



# WAY of life



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May 2012





## what is social media and what does it do?

*Social media is the collective name for all internet applications which make it possible to share information with each other, and to network in a way that is user friendly and, above all, fun. The information could be in the form of texts such as news and articles; sound in the form of podcasts, recorded texts and music; and images such as photos and videos. These find their digital way to various receivers who are labelled friends or friends of friends, followers, people, links, classmates, contacts or connections.*

*In other words, social media means the media that allows you to socialise with the environment in which you find yourself. The best known are Hyves, Twitter, Facebook and LinkedIn, but there is also Youtube, Wikipedia, Wikimedia: Village pump, MySpace, and Friends Reunited, and Nujij and Dienstmakers in the Netherlands.*

*Even industry cannot avoid taking part in this hype, though in a business like way. Recruiting staff is hardly done anymore through advertisements in the local daily or weekly newspapers. No, the best way to do this at the moment is through LinkedIn. Put whatever you are looking for or what you are available for on LinkedIn and you will be surprised by the reactions. People also offer their skills spontaneously if they are, for example, looking for a new challenge or would like to know what their market position is.*

*Next to this, chats, tweets and notes do the rounds of the company where you work. It is highly recommended to refute these messages if they contain untruths or to prevent undesirable consequences. You will also need to put the necessary information on the web and make it known. After all, the idea is to get plenty of followers! However, they do need to be followers who will also read the messages. I wonder if the 20 million Lady Gaga followers really read all her messages. And I'm only talking about Twitter. This just goes to show that social media can be used in a positive way and you can avoid having it back-fire on you! To illustrate this, I now have my doubts about a particular mayor who recently twittered about a hold-up in a Slinese restaurant. We have in any case taken our first steps in social media (see the article further on in this Way of Life) and we would like to invite you to follow tbp. All our social media options are linked on our website - all you need to do is click.*

*Or do you actually have no idea about social media and would like to know how to use the various accounts yourself? Any child, from kindergarten upwards, can explain in detail what is hip & hot and how it works!*

*And now just an app for an social-media-in-one account... That would be practical.*

**Ton Plooy**  
CEO

Tweet 461

Share 53

Like 270

+1 22

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# tbp at exhibitions again

*Just as it did two years ago, tbp is getting ready for two important trade fairs: HET Instrument and Electronica. HET Instrument will take place from Tuesday 25 September to Friday 28 September in the RAI in Amsterdam. This location is the best meeting place for everyone that works in our sector. We would of course like to invite you to our stand, 1B037. As usual, the fair has its own website: [www.hetinstrument.nl](http://www.hetinstrument.nl)*

Apart from HET Instrument, we can also be found at the Electronica 2012 that opens on 13 November and runs up to and including 16 November at the Neue Messe in Munich. This is "the place to be" in the world for business professionals involved in electronic applications. Experts from highly varied sectors will gather here. There will be people from the automobile industry, industrial electronics, "embedded" applications, wireless communications, medical electronics and MEMS (Micro-Electro-Mechanical Systems, the integration of micro-electronics and micro-mechanics). We would like to invite you to stand 411, hall B1. More information can be found on the fair's own website: [www.electronica.de](http://www.electronica.de)



## warm welcome

Both fairs offer you and ourselves the opportunity to catch up on business in an informal atmosphere. Cialona, our stand designer and builder for both fairs, says

that this is one of the things that stands out about tbp. Spokesman Tjeerd van de Kimmenade knows tbp's preferences all too well: "tbp wants to bring the atmosphere of the company to its stand. To be specific, it wants to bring the ambience of the company's restaurant to the fair. A warm, almost dolce vita, atmosphere that contrasts with the pure business side of the production process in this "clean" high tech environment. To create this feeling, some of the furniture from the company's restaurant is even brought to the stand. It feels a little like coming home.

## HET Instrument

The theme is set: X-plore electronics. Much hard work is going on behind the scenes to make it a real experience for you. The energy of the participants seems to be good too. The level of interest is similar to the fair two years ago. The fair organiser, FHI, is again hoping that about 17,000 visitors will find their way to the fair.

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## summer closure

Please note that this year tbp electronics will again have a summer closure. Our company will be closed in weeks 30 & 31 (23 July to 3 August 2012). Please make sure that you submit your assignments and quotation requests to us on time so that your own production and orders are not jeopardised. Last year we experimented on working through the holiday period "on half capacity", but it was not a great success. We saw the effects of not having the right combination of the right people for a particular activity at a particular time. This does not make for good company operations. It goes without saying that we do not want to repeat this experience.

While our company is closed for two weeks, in case of emergency please contact Mr Frans Geerts (M +31 (0)65025 2708, [E.fgeerts@tbp.nl](mailto:E.fgeerts@tbp.nl)).



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# tbp at exhibitions again

To make a visit to the exhibition even more appealing, we are creating a new gadget. Two years ago you were offered a sound gadget, now it will be a so-called compass clock. It goes without saying that the gadget is made possible as a result of extensive collaboration throughout the chain. Apart from its various components, the production, printing plate and testing are sponsored too. And the fact that tbp is also making a contribution will come as no surprise. Visitors can pick up hardware

or software from the exhibiting sponsors to obtain the compass clock.

A varied programme of presentations is a good addition to the fair, and the development club will again be a part of the presentations with a number of innovations. The "small scale" specialist developments will be located in the Micro-Nano Pavilion, while the product and services that are focused on testing and measuring will be brought together

in the Test Technology Pavilion. Keep an eye on the website because that is where information such as the entire programme of presentations will be found. For the industrial electronics branch, the organisation is considering the themes Tomorrow's Electronics and Design Automation & Embedded Systems.

