



# WAY of life



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## assembling is like juggling

*The tbp supplier day, tbp customer day and the open day now lie behind us and tbp is getting ready for the next Electronics & Automation fair on 25, 26 and 27 May in the Jaarbeurs in Utrecht. During the supplier and customer day we showed our guests what juggling really means: concentration, watching, keeping an eye on your juggling partner, hand eye coordination, **collaboration**, talking and acting, staying sharp, looking ahead, assessing difficult situations while keeping cool. Whether they are balls, clubs or knives, they stay in the air. And that is exactly what happens during the total assembly process. Assembling is like juggling: you need to be alert the whole time for unexpected situations but - after years of experience - the basis should just flow by itself. There must be trust, the courage to let go. By organising these gatherings, tbp strives to foster trust in new clients and to strengthen the bond of trust with its existing clients. All of us at tbp see a rosy future with you.*

*Ton Plooy, CEO*

# contents

- 2 column
- 3 E&A2011 fair
- 5 looking back at 2010 fairs
- 6 open day
- 7 Nevat: working with capacity
- 8 machine park perfected
- 9 summer closing days
- 10 tbp supplier & customer days
- 12 Holst Centre & Bronkhorst High-Tech
- 13 new test platform: GTP
- 14 tois
- 15 Document Management System (DMS)
- 16 quality system
- 17 BTG: technical ingenuity
- 18 ODB++: magic or daily fare?
- 20 CD&V new year reception in Geel

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# may we invite you?

**ELECTRONICS  
& AUTOMATION 2011**

JAARBEURS UTRECHT  
25-27 MEI 2011  
[WWW.EABEURS.NL](http://WWW.EABEURS.NL)

*Every self-respecting electronics professional is probably looking to the final stretch before the Electronics & Automation (E&A) fair which will be held from Wednesday 25 to Friday 27 May at the Jaarbeurs in Utrecht. This bi-annual professional trade fair, organised by FHI, attracts about 130 electronics exhibitors. The programme also includes a congress and presentations. In all, the fair attracts more than 4.000 professionals. It goes without saying that tbp electronics will have a stand there. Our stand, resembling our Grand Café, will again offer the space and opportunity for*

*useful and congenial discussions. We would like to invite you to our stand 8E024. Tip: would you prefer to visit us during our happy hour? Then come on Thursday 26 May in the afternoon. A musical accompaniment will make it even more enjoyable. By the way, as it was such a success, HET Instrument will be extended: two delicious Belgian tap beers will be served again. Any reason is a good enough reason to visit our stand. Another tip: make things easy for yourself by getting a free entrance ticket. Just register in advance using the relevant news item on our website: [www.tbp.eu](http://www.tbp.eu).*

continued on page 04 >



### why go to the E&A?

Ton Plooy is not only CEO of *tbp* electronics, but is also a member of the trade fair committee of the FHI's industrial electronics sector. He put the case for coming to the fair convincingly during the fair's kick-off: "All the relevant players in the electronics industry are at this event and visitors can get the latest low-down on the industry in all sorts of ways. Even a whole day at the fair is not enough."

What can you expect at the fair? First of all, the participants' stands. Then there is the conference programme. In contrast to last year, entrance to the seminars will be free this year. However, advance registration is required (through [www.tbp.eu](http://www.tbp.eu)). This year's programme contains the subjects man-machine-interface, traceability, wireless communication in the production environment, sustainability and tomorrow's electronics. Another subject currently drawing much attention, is the Live PIL, de Production Integration Line. This mini-factory, a chain of connected machines supplied by twenty companies, will again show how the electronics of the forthcoming gadget - yes, it will again make its appearance! - are produced. Part of the production will be done beforehand this time in order to cope with the rush of the first day of the fair. And finally, developers can go to the Development Club Pavilion. Many themes can be found there that will be made known on the website: [www.eabeurs.nl](http://www.eabeurs.nl). Now that we have mentioned the word

'developers', we would like to let you know that representatives of Techno-*tbp*, the collaboration that was started last year between *tbp* and Tehnolution, will be at our stand. Techno-*tbp* is the contact point for OEMs in particular who are interested in the development of electronics from the idea stage to the final product!

### electronics gadget

We have already mentioned it: the gadget. This time it is a top with the name 'spinner'. When the top spins, LEDs light up to form a text. Visitors can assemble the gadget themselves by collecting the different components at various stands. The gadget has been tested carefully, and is a further development of an Elektor design in collaboration with Analog Devices. It is sponsored by more than ten companies, including *tbp*, who have either made components available or who have made a financial contribution.

**We hope that you enjoy the fair and we look forward to seeing you in our Grand Café, 8E024.**

# looking back at 2010 fairs

the musical delights of De Swingers during the happy hour put everyone in a great mood. We have invited them again to play at the *tbp* happy hour on Thursday 26 May in the afternoon at the next E&A2011 fair.

[www.deswingers.nl](http://www.deswingers.nl)



*Last autumn, tbp successfully took part in three gatherings worthy of mention:  
HET Instrument 2010, electronica 2010 and the LED Event 2010.*

HET Instrument, back in the Amsterdam RAI after a few years' "stay" in Utrecht, was a success for tbp despite the slightly lower number of visitors than expected. Our business contacts were certainly able to find their way to our Grand Café. Not to mention the magnetic powers of our tap beer on passers-by. The beer was clearly a draw for one student from the KH Kempen University College in Geel. On hearing that it was free he twittered his friends: "Free beer at the tbp stand". It did not take long to see what happened next! Who knows, these students may be tomorrow's prospects or colleagues. Oh yes, the musical delights of De Swingers during the happy hour put everyone in a great mood. We have invited them again to play at the tbp happy hour on Thursday 26 May in the afternoon at the next E&A2011 fair.

The crowd visiting the stand at the electronica fair in Munich was slightly smaller than expected. This has taught us that we need to make ourselves better known abroad. That said, we are not unhappy as we have a number of prospects in the pipeline. And finally, we took part in the LED Event in Eindhoven on 23 November 2010. The organiser, FHI, was able to bring a group of about 250 participants together at the Evoluon in Eindhoven. One of the speakers at this combined seminar and fair was Bart Cox of tbp electronics Belgium. He gave a presentation about "obsessed and industrious production". From a survey held after the event, it appeared that almost everyone who attended the LED Event came to expand their knowledge. The presentations far exceeded their expectations. The visitors were very enthusiastic about the event that will again take place at the end of the year.



