Back contact is no longer a concept – it's proven

Experienced in back-contact module manufacturing since 2007, Eurotron is taking module manufacturing to the next level. "Back contact is no longer a concept. It is a proven technology and our clients are currently in mass production," says Bram Verschoor, Commercial Director at Eurotron. PES caught up with Bram and Jan Bakker, Technical Director at Eurotron, to corroborate this claim and learn why the solar industry is ready for back-contact modules.

PES: Could you begin by introducing your organisation and explaining to us how it serves the solar/PV industry?

Bram Verschoor & Jan Bakker: Eurogroup is a group of companies dedicated to back-contact module manufacturing and everything that relates to it. The group consists of Eurotron, Eurolab, and Eurotec. Eurotron produces equipment for manufacturing of solar panels and will be the topic of our conversation. Eurolab is a lab facility that enables testing of back-contact modules, while Eurotec is dedicated to general industrial technology applications.

PES: Back-contact technologies offer an interesting ratio between efficiency and price. What are the advantages in terms of power generation?

BV & JB: We believe that back-contact panels are the best way forward for power harvesting. With a single Eurotron manufacturing line clients produce between 10 and 90 modules per hour. Depending on cell performance, our largest production line generates between 200 MWp and 250 MWp on solar modules, on an annual basis.

It would also be good to mention that several cell types are already available, even if back contact is a new technology: MWT (metal wrap through), IBC (interdigitated back contact), as well as upcoming cell generations like HJ-BC (heterojunction back contact). As such, our production platform will support cells tomorrow as much as it does today.

PES: Why do you believe back-contact modules are the best way forward for power harvesting?

BV & JB: If you take a closer look at H-type cells, you will see they have ribbons from front to back. Current transportation means maximum ribbon thickness as the bend between cells may damage cells. Nor can ribbons be too wide, for they could reduce a cell's intake of radiation. Although we have gone from two ribbons in the past to four or even more today, ribbon thickness, width and quantities will always be constrained.

The plus is that cell performance is continuously improving. In just a couple of years performance rates have gone up from around 17% to a range of 22% today. However, resistance is the square of the current. If cell performance improves, it is not the voltage but the current that increases. This means any boost in cell performance development will result in additional resistance. It really is a pity. Millions and millions are invested in cell development, only to increase resistance in the module.

Back-contact modules solve these problems. In a back-contact module, cell currents are channelled directly to the rearside of the cell, where they debouch into a copper or aluminium conductive sheet. No restrictions are imposed on the thickness of this plain sheet: it does not block radiation or require bending. As a result, the module's internal resistance is reduced to an absolute minimum.

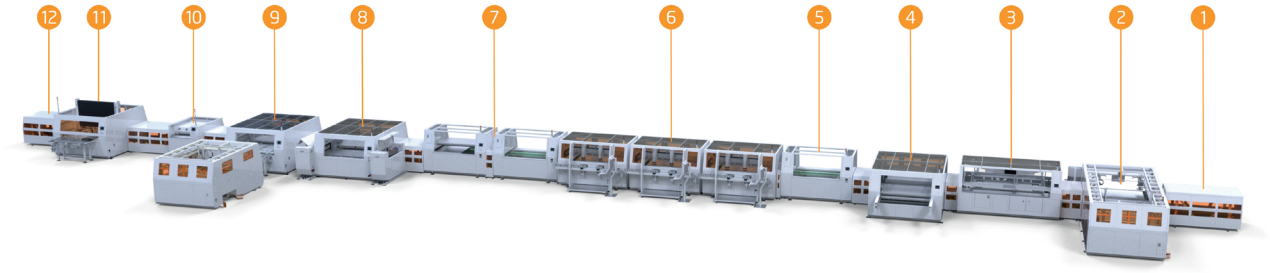
Traditional modules typically see a cell-to-module power loss of between 2 and 3%. Our modules produce a power gain of between 1 and 2%. A power gain? It may sound unbelievable. After all, our modules suffer resistance too. However, their resistance is overcompensated by the optical behaviour of the module: light trapping through the glass and back sheet combined with module materials which act as a reflector.

And yet there is more. Waver-to-cell conversion costs are lower than those of traditional modules as back-contact cells require less silver on the front of a cell. A traditional cell requires silver-printed lines to transfer currents; in back-contact cells via transfer currents to the rearside of a cell, resulting in a 3.5% drop in shading. Moreover, due to spacing, brushing, and the outer edge a traditional module has a dead area of about 11%. Back-contact modules reduce dead areas to 7%.

Finally, the power output of a traditional module in the field will drop at about 1% for about every additional 2 degrees Celsius once temperatures have exceeded 25 degrees Celsius. In the field, back-contact modules have shown 4% lower operating temperatures (NOCT), translating to 2% of additional power harvest.

EUROMAX 90

250MW/year - MWT/IBC/HJ-BC



Process steps:

1. Upwards elevator
2. Back sheet lay-up
3. Interconnection
4. Application of encapsulant
5. Quality inspection
6. Cell positioning
7. Quality inspection
8. Encapsulant unwinding and application
9. Glass de-stacking and lay-up
10. Pre-tagging
11. Flipping
12. Downwards elevator

PES: What are the implications of back-contact technology for the end user?

BV & JB: If you convert a back-contact cell into a back-contact module, you save around €0.02 per Wp. This is about 6% less than what you would pay for a traditional conversion.