For further information see [www.hetinstrument.nl](http://www.hetinstrument.nl).



*the compass clock is the gadget of 2012*



## WHAT ELSE?

Apart from the HET Instrument and Electronica exhibitions, there are of course plenty of other fairs, congresses or events that may be of interest to you. Here are a few from the wide selection:

## ARE YOU INTENDING TO GO TO HET INSTRUMENT?

Then register on tpb's website ([www.tpb.eu](http://www.tpb.eu)) to make sure you get a free entry ticket. This will save you € 19.00 that you would otherwise have to pay at the ticket office to gain entry.

The exhibition is open:

- from Tuesday 25 September to Thursday 27 September from 10:00 - 18:00
- on Friday 28 September from 10.00 to 16.00.

22-24 May 2012, Parma, Italy  
**SPS/IPC/DRIVES ITALIA 2012**

exhibition & congress: technology for industrial automation, propulsion technology, systems and components  
[www.sps-italia.net/en/inside.asp](http://www.sps-italia.net/en/inside.asp)

22-24 May 2012, Nuremberg, Germany  
**SENSOR + TEST 2012**

the exhibition for measurement technology  
[www.sensor-test.de](http://www.sensor-test.de)

23-24 May 2012, Velbert/Heiligenhaus, Germany  
**INNOSECURE**

exhibition & congress: technology for home and vehicle security  
[www.mesago.de/de/INS/home.htm](http://www.mesago.de/de/INS/home.htm)

12 June 2012, TU Eindhoven  
**POWER ELECTRONICS EVENT**

seminar about the applications, innovations and knowledge in the area of power electronics  
[www2.fhi.nl/vermogenselektronica](http://www2.fhi.nl/vermogenselektronica)

19-21 June 2012, Shanghai, China  
**PCIM ASIA 2012**

International trade fair and conference for power electronics.  
[www.pcim-asia.com](http://www.pcim-asia.com)

4-5 September 2012, Willibrordhaeghe Conference Hotel, Deurne  
**DUTCH SOCIETY FOR PRECISION ENGINEERING CONFERENCE**

for and by technologists, designers and architects in precision mechatronics  
[www.dspe-conference.nl](http://www.dspe-conference.nl)

16-18 October 2012, Frankfurt, Germany  
**ID WORLD 11<sup>TH</sup> ANNUAL WORLD SUMMIT**

exhibition & congress: international congress about RFID, biometrics and smart card technology  
[www.mesago.de/en/IDW/home.htm](http://www.mesago.de/en/IDW/home.htm)

16-17 October 2012, Nuremberg, Germany  
**E|DPC EXPO 2012**

international trade fair and conference for electrical propulsion  
[www.mesago.de/en/EDPC/The\\_conference](http://www.mesago.de/en/EDPC/The_conference)

27-29 November 2012, Nuremberg, Germany  
**SPS/IPC/DRIVES 2012**

international trade fair & congress: electric automation, systems and components  
[www.mesago.de/en/SPS/home.htm](http://www.mesago.de/en/SPS/home.htm)

# automated selective soldering

*Soldering is a technique that throughout human memory has been used to bind electrical parts to each other. The parts to be soldered are brought to the required temperature together with a liquid - the flux - and soldering tin (an alloy of tin with copper and/or silver or tin/lead). The binding is done when the parts have cooled down. We see various versions of the soldering process in today's production environment. One of these is the wave solder bath. Using this technique, the printed circuit board (pcb) whose components for soldering are given a dose of flux, is pre-heated and guided through the hot solder bath. The result is that all the connections are done in one go.*

## selective

There are countless reasons why only a small part of the pcb needs to be soldered instead of the whole thing. This is then selective soldering. Imagine that components need to be added to a board by hand to an area where there are already soldered smd components on the underside. In this case, the whole pcb cannot again be given flux and liquid soldering tin. What then needs to happen is that a mask needs to be applied to the carrier - the mechanism with which the pcb is transported through the machine - that prevents the tin making contact with the board in the places where this is not required. But several measures need to be taken to ensure that this process runs

properly. After all, the soldering tin does need to make contact with the areas to be soldered. The carrier, as a result of the applied components, is about 8 mm thick on the underside and in the case of small openings in the carrier, it is a challenge to let the wave touch the board. The carrier furthermore screens the largest part of the board, making it difficult to heat properly. The carrier design and the soldering specifications are critical: in practice it is easy to do these types of connections by hand.

## new machine

To simplify the process, tbp has acquired a special soldering machine to solder selectively, thus exactly on a pre-determined

place, through hole parts - whereby the cabling is led through holes in the pcb - for example a trafo, connector or similar. The crux is in the presence of a mini-soldering bath instead of the usual bath spanning the width of the pcb. With the mini-soldering bath, the liquid soldering tin presses upwards through a nozzle that ensures that the soldering is done locally. There are different nozzles with working widths of 4 to 8 mm.