*the kick-off meeting E&A2011*



*LED Event 2010*



*electronics fair 2010*

*HET Instrument 2010 fair*





# open day in Dirksland

*It was announced well in advance on social media and in the local media: tbp's open day in Dirksland will be on 16 April 2011. Come and see how electronics are produced, after all, electronics are the future was the warm invitation. And it worked. Hundreds of visitors turned up to have a look at what takes place behind the walls of the company. While the golden rule is usually that looking is only done with the eyes, the company made one exception to this rule. A number of workspaces were open to young and old alike to have a go with the soldering iron to make a printed circuit board assembly using various components. The end product was an electric dice that the visitors could take home with them. A fun alternative for gamblers!*

They were amazed to see how printed circuit boards (pcb's) are magically turned into printed circuit board assemblies (pcba's), as the finished products are often called these days. The yellow light that shone from the clean room also called for an explanation, which the staff members were very eager to give. This was about the fifteenth time that tbp held an open day in its 35 year history. It goes beyond only words in relation to corporate social responsibility. A major reason to hold open days is to get people interested in electronics and in working at tbp: get them familiar with EMS, what exactly happens, and the atmosphere of the company. One of the goals is to attract people to fill the various vacancies that we

currently have. Experience has shown that despite unemployment, it is still hard to fill the current vacancies well. In any case, it was encouraging to see so much interest among the visitors, and that the pleasant ambience in the Grand Café made it a good place to talk about what is happening on the work floor. A number of visitors showed their interest in applying for one of the vacancies! But it was not only job applicants who visited the company premises. Family members and friends of employees and interested members of the public also came in to have a look around. Happy with the self-assembled dice, many stayed to enjoy a drink and a snack. It was the end of a successful event.

*People looked with great interest at the wave solder where the soldering process takes place.*



*Various components are positioned in the right place by hand.*



*Time for a practical session of good soldering required for the electronic dice.*



*An explanation about the workings of each machine was given.*

# Stronger together and improving capacity

*It is no secret that tbp electronics is striving to be the best supplier in the EMS world (Electronic Manufacturing Services). Maintaining professional contacts with partners that play a significant role in this world is crucial in reaching this goal. Nevat (Leading group of Dutch suppliers, a part of FME) is a sector association whose members comprise 250 leading suppliers. Nevat's goal is to support its members to perform better. This is the reason for tbp to join Nevat. Recently, Anton Hermus, COO of tbp electronics Belgium, has taken a seat on Nevat's sector board, EMS. A good reason to pause and look at this energetic organisation more closely.*



Edwin Dekker, Nevat



Anton Hermus, tbp electronics



## Nevat

Edwin Dekker, EMS sector manager, and the management and coordination engine behind Nevat, explains: "Nevat has a clear mission. The ultimate goal is to make the Dutch suppliers' market one of the highest value markets in Europe. That means that Nevat's member companies are the first to hear about everything that is happening on the market. This allows them to anticipate better. Great benefit thus compared to the companies who do not belong to this group." Given that Nevat is a melting pot of various disciplines, a number of sub-sectors have evolved such as the car industry, system developers, sheet metal industry, precision machining, system suppliers, EMS and the Precision Parts platform. "All kinds of activities are developed within these sub-sectors and are discussed in order to reach a common goal," continues Edwin.

## EMS

The sector EMS was created on 1 January 2003. It combines the strengths of Nevat affiliated companies that are specialised in producing electronics. Anton is pleased with his participation in the discussion about further professionalisation of the EMS sector. Several subjects are brought forward that are also important points for tbp. Anton: "We will devote attention to issues such as innovation, an important factor in manufacturing. Not only in terms of knowledge, but also in terms of ability. There are several working groups within our

group that are working on improvement projects. There's enough to do." Discussions still take place, for example, about leaded and lead-free soldering. While clear regulations do exist, this does not mean that everything is in order. Think about the macro-economic problems, cash flow, production resources, throughput speeds, the availability of components and so on. Enough food for thought to jointly find the right way to get everything moving in the right direction. That direction must result in what the sector itself calls "the prominent positioning of service provision in Dutch electronics companies on the international market".

## proven effect

Establishing a trade organisation may not be rocket science, but it does require a tremendous input from the organisation in order to consistently achieve the goals effectively and successfully. The organisation has justified its right of existence over the last few years. A couple of examples:

- much has been achieved regarding the integration of production and design. The design and production companies used to be in opposition. There was little talk of collaboration. The engineers dictated the specifications and the suppliers just had to listen. The relationships were poor. Nevat has managed to bring the two parties closer together. The design companies and the suppliers now work together, with both parties checking the specifications and their practicality with each other;
- for deliveries abroad, producers are required to meet the world class manufacturing (WCM) regulations. If a

company maintains the WCM techniques and tools, it is clearly striving to be included among the best in its sector. These methods include Lean Manufacturing, Total Productive Maintenance (TPM), Six Sigma and the European Foundation for Quality Management (EFQM). Nevat has stimulated the active use of these tools, thereby greatly improving performance;

- the creation of a strategy around supplying is a vital condition to remain successful. This led to the definition of a benchmark. This benchmark allows Nevat to quickly make an assessment of how a company performs using critical factors from the *business balanced scorecard* such as throughput time, dropout percentage, procurement statistics and so on. An independent centre of expertise in Nevat enforces the benchmark. The members can use the results to adjust their strategies or to draw their clients' attention to their unique qualities.

Apart from the meetings for the members, a congress is held once a year. Ministries, policy makers, the financial world and industry gather together to discuss subjects of common interest and importance. This congress has generated a great deal of approval and recognition. And finally, Nevat also initiates and develops regulations for subsidies for innovation awarded by the Ministry of Economic Affairs, Agriculture and Innovation. Regular consultations take place between Nevat and the Ministry to tighten or adjust the regulations as required.