In the field you gain additional savings as back-contact modules cover less space than traditional modules. The result is a capital expenditure saving per MWh of about 10%. And it may sound strange, but back-contact modules look better. There's no accounting for taste, but most people asked, think that back-contact modules look better than traditional modules.

Back-contact modules, finally, outperform traditional modules in the area of accelerated lifetime tests. During temperature shock tests in particular, back-contact modules have been seen to perform three to four times better. This is a cost factor, as a longer lifetime will yield a reduction in levelised cost of electricity (LCoE).

PES: What is the rate of production at Eurotron?

BV & JB: Our highly educated mechanical, R&D, and software engineers operate at an extremely fast pace. In 2016, in just six months, we produced manufacturing equipment amounting to a combined output of 1.5 GWp. Thanks to increasingly standardised equipment; we now install a production line within a few weeks.

Most module manufacturing lines require extensive tuning – a full month on average – before operations take on full speed. During this month, facilities are paid for and employees hired, but the investment does not pay off. Eurotron modules require as little as half a day of tuning.

Our team installs a line, powers it and within a couple of hours from start of production, a client is manufacturing back-contact solar panels at full speed.

PES: How is this possible?

BV & JB: Eurotron is taking a radically different approach to module manufacturing. Our approach revolves around a line that is made of several revolving carriers. Each process step is assigned to a carrier and happens simultaneously.

Thanks to the mechanical precision and optical alignment with our camera systems, we can achieve very precise module build-up. Because our lines are modular, problems can be isolated and identified at the earliest possible stage. Because we can adjust software settings remotely, clients enjoy a high uptime. With our new approach, we are pushing the market into an entirely new era of module manufacturing.

PES: Have there been any key product introductions or innovations at Eurotron since we last spoke?

BV & JB: Absolutely! We introduced Eurolab: a lab facility where material suppliers, scientific institutes, solar challenge teams and customers are welcomed to test and develop back-contact concepts, in a strictly confidential environment.

In addition to experiencing back-contact technology for themselves, clients cut back on the time they need to get to full-swing production. Thanks to Eurolab, customers can request certification for their modules whilst Eurotron is producing their equipment and save up to a few months' time!

PES: We know that you have been active in China for a number of years already. How important is the Solar/PV business in China to Eurotron?

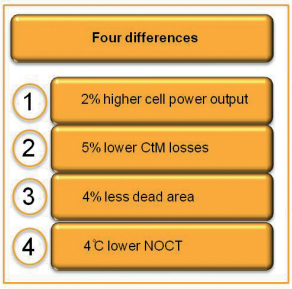
BV & JB: China is Eurotron's most important market for a number of reasons. Firstly, communication with our Chinese customers is very pleasant. There is mutual understanding, a high level of trust and a focus on the wellbeing of the other party – cooperation with Chinese customers is fruitful for all parties involved.

Furthermore, agility is a characteristic of the Chinese market. Generally speaking, Chinese players are the ones to incorporate new developments into their businesses first. Their employees – the operators of our equipment – are highly skilled, and there is another interesting factor to note. China once had the world's

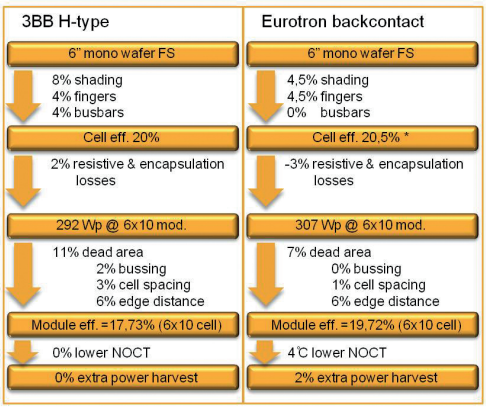
EUROTRON
POWERFUL INSTRUMENTS

Technology differences

Four differences contribute to Eurotron's higher module power harvest



Comparison of module power output starting with neighbouring wafers



*Reason: less shadow because of different front print and reduced electrical losses within the cell

largest production market. This is shifting; the country is becoming an ever-larger market for installation of modules. Not long ago, China's premier Li Keqiang promised his citizens a blue sky in not too distant future. In order to fight smog, solar panels are needed – and China is serious about this.

PES: To what extent do China and Asia as a whole embrace back-contact technology?

BV & JB: Supply of back-contact cells used to be tight, if available. Asian customers were reluctant to integrate a back-contact system due to the possibilities of cell supply shortage and related production outages. Today, the number of suppliers able to provide back-contact cells is always increasing and our (potential) customers' reluctance to move forward with back-contact technology is on a steeply downward slope.

PES: There have been significant changes in the political landscape, with BREXIT and Donald Trump coming into the White House. How do you think these changes might impact current trade agreements?

BV & JB: We are not politicians and cannot take a position in this regard. We can say, however, that we are not a friend of toll gates and trade restrictions. An example: Since the import restrictions for solar panels were introduced in Europe, prices of modules keep going. As a result, less panels are installed and the local installation industry is suffering.

PES: Speaking from a global point of view, lastly, which geographical regions do you anticipate to be key for Eurotron in 2017?

BV & JB: We would say that Asia as a whole and China in particular, are key markets for us. As well as Asia, we focus on the USA, Latin America, and Europe. Around 80% of our revenue is generated in Asia; the remaining 20% comes from other places in the world.

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