## in practice

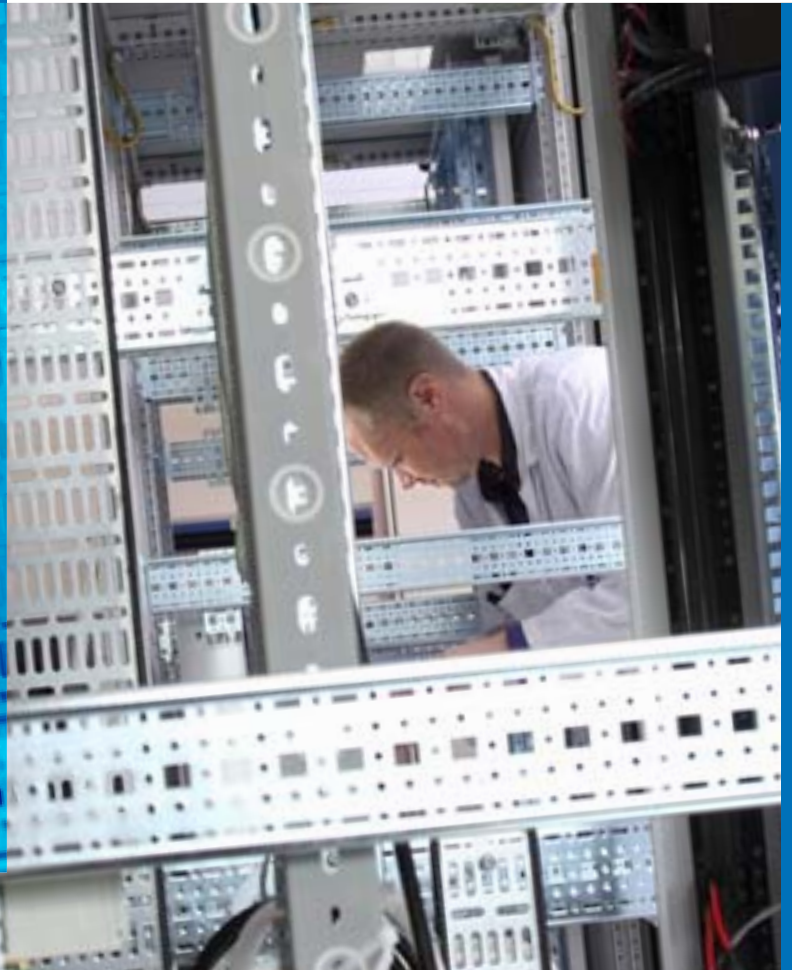
The machine works as follows in practice. The operator scans an empty board. An image of the board appears on the screen. The operator uses the mouse to indicate which areas need to be soldered. This information is saved and the process can start. The pcb is placed on a transport belt. On the basis of the programmed profile or the barcode, the machine recognises the print card and, using the saved data, thus knows which areas are to undergo soldering. The pcb is then pre-heated to 105°C. A pyrometer "checks" when this temperature is reached and sends a signal to a gripper. The gripper, a sort of robot arm, allows the machine to move the pcb in any direction. The gripper guides the print card over the flux and soldering nozzle so that the selective soldering can occur. Another nozzle which exudes nitrogen is also located at the soldering nozzle to reduce the chance of oxidation at the connection point. When the process comes to an end, the card is ready. Apart from carrying out its primary task, the machine also supplies additional information that is essential in today's company operations. This may include information about traceability so that, even after several years we can see what the machine has done. The major advantage of using this machine is the further automating of the production process, by which quality remains the priority. This increases the reliability of the connection and thus fulfils our company policy "the business of perfection".

*The latest addition to our production area is this Vitronic Soltec 6746 soldering machine. Operator Jan Almekinders in action at the soldering machine.*



# super clean into the cabinet

*Box building, or the building of specific electronic cabinets, is an activity that tbp electronics does but promotes less actively. Actually, it should promote this because a good cabinet is essential to protect all the electronics against external influences. Perhaps tbp electronics is being modest because cabinets do not seem that spectacular. A cabinet looks quite conventional, but in fact, it is precisely in the high tech environment that the most cabinets with the most modern electronics are found. But you only notice this when you really look at a cabinet. The steel doors hide more than one might think.*



## clean mounting and assembly

Cabinets for housing electronics have been used for years. Their appearance may vary, handy features may be included here and there, but from the outside a 19" cabinet still looks the same as it did 25 years ago. Long live standardisation, many would think! However, on the inside the enclosures are mostly custom-made and functional. They need to be specific because of the subracks, ventilators, heaters, feeds, fuses, signals and all sorts of cable looms.

Another common complicating factor is that a cabinet and its submodules need to be put together in a dust free environment. All print cards, cable looms and other equipment are therefore mounted in a clean room. There are machines that will only function in a dust free environment because they work on processes in which the dimensions are smaller than an average mote of dust. These include a wafer stepper for the manufacture of chips. Dust is enemy number one! Since creating the clean room in Dirksland, we have also thought about adapting this space as a workspace to build enclosures and racks. This is not that simple as various things need to happen, particularly in the logistics. The selection and qualifications of the suppliers in the logistics play an important role too.

Partly because of the efforts of our colleague, René Verbeek, work preparer box building, we are completely ready in Dirksland. René has gained a lot of experience at tbp electronics Belgium and before that at Bell, Scanfil and Alcatel-Lucent as a box builder in a clean room environment. René: "We made various racks and cabinets for several clients in Belgium. Some of these

were volume built in a dust free environment and with very specific quality requirements specified by the clients. This experience is useful when building new types of cabinets. It is when you build the first model that you see the unforeseen differences between theory and practice. The drawings on the electronic "drawing table" or on three dimensional drawings usually look good, but sometimes it turns out that certain constructions cannot be made. This requires an understanding in order to overcome potential problems. Doing an FMEA (*Failure Mode and Effect Analyses*) and a DfM (*Design for Manufacturing*) is recommended for these products to prevent problems arising with volume production.