## machine park further perfected

*Another step was taken in Dirksland recently to further perfect the machine park with a view to improving the production process. Three new screen printers with connecting inspection equipment are now in operation, to everyone's great satisfaction. One of the first activities in the assembly - some call it "bestücken" - of printed circuit boards is the selective application of solder paste at the right places. This paste enables the electrical and the mechanical connections after the components have been placed. Easier said than done. Too much paste quickly results in a short circuit, while too little means a poor connection that will not last long. Similarly, the accuracy of placing the paste is crucial: the paste can end up in a path and result in short circuits or too little metal. Procedures stipulating the right way to apply the paste that are automatically adhered to are a must.*

### screen printing

The technique that is used to apply the paste originates in the graphic world: the screen printing technique. It is often used for artistic creations, and also in the technical world. There are three machines in the factory in Dirksland that operate according to the screen printing technique. While they do their work as they should, there are a few disadvantages of the previous configurations. One of these was that the programme that operated the machines was not interchangeable. That means that that software used to produce one particular print only worked on one of the three machines. If, for whatever reason, the production needed to be done by another screen printer, a new programme for the same print job needed to be made for that particular machine. This severely limited the degree of flexibility on the work floor.

### a little bit of technology

During screen printing, a particular paint or ink is applied to a substrate, for example paper or plastic. The paint or ink is pressed through a fine mesh or metal stencil which is called a 'screen'. By either sealing or opening parts of the mesh, the paint is applied in the desired pattern. Applying solder paste on the still empty printed circuit boards is done in the same way. Using a so called 'loader', the boards come into contact with the screen printer in the right way. Each board has its own specially produced stencil. The loader loads the board onto the holder of the screen printer. The stencil is then positioned precisely using a number of reference points. Once the specific digital information (the programme) is loaded for that particular board, work can start: the squeegee presses exactly the right amount of paste in exactly the right spot. The drops of paste are in precisely the right place to connect the components on the so called 'pads' at a later stage. Pads are little islands, as it were, at the ends of the copper connections on the board. The paste is slightly sticky so that the components which are placed in the next phase of the process remain stuck in the right place before the soldering is done.

### new screen printers

To remove the disadvantages of the current screen printers and to prepare for the technology of the future, tbp electronics has purchased three screen printers from DEK. The Horizon 03iX platform meets tbp's stringent requirements such as a high print quality, the universal use of a shared database and a high level of reproducible accuracy. Even the changeover time, the flexibility - thanks to an excellent GUI (Graphical User Interface) - and the reliability more than meet the expectations. Further, the service is in good hands. It is provided by Partnertec with whom a good relationship has built up over the years. Among the items serviced by Partnertec is the Vitronics oven and the Dage X-ray equipment. Our confidence in our suppliers was partly confirmed this year by manufacturer DEK being awarded with this year's Distributor award by Partnertec.

### new inspection equipment

A special 3D paste inspection is required to stringently check the positioning and the amount of solder paste. Using the stencil data, the inspection machine checks if the right amount of solder paste has been applied to the pads. The height, width and shape are important aspects, and the system also "looks" for any threats of short circuits. The new Koh Young inspection machine (supplied by W&S Benelux) even measures the solder paste on uneven parts with the accuracy of a few micrometers. For comparison: the diameter of a human hair is about 100 micrometers. Should the testing equipment detect any unevenness, it sends a signal. The operator can then decide if the board is suitable for further processing. But, thanks to the screen printer that now works perfectly, the signal will rarely be heard.

*More information is available on the following websites:*

[www.dek.com](http://www.dek.com)

[www.partnertec.nl](http://www.partnertec.nl)

[www.wsbenelux.nl](http://www.wsbenelux.nl)

# no summer closing in Dirksland

*For the first time in its history, tbp electronics will experiment with a staggered holiday period in its Dirksland (NL) branch. The company will thus not close this summer.*

*The production capacity will be somewhat lower during the holiday period than during the rest of the year, but the advantage is that you won't be faced with a closed door. The staggered holiday period will be from Monday 4 July until Friday 2 September (weeks 27 to 35 in 2011). There is a chance that your trusted contact person may not be present, but one of his/her colleagues will do the honours.*

### summer closing in Geel

*The Geel (B) branch will close for summer from 11 to 22 July (weeks 28 and 29 in 2011). For any urgent matters or orders during this period, please contact Mr Frans Geerts: [fgeerts@tbp.eu](mailto:fgeerts@tbp.eu), M +31(0)650252708 so that we can find a solution together.*

*For urgent matters from both branches: please send quotation requests, forecasts and orders in advance to avoid problems in your production process.*



Arnold de Vos



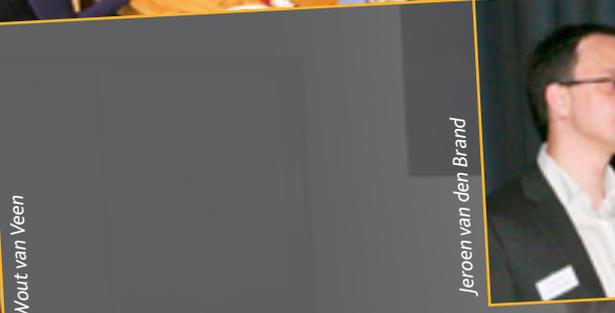
Wybren Jouvasma



Rutger Mollee c.s.



Wout van Veen



Jeroen van den Brand



Wiljo van Okkenburg



Anton Hermus



Ton Plooy



Ate de Vries

custo

*For many, the tbp customer and supplier days was an inspirational gathering with a pleasant atmosphere. These were the overriding reactions of those who took part in the now almost traditional events of 13 and 14 April. Both clients and suppliers rated the presentations with a high score of over eight, showing their appreciation. Tbp updated the guests on relevant issues in a series of 10 minute long presentations. The issues of importance to the outside world included: a glimpse to the future, the financial key figures, quality and the supply chain. Thereafter the attention turned to Techno-tbp - the collaboration with the development company Technolution - and a presentation was given about innovation in the electronics sector (see page 12). The floor was given to MBTM Consultancy to close the official part of both afternoon sessions. MBTM stands for: More Balls Than Most ([www.moreballs.com](http://www.moreballs.com)). The virtual professor Rutger Molle then announced that he had carried out research into change behaviour of individuals and organisations. His announcement quickly unearthed the real identity. This was unearthed in a cabaret in which EMS terminology was combined with expert juggling. It was a trio act that everyone clearly enjoyed.*

