, Snow White etc.) add up to a challenging run over a total distance of approximately 80 Kilometres. The stretch begins at a height of 100 m and climbs to more than 400m during the Mother Hulda stage on the fourth day. Anyone can take part, providing they feel that they can cope with the exertion of covering the course within a total time limit of 9:15 hours. Whereby



the performance is judged differently for men, women, young, old and even older – up to 70 years old and more. Part of the course runs along age old trading routes, passes historic buildings and through picturesque landscapes. This year the Brothers Grimm Run was held for the 23rd time.

For more information, click: www.mkk.de

PACO's Short Guide to Manufacturing



Work at PACO is characterised by a variety of different production techniques. We present the most important of these in a series that is appearing periodically in various issues of PACO WORLD:

5. Chip-removing metal machining

In filter making and mechanical engineering, machining metal using chip removing processes is one of the fundamental production techniques. The workpieces are e.g. filed, milled, ground, drilled or turned. At PACO we use the whole spectrum of these machining techniques. This starts with turning on a conventional lathe and continues through automatic turning and CNC milling to fully automated machining centres. Whatever the method, it has to play its part in assuring the high precision and quality of PACO metal wire cloths, also when they are further processed to produce filters, elements and machinery.

Imprint

All information in this edition of PACO WORLD has been carefully checked prior to publication. Nevertheless, we can make no guarantee for completeness, accuracy and up-to-dateness.

Publisher:

PACO PAUL GmbH & Co.
Metallgewebe und Filterfabrik
Industriegebiet West
36396 Steinau a.d. Straße
Germany
Telephone: +49 66 63-97 80

Editor, copywriter: ralf.geisler@t-online.de

Layout: info@knoechel.info

Printer: Druckerei Chmielorz,
Wiesbaden-Nordenstadt

Fotos: pp. 1 top and pp. 2 top centre – Fotolia / S. 4 bottom right – Tourist Office Steinau, photo Helmut Herber / all other pictures PACO