## less clean too

Not only does box building in the clean room belong to tbp electronics's portfolio, but also the conventional construction of all sorts of modules - also called box builds - falls within its range of services. Way of Life (issue 27) has previously covered the so-called box building. Are you interested in reading it again? Previous issues of our newsletter are published on our website, [www.tbp.eu](http://www.tbp.eu), under the 'News' tab.

# test engineering: a new tbp service

Most Way of Life readers will know that the assembly of circuit boards is one of tbp's core activities. But one new activity has been added to this. This is test engineering, specially servicing OEM\* and EMS\*\* companies. Testing as a means to check the production processes and, if necessary to adjust them, has always been a part of tbp's daily routine. That this is so important hardly requires further explanation. As a producer, you want to deliver as good a

product as possible for an acceptable price. Knowledge of testing is now available to any developer and producer of electronics! tbp's new "testing team" - tbp test engineering - consists of eight electronics specialists and will focus in particular on offering services to developers and producers of electronics. Marcel Swinnen, team leader, is pleased to explain what his department can do for developers and producers of electronics.



team leader Marcel Swinnen at the GTP

## three activities

"Our business services three areas", explains an enthusiastic Marcel. "First, we offer DfT, Design for Test, an activity which is increasing in demand. Second, we offer support in setting up a test strategy for anyone working in EMS or as an OEM, and even those who build pcbas (printed circuit board assemblies). Finally, third, we will make clear to clients the importance of the Generic Test Platform that was developed by tbp. We are secretly quite proud of this. The GTP increases product quality and offers some additional facilities which will benefit most clients." Three areas thus that warrant further explanation.

## DfT

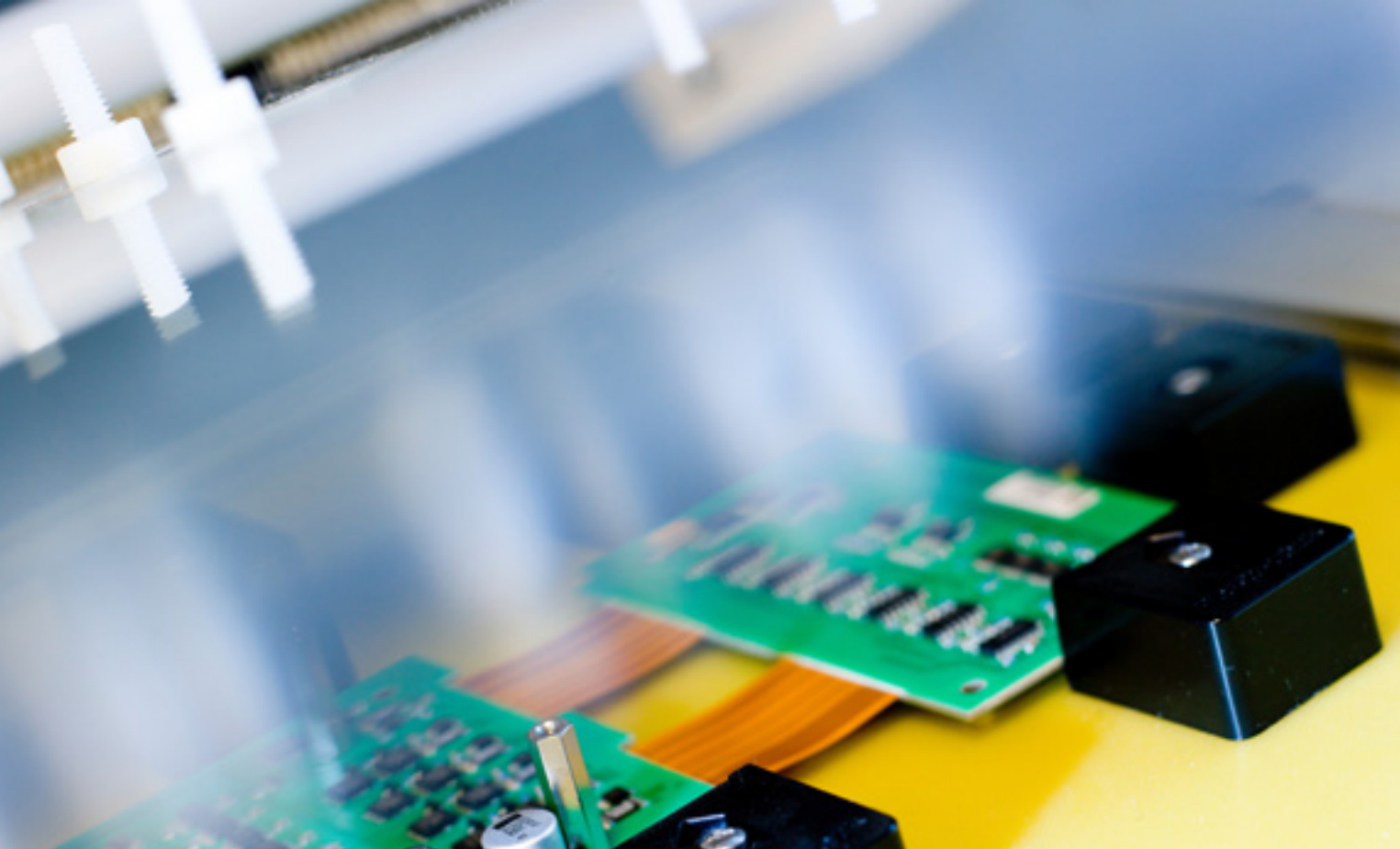
Design for Test. This has become a discipline which justifies the increasing attention it is getting. DfT is bringing a clear change in the world of designer and producer. Until recently it was usually the designer who decided on the electrical diagram and the associated layout of the pcba, and then offered the product, under time pressure (short time to market), to the producer. The designer believed that there was sufficient information to supply a ready-made product. However, the producer was pushed into a corner because of unexpected problems with the construction and the lack of testability. Opportunities to test the pcba were either not available or else not sufficiently available so that all they could do was wait to see if it would work or not. In short, the designer and the producer each lived in their own separate worlds. DfT has brought about better collaboration. Marcel: "Our team will help designers to develop better products. Their core activity remains unchanged, but additional test facilities will be implemented for the design. This could range from a couple of extra pads on the board to make measuring easy; adding components that make a boundary scan doable; providing the pcba with a connector; or carrying out a test. This also brings better solutions to the construction side of the business.