#### future vision

After the opening by Ton Plooy - who else could do it? - the chairman of the day, Joep Stassen, gave Anton Hermus of tbp electronics Belgium the opportunity to talk about developments at tbp. Things are plain sailing at tbp Dirksland. The production has been extended to two shifts. The financial figures underline the fact the recovery that started in the 4th quarter of 2009 in Dirksland has continued. The results are that 2010 was a positive year and that this year started strongly. In tbp Geel, efforts are continuing to reduce the dependency on a few large clients and to spread the work among about thirty

clients. tbp will be Alcatel-Lucent's NPI (New Product Introduction) assembly facility. The product will be moved to another EMS partner in Romania using the Transfer of Technology method once scaling-up and sufficient experience has been gained. Two led product projects have faced problems. One order has been halted, and will not be included in the client's programme anymore. A second project suffered component delays resulting in high stocks and negative pressure on the working capital. tbp Geel is currently running a number of programmes: the improvement of the cash situation due to short through-put programmes; the three



# Customer & supplier days

hour factory; and the tois (tbp's operations improvement system) programme. The tois entails improvements being made in a playful manner that makes hidden costs visible so that they can be reduced. Apart from the usual production service, tbp electronics Belgium is independently working on supplying test engineering services and repairs. It recently acquired a large contract for a series of services.

## key figures

Wiljo van Okkenburg, financial manager, painted a rosy picture about the situation in Dirksland. The 2010 results are significantly improved. The last quarter in particular saw a sharp growth in turnover. The 2010 turnover is more than half as much compared to the previous year. Parameters such as solvency, liquidity and labour productivity are above the usual standard. The budget for 2011 assumes continued growth so that the annual turnover is expected to increase further. Important indicators requiring extra attention are the labour productivity (added value) and optimum stock management. After all, these key figures determine the solvency and the liquidity and thus how successful the company is. The future looks good.

## quality

In his presentation, Wout van Veen highlighted three aspects of the term quality: vision, key figures and traceability. Vision points to the understanding that quality

must be reflected throughout the chain, from design to end product and all the steps in between. A complicated process in which communication between client, supplier and manufacturer is crucial. The key figures show us the impact of the improvements put into action. The chance that a product is manufactured without errors in the first run is slowly but systematically rising to the theoretically achievable 100%. Clients attach increasingly more value to traceability. This means that tbp must do everything possible to register the origins and handling of all materials and activities. The ERP system Isah7 is an invaluable link in this chain.

## tbp the logistic way

Arnold de Vos presented an overview of the supply achievements of suppliers according to the QLTC (Quality, Logistics, Technology & Innovation, Costs). The figures clearly show the challenging scenario on the components market. Long delivery times are no exception. It is crucial that suppliers report delivery problems in a timely fashion. Being aware of delays means that other solutions may still be found. The need can not be stressed enough for suppliers to give early warnings as soon as possible to avoid the threat of stagnation. This also applies to the regular product storage buffer. Luckily, the first quarter of 2011 shows a slight increase in the average delivery rates of suppliers.

## Techno-tbp

Ate de Vries, program manager at Technolution, could explain to those present in the clearest of terms what Techno-tbp stands for. The collaboration between the two companies is rooted in the changes in company policy in many OEMs (Original Equipment Manufacturers). More and more OEMs are concentrating on their core business. That's where their knowledge lies. Electronics is often only one part of a machine and as such is a different discipline. An intensive collaboration between designer and manufacturer significantly improves the product's quality. As long as account is taken of issues such as manufacturability and testing at the design stage. By concentrating everything under one supplier who both designs as well as manufactures, the client has a significant benefit: there is one point of contact that is responsible for the whole chain. This is managed by the OEM employee.

Our guests qualified the event as useful, informative, inspiring, interesting and pleasant. What stood out in their feedback was their enthusiastic response to the speakers and the well thought through presentations. And finally, thanks to all the participants for their positive reactions.



## Jeroen van den Brand: electronics foil

Utopia: foil with added functionality from integrated electronics. Does that exist? Yes! Even though developments are still in their early days, the efforts of the Holst Centre (collaboration between TNO and the Belgian equivalent Imec) have successfully embedded electronic connections in flexible, plastic foil.

Jeroen van den Brand, Integration Technology programme manager at the Holst Centre, has worked on the development of various intelligent flexible foils since 2006. The initial results are positive. The integration of electronics either in or on foil may seem similar to conventional printed circuit board assembly, but then in a flexible version. That is however not the case. There are few similarities. The electrical connections on the foil are not generated by copper etching, but by printing conductors on plastic foil. Components such as resistors, capacitors and so on are mostly placed at the level of the chip. Chips can be made so thin that they too become flexible. The electric current, mostly derived from flexible batteries, can even be integrated in the foil. The technology also exists to print materials that convert light to current so that flexible solar cells can be made.

A whole new world opens when we think of all the applications for this new generation of electronics. One example: a plaster with an integrated sensor that registers the heartbeat and transmits the information through nfc (near field communication) or stores it in a memory. Or a blister pack of medicines which check the dosage



## Wybren Jouwsma: gnomes and innovation

You can't help but prick your ears when you hear the title of Wybren Jouwsma's, technical director of Bronkhorst HighTech BV in Ruurlo, presentation: "about gnomes and innovation". Who are the gnomes? These are people in an organisation who he categorises as the "freaks". The people who don't follow the well trodden paths and who do new things with good ideas. Successful entrepreneurship without the expensive pre-analyses. They do it with flair, and sometimes going against the current. Creatively using experiences, using what they hear and see. These qualities must be innate, you can't study them. Who Wybren describes is not difficult to guess for those in the know ... Wybren is more techie than psychologist in his daily life. Bronkhorst High-Tech's core business is the control theory of gasses and liquids, in particular in the laboratory sector. Bronkhorst, only 30 years old, derives its name from the smallest city in the Netherlands. The city, together with Hengelo, Hummelo & Keppel, Steenderen, Vorden and Zelhem, is now part of the municipality of Bronkhorst. Bronkhorst's products are applied in diverse market sectors, from the nano-technology and semi-conductor world to the medical world. General characteristics: the measuring of small amounts of gas or liquids per time unit using an upper limit that is comparable to measuring water and gas in a domestic environment. The applied principles of measuring rest on measuring the degree of cooling of an electrically heated resistor as a result of gas or

liquid flows. Mechanically moving parts are thus not included. Well known clients include OT, Aixtron, TNO, ASML, ASMI, Shell, DSM, Dow Chemical, Dräger and the scientific world such as universities.

### Jeroen van den Brand and Wybren Jouwsma were guest speakers at the tbp customer returning supplier day.

through detecting the state of the rupture side. You can then later see exactly what time the medicines were taken.

Research focuses on both the choice of the foil materials and the electronics as well as the development of the production tools. The Holst Centre is working on the development of these technologies together with more than 30 companies such as Philips, Panasonic, DSM, ASML, Olympus and Agfa. They are joining forces and working together to develop the "intelligent foil" and turn it into a valuable product in its own right. There are challenges enough to keep Jeroen and his companions busy!

[www.holstcentre.com](http://www.holstcentre.com)

Apart from his passion for technology, Wybren is interested in nature. He volunteers at the IVN Association for Environmental Education, contributing to the maintenance of the landscape. Activities include protecting hedgerows and pollarding willows. He also acts as a guide for one of IVN's nature walks. His interest in "everything that lives and grows" permeates his home environment: his vegetable garden and orchard provide him and his family their daily food. There is enough to do throughout the year, every weekend to forget the daily worries. Wybren is certain that this is how to keep balance in life.

[www.bronkhorst.com](http://www.bronkhorst.com)

# new thorough platform test

Last year, tbp's test engineering department worked on developing a Generic Test Platform (GTP). This test platform - developed to test printed circuit board assemblies (pcba's) - is the outcome of the experience built up through the years in this department. What transpired was that increasingly more similar measurements were needed to test new products. Should it be possible to use the measuring equipment to test various products, the product specific test development costs could be kept to a minimum.

The catalyst to develop the GTP was the realisation that standard test systems such as the AOI (Automatic Optical Inspection), flying probe or in-circuit test were not suitable to cover all aspects of testing pcbas. Extra tests were needed to ensure that the board fully met specifications. The only solution is often a tailor-made test system. This, however, means much development work for both hardware and software. A system like this is then only justifiable for high production volumes or high quality requirements. Reducing this development work and the related cost savings were the reasons for developing the GTP.

## for clients' usage too

The GTP can equally be used in the product design process. It offers many opportunities for clients to verify prototypes. Experience built up during the verification process can significantly reduce the test development costs of the end product.

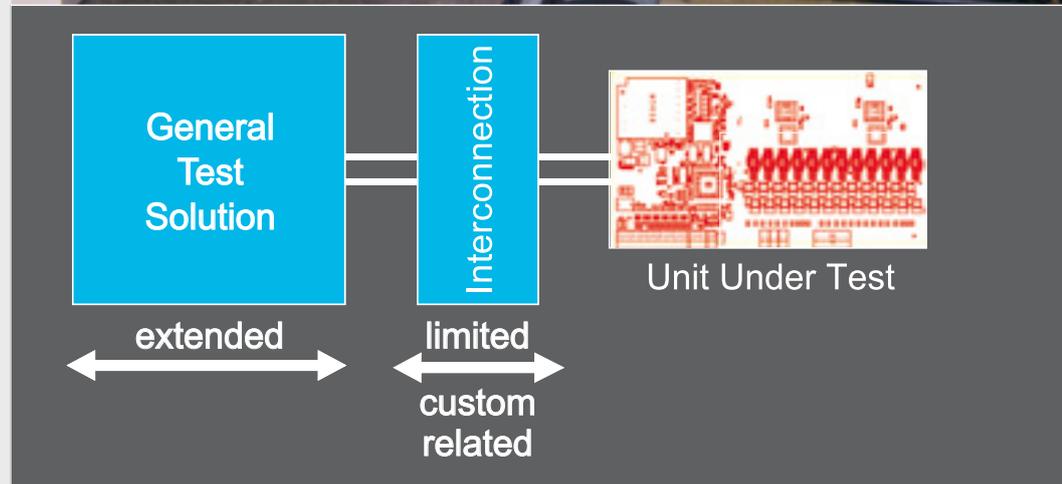
## what makes the GTP unique?

The testing of a UUT (Unit Under Test) comprises the sending of a test signal to specific UUT test points or interfaces, and measuring/analysing the resulting reaction. Tailor-made test solutions often use a needle bed to create a connection between the test hardware and the UUT. This technique is also used in the GTP, where the needle bed is attached to a tailor-made pcba. The needle bed is mechanically pressed to the UUT during the test. The GTP's housing and its operational mechanism are supplied by Test-ok. In the case of less complex pcbas, the GTP can be compared to a well developed

in-circuit tester, but costs a fraction of the price. This is because tbp has developed an intelligent interface that makes it possible to connect the GTP test hardware to the UUT in a dynamic way. The dynamic character allows the best use of the measuring potential of GTP test hardware. The GTP test hardware comprises four GTIFs (universal measuring cards), developed previously by tbp, that can be plugged into the GTP interface.

When introducing a new product for testing, only the UUT specific part needs to be developed again. The generic part of the GTP remains and can also be used to test other products.

The GTP is controlled by the previously developed GETS test platform that is based on National Instruments' TestStand. The generic character of the GTP test hardware means that the control software can be reused to the maximum.



the block diagram



## tois: the continuous improvement process

*Tois (tbp's operations improvement system) strives to get all employees in the company working on improving the company's processes. Strides have been taken in many areas. One example is the reduction of the throughput time of the assembly of high runner products from an average of three weeks to one day. An incredible success! Of course all the necessary materials must be available before the process is timed. The difficulty in obtaining some components which have a delivery time of three months or more make an objective time measurement impossible. The emphasis on the time saving aspect now lies on removing any time swings that arise. With this in mind, the aim that the three hour goal is achievable is both feasible and justifiable. A clear time saving has also been reached in the changeover times of machines (indicated as smed - Single Minute Exchange of Die) Until recently, this was one to two hours for every quarter of an hour now.*

### production on demand

A client will often place an order at the very last minute for various reasons. On the one hand, clients want as few ready-made pcba's (printed circuit board assemblies) - the finished products - in stock as possible, and on the other hand they need these in order to be able to make their final product. Keeping finished products in stock is relatively expensive and they are vulnerable to possible revision requirements which, if not done, make them redundant. This means that clients prefer to place their orders at the last minute. Furthermore, doing this is good for the effective use of available components. In the worst case, if a pcba is no longer applicable, a finished product may be discarded, while components may still be sold. Delivering quickly on demand in other words is directly economically beneficial to the client.