In short, it will result in a design that is not only looking at functionality, but also on proper testability. In general, we are striving for a perfect product with high yield and no slip-through.

## test strategy

Depending on the client's machine park, test engineering decides what needs to happen in order to achieve a particular quality standard. To this end, it has analysis tools that include all the characteristics of the production machines. These provide the basis on which the right test strategy is designed. We understand this as meaning which tests need to be carried out from empty board to end product on a production line. These may include such things as AOI (Automatic Optical Inspection), boundary scan, flying probe and ICT. How can you do these cheaply and most efficiently? How can you ensure that the product meets the requirements of your client? Marcel is aware of possible mistakes and knows how to avoid these in the future. "In fact, we optimise the production line so that the chance of errors while making the products is continually being reduced. While we strive for 0% errors, in reality this will always be hypothetical." All tests carried out during production contribute to quality. But not everything can be tested. A boundary scan test may





*A fixture is needed at the GTP for the interface of the pcba and the test instruments.*

give a good impression, but it does not reveal 100% of the errors. Just as AOI. The camera detects if a component is at the right place, registers a correct soldering connection, but does not determine if the components have the right values or are defective. In short, testing in general can never cover 100% of eventualities. Marcel illustrates this with an example of what can go wrong in building a pcba for an electric feed. "A board has a number of electrolytic capacitors (elcos) and one or more capacitors that are connected in parallel. Measuring the capacity can indicate that the elcos meet the required value given their high capacity. Unfortunately, the value of the capacitor cannot be determined in this case. The capacity after all is nothing compared to that of the elco. That this capacitor is important only becomes clear later if the pcba is in operation at the OEM\*. The capacitor then acts as a discharge, removing the warning signals from the environment."

#### **GTP**

Imagine that despite all the measures taken to avoid errors, the end product still does not meet expectations. It means that a more thorough test regime will then have to be adopted. In this case, Generic Test Platform (GTP) is the way to go. This apparatus is the result of tbp's years of

experience and is designed for the testing of pcbas either individually or in panels. This pcba is connected to the feed and measuring instruments through a test fixture (interface). This may seem like a very costly solution, but this is not the case given the GTP's universal character. The client only pays for the software and the dedicated fixture, while the standard test platform - the Generic Test Platform - can also be used for other test assemblies. The GTP's goal is to reduce the test development costs of introducing new products. Experience shows that when testing new products, the same types of measurements are needed. Should it be possible to use the same measuring equipment to test various products, the product specific test development costs could be kept to a minimum. The GTP can also be used in the design of a product. In this way it offers additional options for clients for prototype verification. The experience gained during the verification process can strongly reduce the test development costs of the final production testing system.

#### **Eersel**

Seven men and one woman work at tbp test engineering. Marcel: "All of them are seasoned technicians with electronics in their blood. The foundation for most of them lay at the previous branch of tbp

in Belgium. We focused particularly on testing there for several years with the objective of improving quality. What we are now going to do is really a logical continuation." Given that the tbp test engineering specialists want to be as close to the clients as possible, a search started for a location that would meet this criteria. The choice fell on Eersel, near Eindhoven, home to countless electronics companies.

The tbp test engineering team is located on Sigarenmaker 9 in the De Haagdoorn industrial estate in Eersel, on the A67.

*The press release about this is available on our website [www.tbp.eu](http://www.tbp.eu).*

\* OEM = Original Equipment Manufacturer

\*\* EMS = Electronics Manufacturing Services

# catching up at the tbp customer and supplier day

In 2007 we also opened the assessment of the first edition of this, what has now become, traditional event. The time in which we can update both customers and suppliers about the current state of affairs and developments at tbp. The chairman and CEO Ton Plooy was pleased to announce to everyone present that all is going well with tbp. The company is healthy, the turnover is growing and there is plenty of work. So much work that the company is always looking for well qualified colleagues to help achieve its ambitions. It appears that various positions, in particular in technical functions, are difficult to fill. The advice for up and coming talent is to gain skills in the technical sector. Attracting "new blood" is necessary to meet the expected growth in engineering and production. Certainly the areas of Design for Test en Design for Manufacturing are challenges for tbp. These are not only good for tbp itself, but are especially beneficial in supporting customers to be able to create good products.

## investing

Apart from investing in new staff members, investments will also be made in new production equipment. The technological developments are going so fast that yesterday's equipment no longer meets the needs of tomorrow. Given that tbp strives to be at the forefront of quality, capacity and efficiency, the equipment generally does not even have the chance to get old. Investing in the future! Further increasing production capacity requires an expansion of the workforce. Fortunately the foresight of the management led to the architect and contractor laying the foundations for this expansion when they built the current premises. The gravelled front garden can be cleared, walled in and roofed over to provide extra space for the necessary production equipment.

## in Eersel too

Test engineering is one of the new key areas with which tbp has expanded its range of activities. Why this is important

is outlined on page 8 of this Way of Life. Communication between Eersel and Dirksland goes through a fibreglass connection. This means that operational obstacles rarely occur.

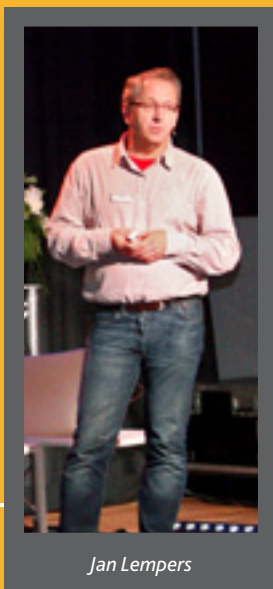
## introduction of the app

Another new item: the birth of tbp's first app. An app that is primarily useful for customers. This programme allows users to view the status of a project on their smartphones at any given point in time. In the future an option for a quotation request will be added. Using his own iPad, Tom demonstrated very convincingly what the app will look like when used in practice. To adapt one of Shakespeare's famous phrases: to app or not to app (see page 20).

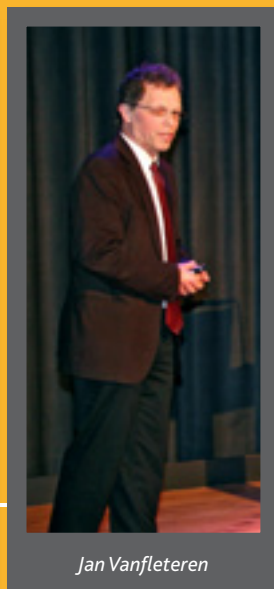
## the figures

Wiljo van Okkenburg, finance manager, had the pleasure of further outlining tbp's financial position. It is too complex to reflect in any detail in this article. For any readers who are interested in the figures, the company's results will be shortly deposited at the Chamber of Commerce and are thus available for anyone to view.

The overall conclusion, as Ton Plooy had already signalled, is that the company is financially healthy. Last year's turnover grew by about 15% though the profit decreased. This was partly because of investments made and the effects of the bankrupt Belgian company (which had been an independent entity). Contrary to this, however, important parameters such



Jan Lempers



Jan Vanfleteren

The customer & supplier day is a special event for tbp electronics' business contacts. An afternoon programme is designed that is presented in two days. One day is for customers and one day is for suppliers. This year, the tbp customer day was held on 18 April, and the tbp supplier day on 19 April. The first part of the programme consisted of presentations by tbp which openly gave an impression of financial indicators, logistics, quality and technology issues. This was followed by a presentation by a guest speaker, usually on a subject that is of interest to both groups. The official programme was closed, as usual, by entertainment. For anyone interested, there was a tour of the production areas. During this factory tour, visitors could see how activities are carried out and on what, and all the factors associated with manufacturing products to the right specifications and distributing them. It was then time to close the event with a buffet of warm and cold dishes to satisfy the inner being.

as solvability and liquidity were well above the norm. Labour productivity scored well too. This is such an important parameter that Nevat was placed at the top of the ranking in the list of financial performance indicators! The necessary investments are planned for 2012. These include various innovations such as Design for Test & Design for Manufacturing, as well as the optimisation of the ERP system. To keep the costs well in hand, more care will be given to stringent stock management. While stocks may be good, too much stock is capital destruction. Synchronising procurement and sales should avoid this.

### quality issues

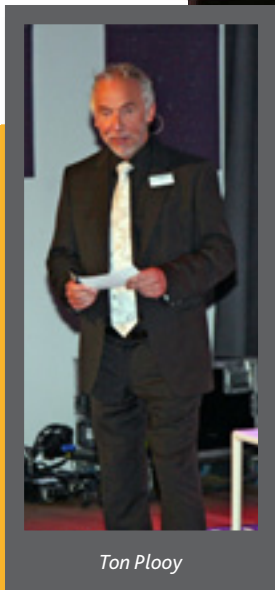
Kees du Pree, KAM coordinator, opened his talk with the question 'what is quality?'. Everybody has his or her own ideas about this. One definition we found in the literature is: "quality is the degree to which it completely meets the expectations of the recipient, within the boundaries of the price that this person is willing to pay and the delivery time that he/she is willing to accept." The entire chain is involved in this: from the design of the product to the end of the life cycle. Kees confined his talk to the first phase - from the idea to the production ready volumes. He again emphasised the importance of the early involvement of tbp, as production company, with the designer. DfM and DfT are not lip service, but are the trump cards in determining the quality of the product.

*continued on page 12 >*

## questionnaire

As the guests were leaving they received the book "De Conversation Company" by Steven Van Belleghem as thanks for their attendance. Before they returned homewards, the guests were requested to fill in a questionnaire in which they could rate the programme. The responses will be useful in planning the next programme. An impression of the questionnaire:

- the average rating for the tbp presentations was an 8
- Richard Groenendijk's rating was even higher
- Steven Van Belleghem was the star - unfortunately he was only available on the customer day
- the complexity of the content of Jan Vanfleteren's talk made this difficult to follow, but it nevertheless scored above average
- the organisation and the care that went into the event were rated excellent
- both days were rated as worthy of recommending to others and full of humour
- people were looking forward to the continuation of the event.