### insight into processes

Each work zone in the factory such as the mounting, inspection or test zone, has a computer screen which shows the productivity goal for that zone in real time, and what is achieved in reality. There are three indicators on the screen: a green, orange and red coloured bar. The information in the bars directly show the operators where something is lacking. At the end of the day the operators can review the statistics and see where to make improvements. Direct feedback fosters the right discussions which result in improvements. The screens are not intended to point fingers at anyone, but are used to enhance the knowledge of production processes and thus their improvement.

### 5S

The 5S method was explained in the previous Way of Life. In short it is about creating and maintaining an ideal workstation. The five actions are Separating, Sorting, Cleaning, Standardising, and Systematising. Since its introduction, Geel has seen good results. In this method, the employees regularly check their own zones and designate a colour to the results: red is poor, green is good. At present, the focus lies in phase 2, or sorting. In this case, it means that the tools are always in an agreed place. If the tools are not there it means that a colleague is using them. The result is immediately visible: the factory looks neat and tidy.

### better communication

During the shift change, it is common practice that the work is handed over during a short overlapping period. Now there is consultation about, for example, the most efficient way of organising resources, tools and so on. A discussion starts that leads to a communal approach to a problem and the best solution. In practice this leads to a change of culture on the work floor that is perceived as positive. We are another step closer to perfection!

# the paperless office is closer

In the previous *Way of Life* it was announced that tbp is taking the reduction of paper flows seriously. "This is a real challenge which I, together with three other students, am really interested in", says Rolf Nagtzaam of this final stage of his computer sciences course at Rotterdam University. A DMS (Document Management System) is an obvious aid in reducing the paper flow. The DMS takes over the flow of information, as it were: no information on paper, just on the computer screen. Rolf: "Before we choose which DMS is the best suited to our company, we need to carry out a thorough investigation. tbp management also wants to know the current paper flows within the organisation. Once we know this we can look for the right solution."

## five information flows

The preliminary research into the naming of the various information flows has already had results. It appears that there are five easily definable paper flows that can be digitised easily:

### 1. *procurement invoice management.*

This concerns automating the complete stream of procurement invoices such as in-coming order confirmations, invoices and delivery notes. The advantage of a DMS is that relevant documents are automatically linked so that there is always a good overview of the status. Apart from that, the amount of time spent on the necessary checks every

week is expected to be reduced by at least 80%. This will be the result of a live link between the ERP system Isah and the relevant DMS;

### 2. *the quotation registration.*

A number of employees are involved every time a client requests a quotation. Today, all the information is collected by hand and is then processed. This does not allow for a fast throughput. If the information would automatically flow to all involved, this will be a huge advantage;

### 3. *the quality manual.*

A quality manual must meet the requirements of particular ISO standards. A DMS will make it easier to update each document more easily and more accurately with information such as who made changes, what was changed and when, and the decision taken as to which documents can be made available for tbp employees;

### 4. *recruitment (HRM).*

Whenever the management team approves a vacancy, a flood of paperwork follows: job descriptions, approvals, advertisements, applications, selection procedures and so on. The information stream can sometimes be even more complex when, for example, secondment or employment agencies are brought in. Digitising can be useful here. A digital archive can be created for

applicants for whom there may not be a job at present. This is useful for future vacancies;

### 5. *leave requests.*

Traditionally, handling leave requests also involves much paperwork resulting in requests remaining unanswered. Management has approved these five procedures for the next step. This means an action plan will be worked out which will result in a functional design. The design will be the basis in the search for the right software for the DMS.

## the search

tbp wants a comprehensive solution to the efficient processing of the information flow. This led it to concentrate on finding DMS suppliers who could supply solutions. In total, twenty suppliers were approached. The request for proposals resulted in a mixed bag of answers making comparisons between suppliers difficult. The answers had to be standardised in order to be able to apply an objective comparison. Rolf: "Ten of the candidates were ultimately selected at the beginning of November 2010. They were screened and a rating was applied. Then an assessment was made on the price quality ratio, the quality of the quotation, the timeliness and so on. This gives us an initial impression of the supplier. After this process, three suppliers remained."

In mid-February, these three suppliers were invited to demonstrate their systems to a group of 12 tbp employees. After an evaluation of the demonstrations, two suppliers remained: I.R.I.S. and Expansion. Our experience in the process up to now are such that it is still hard to take the right decision. Another session is planned where the possibilities of each system can be examined in more detail. The chance is high that this will result in a definite choice. We are then ready for the next phase: the implementation. But that is further down the line.



*the project's graduation group from left to right: Jasper Eggink, Yvette Noorland, Richard Bras and Rolf Nagtzaam (tbp)*



# quality system for perfection

*As an organisation grows, the need for structural improvement grows. During the development process, the emphasis shifts from product quality to process quality. Ultimately the vision shifts to quality throughout the organisation, and quality becomes an integral part of the company. The term quality is irrevocably bound to the company's philosophy. tbp electronics' current quality management system (QMS) focuses on the evolution of "quality thinking" to integrated quality care. Integrated quality care includes all aspects of the whole company. The independent organisational processes are then in tune with each other.*

## **involvement**

Enhancing synchronicity requires management commitment, dedication of the process owners and PDCA (Plan Do Check Act) oriented process descriptions to be leading. This last will lead to clarity and transparency in the processes. One essential detail is that the processes come together as internal clients and internal suppliers, each with their own specifications (requirements and preferences). This allows people to put the best possible interaction between the processes into action, making them perform as efficiently and effectively as possible. On top of this, the combination of clear process goals, continuous measuring and sufficient adjustments is a must. To bring structure to the management of the quality system,

tbp has established a quality management system meeting every two weeks. A standard agenda puts all the essential and necessary points on the table (including those required by the ISO9001:2008 standard). This allows the company's processes to be checked regularly and in time and, if necessary, adjusted. Issues can then be dealt with pragmatically. Any results of these points are used as input for the annual management assessment. This stops much information from being spread or becoming incomplete, and encourages the implementation of well balanced analysis and forms a basis for effective advice. During the presentations of each quarter, the company's achievements are made known to the employees and all colleagues receive information regarding crucial quality related items from both within and outside the company.

## **compliance**

Because tbp wants to meet and exceed the expectations of its clients, it works with the highest quality requirements and standards. An independent external control body (Dekra, formerly Kema) checks if the quality system is goal oriented, and thus efficient and effective. Inherent to this is the check on whether the system in reality is complied with and if it is maintained. The recently held three day company wide Dekra re-certification audit went well, and the ISO9001:2008 and AQAP-2110:2009 certifications were again awarded without a second thought. The level of involvement and the expertise of the employees are of a high standard. This clearly emerged from the audit. The efforts of the management, the way things work in each department, together with a pleasant work climate all go to making tbp electronics an energetic and dynamic company. Apart from the audit, tbp itself runs continuous internal audits. The purpose of these audits is not to monitor colleagues, but to evaluate current methodologies and tools to be able to improve the work situation and the organisation around the

work space. The results and opportunities for improvement lead to corrective and preventive measures. These internal audits contribute to increased insight in the workings of the company's operations. Implementing an internal audit thus goes beyond simply ticking boxes on a checklist. It needs to generate usable information. The internal audit is one of the better tools to raise processes and performance to a higher level of quality. It is worth mentioning that clients also carry out regular internal audits at tbp. To reduce wastage in the processes as far as possible and thus to increase the effectiveness and efficiency, the FMEA was established. FMEA stands for Failure Mode and Effects Analysis. An FMEA analyses the consequences of possible defects in a process so that constructive or process measures can be taken in advance to prevent potential failures.

## **aim: client satisfaction**

The capacity of a company is often measured using four performance indicators: Quality, Logistics, Technology and total Cost (QLTC). Nowadays, clients are more verbal and more aware when choosing their suppliers, and always require products and services that meet their specific requirements and preferences precisely. It is therefore essential to make the processes as efficient and effective as possible. One delay or defect in one process can affect another process. The client, after all, does not make distinctions. For him/her, the only thing that matters is the QLTC and for tbp electronics the only thing that matters is customer satisfaction.

# technical ingenuity in micro-electronics



Diek Neurdenburg of BTG

BTG is an electronics development company which develops and supplies unique products and services. "We are always on the lookout for jobs which are highly challenging. Not the standard solutions that are available, but tailor-made electronics designed with 'embedded software'. Micro-electronics in the broadest sense of the word," answers Diek Neurdenburg to the question "What makes BTG different?" Diek, owner director of BTG for a year, quickly adds "Our knowledge of the electronics and component market means that we can design innovative and high value products primarily for manufacturers of products (the client is almost always the

owner of the design). In practice, this means that we usually work with smaller product series, and rarely in large quantities such as consumer products. Flexibility, competence, and short, direct lines of communication are the key words in our company."

BTG, with its 14 employees, is strong in product development and re-development (hardware, software), technical automation, EMC-consultancy and secondment. The company is around 25 years old and for about two decades has commissioned tbp electronics to supply its electronics. A part of the tbp supplied prints end up in harbour units.

## own design

Once an electronics design reaches its final stage, BTG usually builds a prototype in-house. In doing so it gives much attention to EMC: does the connection work if it is exposed to electro-magnetic fields,

or does the prototype produce this itself? Diek: "EMC is one of our specialities. This is, after all, an important though often underestimated part of electronics. Many of our specialists are well versed in this and are qualified to run pre-compliance tests in-house. This means that they will ensure that the product meets the required standards. Should the circuit meet the requirements, the production will be outsourced. In many cases, this involves a pilot run of about 10 pieces to check the reproducibility. Most of the work is outsourced to tbp, unless the client, for whatever reason, prefers another supplier. In the end, the client decides who the producer will be.

## knowledge

In and around the container transfer in harbours are many processes which are given a helping hand by electronics. This often entails specialist requirements

continued on page 18 >



An AVG transports containers around the company's premises. The transponder can be found underneath.

in which strength, speed, accuracy and safety are the most important issues. In this world, BTG has earned its stripes for its work in the development of control theory. The emphasis lies in measuring and positioning systems for container transfer and freight transfer in automated harbour systems. Diek gives an example: "BTG has developed a positioning system companies such as ECT to allow their AGV's (Automated Guided Vehicles) to handle containers on the docks. An AGV is an unmanned vehicle that transports containers around the storage facilities. It is thanks to the electronics, which use RFID technology (transponders) in both the vehicle and the reference points in the ground, that unmanned transport is possible. The systems are not only be found in Europort, but also in the harbours of Antwerp, Milan, Hamburg, Felixstowe and Sydney.

Another product is an infrared camera system to check the position of the spreaders that lift the container. The information made available allows the spreader to be guided quickly and accurately to the right place. While this seems like a simple measuring system, in fact account must be taken of the mass of the container so that when moving containers quickly between ship and dock, unwanted side-effects such as swinging can be avoided. The electronics and soft-

ware have been worked out in such a way as to quickly eliminate these side-effects. The technique is even being applied in other industries such as the car making industry for the rapid transport of heavy parts. BTG supplies the sensor, the car manufacturer supplies the software that runs the transport mechanism. BTG has more than 1,000 measuring systems operating in the port of Rotterdam alone.