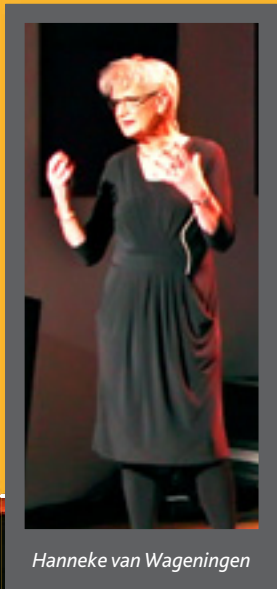
*Ton Plooy*



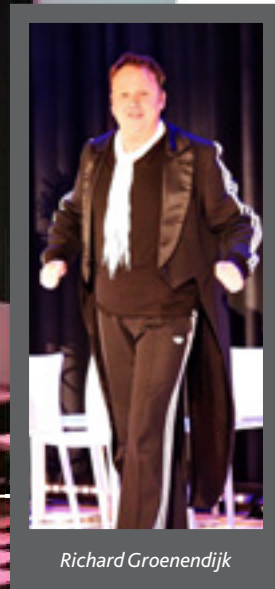
*Wiljo van Okkenburg*



*Kees du Pree*



*Hanneke van Wageningen*



*Richard Groenendijk*



*Steven Van Belleghem*



**Often heard and said:**  
well organised, would not have missed it.

An assessment of the first pass yield (fpy) for the period 2008-2011 showed that the production process is continuously improving. To be able to see this graphically, all types of errors are regularly collected and input into a database. The results show that after a shaky start, a percentage of around 90% fpy has been reached. The majority of the errors were in the soldering process, which therefore requires extra attention. We took various measures last year to improve this situation, such as using new screen printers and a 3D paste inspection machine. These have brought significant improvements so that we have the process almost entirely under control. The focus this year is on the soldering process. The testing of a selective wave soldering machine is almost at an end and the results are very promising. Finally, using an (Manufacturing Execution System) ensures an improvement of the production process as a whole so that our total quality is improved.

### logistics

As part of the slogan "tbp the logistic way, part V", Hanneke van Wageningen shows in "cosmic perspective" the logistical issues that tbp considers so important. She emphasises the importance of "early warning". This time she outlines the QLTC (Quality, Logistics, Technology & Cost). This is a quality, logistics, technology and cost check that also includes communications which tbp regularly carries out on its suppliers. By converting the parameters of various suppliers into a graphic, it is possible to gain an impression of the performance at one glance. Unfortunately, the objectives that we agreed with each other were on average not achieved last year. Was the decrease primarily due to limited availability at the manufacturers? In 2011, the effects of the unjustly labelled intrigue around the "Geelse" also played a role. Fortunately, this situation has now

stabilised. Finally, tbp invites suppliers to take part in a questionnaire about risk management. Our customers are aware of the risks that disasters pose to production capacity. This is the reason that tbp wants to gain an insight into all risks, including technical risks and supply risks. The questionnaire will start in week 20 and after week 26, once all the responses have been collected, a thorough inventory can be done.

### test engineering

In the closing session before the break, Jan Lempers shared some information about tbp test engineering. As mentioned above, this latest addition to our company focuses on DfT and DfM. The saying "knowledge is power" is the common denominator around which this world turns. At tbp, this knowledge is translated into error free products. But perfection is utopia. Jan's observation was that however much effort you put in, you will never be able to create a perfect product. But what you can do is everything possible to come as close to it as possible. This is the reason that we continually plea for what the English call "early involvement". Whether it is the assembly partner that is directly involved in the development of products, or the designer that puts in motion provisions for testability and takes measures to ensure testability and producibility. This after all ensures that the produced pcbas will function as they

are supposed to for their intended life to the satisfaction of the user. And this at as low a cost as possible.

### after the break

Prof. Steven Van Belleghem was a guest speaker at the customer day. He gave a presentation about marketing strategy in which he explained the effects of new media. Why clever actions by the daring can lead to unexpected success. About entrepreneurs whose careers take off explosively simply by making use of the new opportunities. His philosophy is outlined in his book, "De Conversation Company".

During the supplier day, Prof. Jan Vanfleteren of Imec-University of Ghent drew attention to the developments in the area of embedded chips in rigid and flexible prints. In terms of European Union supported projects, he looks for methods to place stacked chips in plastic foil. Embedded and provided with glued copper connections saves enormous volume compared to the conventional printed circuit boards. And finally, cabaret artist Richard Groenendijk took centre stage with anecdotes from his life. Read more about this on page 16.



# managing by measuring

From its very first pcba, tpb has prioritised quality. To achieve this, its quality team always needs to be alert to what is happening in the company. In order to improve the structure of the team, tpb started exploring software options at the end of last year which would manage - and manage by measuring - the production processes. This meant laying the foundations for Manufacturing Execution Systems, or a MES system. MES creates, as it were, the connection between all technical company processes and the ERP (Enterprise Resource Planning) layer at tpb: Isah. MES is primarily used by management, process controller managers and supervisors, and functions as an archive of data, in real time or from the past.

## choice

Establishing an MES is easier said than done. Initially, we started with a list of 165 potential suppliers of MES solutions. It took quite a lot of time to screen this list and to reduce it to five potential suppliers. We entered the selection process with these five, looking at the functions that we needed, the objectives that we had set ourselves and which solution would bring the least disruption during the replacement of QSight and the roll-out to all corners of the factory. This process has now reached the final phase and tpb will soon make a decision. More in the next edition of Way of Life.