#### tbp

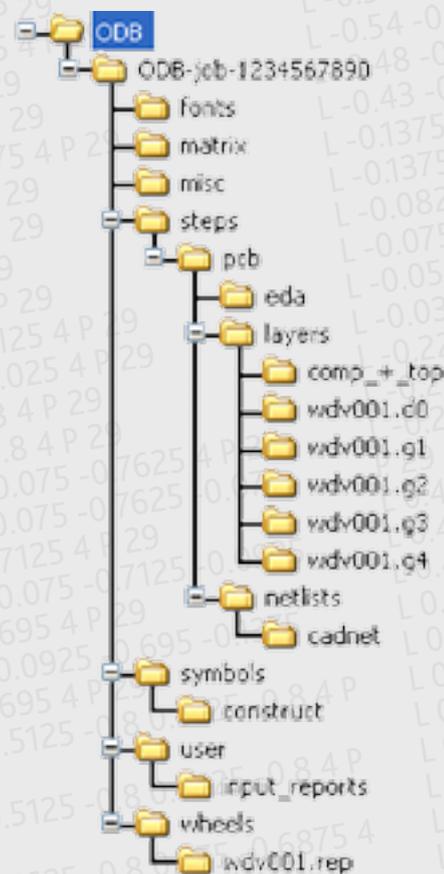
Most of the electronic circuits designed by BTG are manufactured by tbp electronics. This has been the case for about two decades. Diek explains: "This is longer than I work at BTG myself. One of the most important reasons for this long relationship is that there are hardly any problems, and we know each other very well. Even in this time of component shortages we are always well served. I think that this comes from years of having a good relationship. It creates trust and is a pleasant way of working."

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## BTG Electronics Design B.V.

# ODB++:

*a printed circuit board assembly (pcb) can be summarised in a few words: a simple process. Take a plastic sheet with copper foil, remove a part of this material so that copper tracks or the electrical connections remain and apply the components. If necessary, drill a small hole for the cables and the print is ready. In practice, creating the perfect end product is somewhat more complicated.*



*An ODB++ has a directory structure within which the various elements are collected.*

# magic or daily fare?

## software helps

Almost all the designs for a pcb arise as a result of the use of software (such as Mentor or Zuken) specially designed for this purpose. These produce a file that is the foundation for all the processes that follow. This basic file is designated by the term ODB++ (Open Data Base). Valor, which currently is part of Mentor, has created the software related connection between the electronics designer, the manufacturer and the pcb assembly company. ODB++ is actually thus a database containing the information needed to produce a complete pcb.

All the information that is needed for the production of the "bare" pcb and for the positioning of all components, rotation, polarity, electric connections, the copper information, the solder mask, the way the components are mounted, in other words, for the entire assembly, are stored in the ODB++. The ODB also contains the netlist and the test point labels.

## from pcb to end product

The basic information required to make a pcb is called the Gerber file. Gerber files were developed about 30 years ago and they initially served to control photo plotters. Shortly thereafter this format became the international standard in the pcb world. Just fill the Gerber file with a list of materials, the BOM (Bill of Materials), and there is enough information to be able to produce a complete printed circuit board.

Since then, the requirements for production have been expanded. Only "bestücken" or placing and soldering the components on the board is no longer sufficient. After all, what is required is a board that works entirely according to particular specifications. This means that at various places in the production process, tests need to be carried out. These begin immediately after the start of the production process. Is there the right amount of solder paste on the right place? Are all the components placed at the right locations? If the components are soldered, electronic measurements can be carried

out. This is mostly done by carrying out test programmes such as Flying Probe, ICT, Boundary Scan, AOI, Functional Test and Burn-in. Once the pcba has been thoroughly checked and all the tests complete, the board is ready for transport.

## supply of data

What should the client supply in order to be able to make a good end product? In general, a file that contains all the print information such as ODB++, supplemented by a list of materials (the BOM), assembly specifications (general instructions) and test specifications (how the product should be tested). From here, it can generally be determined what the best method is to produce the board and how it should be tested.

Some clients assume that tests are not necessary. They think that "it only costs time and money" and that they would save money by skipping this phase. Practice proves otherwise. If a defect is found later in the manufacturing process, the repair costs are far higher. This only costs more money.

## what does tpb do with the data?

- upload the BOM in the ERP system to produce the quotation;
- check if the product can be made. Can any practical problems be expected?
- how should it be tested?

A team of specialists first examine the information received. Is there always enough space for the copper tracks and the components: While the client/designer should deliver an accurate file, mistakes do appear in practice. For example, print tracks that are too close together, or too little space left for a component. This is known as Design for Manufacturing (DfM) in the sector. These inspection rounds use various software tools such as Valor Trilogy (Valor/Mentor) and Testway (Aster Technologies). The first software package checks the physical sides of the design and gives an indication if there are threats of conflicting situations. The second software package is used to determine if a project can be

tested to the right degree and gives an indication of which test is preferable. Or Design for Test (DfT). If the assessment of the manufacturability turns out to be positive, then all the missing components can be purchased.

## mistakes

Some of the common errors in the delivery of data are:

- an ODB++ that does not correspond to the relevant BOM. A modification, for example, is implemented and no-one adjusts the BOM or people continue to use an outdated list;
- incomplete data. While there is a Gerber file, the complete ODB++, for example, may be missing. There is a BOM. This results in a lot of work done by hand. Just think of the instructions for positioning the components by hand for the pick-and-place machine;
- supplying of outdated types of information. That is even worse than a wrong BOM. In the worst case the assembly will produce an unusable end product.

The moral of the story: always have the right data. It sounds so simple, but in practice it does sometimes go wrong. And as the commissioning client this is not desirable.

# CD&V hosts new year reception in Geel

On 12 January, the political party CD&V (Christian-Democrats and Flemish) hosted its new year reception in the newly decorated foyer at tbp electronics Belgium in Geel. CD&V is the party of the President of Europe, Herman Van Rompuy, of the current Belgian Federal Prime Minister Yves Leterme and the Flemish Minister President Kris Peeters.

More than 300 guests including prominent politicians were present. They all had the opportunity to have a glimpse behind the scenes of our assembly facility.

In his new year speech, the CD&V chair Wouter Beke emphasised that self-confidence and self-awareness were essential elements in having the party grow again. In saying this he made the link

to the words of the tbp host Anton Hermus who had talked about the importance of continuous improvement and innovation in the work processes if a company wants to build on its competitive advantage.

Inge Vervotte, Flanders' Minister for Civil Service and Public Enterprises, took plenty of time with Ton Plooy to ponder the need for maintaining employment in the manufacturing sector. Ton had complete agreement with his vision that government and industry need to cooperate to strengthen innovation as the engine of new economic growth, and that academia should be better aligned to industry so that innovative processes can be implemented more quickly.



*Minister Inge Vervotte  
(right)*



*Ton Plooy & Ineke Vis*



*Anton Hermus in discussion with chair  
Wouter Beke (the man at the centre of the photo)*



*A view of the entrance foyer*