## list of requirements

Without going too much into the detail of specific functions of any of the potential packages, tpb requires an MES to fulfill a number of criteria. An MES system needs to offer a solution to guide every facet of the production process of every product made in the factory. This means that, if necessary, the process can be adjusted should the product no longer meet the required standards of, for example, quality. In order to do this, a number of functions per step are required:

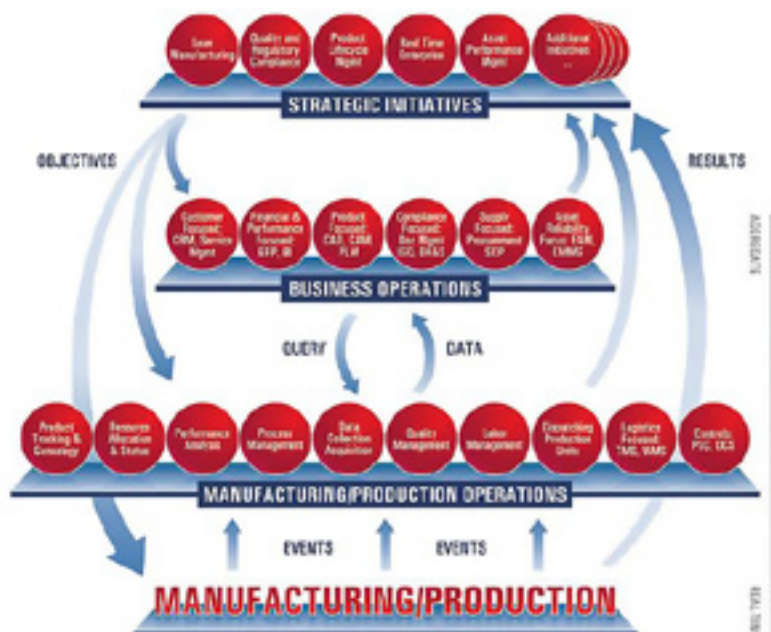
1. create product definition (ODB++ data, piece list, diagram, drivers for various production machines) as is currently done by our Valor Trilogy CAM software;

2. create operational instructions (Shop Floor Documentation);
3. determine the order of production steps for a product (Process Flow);
4. delivery procedure;
5. materials management on the production floor (arranging supply, measuring use, determining location);
6. checking of the required materials for a production step as listed in the materials list;
7. very user-friendly workplace screens on which assembly instructions are legible;
8. options to route a product through the factory by its series number so that the product precisely follows the input order through the factory (Forced Routing);
9. options to save all manual and automated actions per process step in a database. These could include problems that arise, or the results of measurements taken during a test procedure;
10. options to put a note in the system at any given point in time during the entire production process. This could be an aspect of quality or an assembly problem that can be directly linked as a change in the product definition (ECR/ECO);
11. a function that allows information to be obtained from the MES system or the database in the form of statistical or dynamic reports (often called "Dashboards" in jargon).

tpb expects to take a decision from among the suppliers before the summer closure, and the implementation will be done towards the end of the year. By setting up a MES, yet another step will be taken that will further help us deliver high quality, complex and demanding products. Further information about MES in general can be found on a website for specialists: [www.mesa.org](http://www.mesa.org).

## DMS

In the previous issues of Way of Life, we wrote about the progress of the DMS, Document Management System. We made it known that we had chosen a supplier. While the implementation can proceed, the priority at the moment is to achieve the MES. First things first, but DMS will really happen.



source: [www.mesa.org/en/modelstrategicinitiatives/MESAModel.asp](http://www.mesa.org/en/modelstrategicinitiatives/MESAModel.asp)

# how can I make my products better?

*"If there is one thing that is frustrating during the building of a new machine, it is if it transpires that a faulty part has been mounted", sighs Dick van Hees, Technical Supplier Manager at chip machine builder ASML. And he is certainly not alone in this. Almost all factories and OEMs wrestle with this problem. The reason why something does not work often only becomes apparent afterwards. Up to now, the problem of DOA's (Dead On*

*Arrival or, as some call it, Bad from Stock) has not been sufficiently researched and made clear. As a builder of machines, you would prefer to have an insight into the chance of failure beforehand rather than afterwards. Unfortunately, there are still few tools available in this area. But now, thanks to the efforts of the MoVIP project group, there are changes. And these should, of course, lead to improvements on the production floor too.*



## chance of failure

Suppliers of base materials, semi-manufacturers, EMS companies and OEMs of capital intensive high-tech products have great need for models and tools that will help them predict and minimise the makeability risks of their products. The increasing complexity of these products also increase the development risks. The consequence of this is an unacceptably high failure risk or ZHDR (Zero Hour Defect Rate). One of the causes is the speed with which the product is developed and needs to work. There is no space for a learning curve, for example by producing a trial run, when developing such products. Furthermore, these products are often produced in small series that could be very expensive. Designers are often under great time pressure. Designing a product that offers the required functionality is at the heart of their work, and the development of wide-ranging tests fade into the background.

ASML builds and sells machines that light wafers, which then allow for the making of semi-conductor modules such as ICs, sensors or simple diodes. These machines are always high-tech, high cost - on average about 45 million euros - and highly complex. Hundreds of thousands of components ranging from a relatively simple screw or washer to an extremely expensive item are contained in each machine. To illustrate what can go wrong, Dick van Hees gives an example. "Imagine that we build a machine with 1,000 print cards and the ZHDR is 1%. That means that 10 defective cards are mounted and the impact only comes to light after the test procedures of the composite machine are run. It then takes about 3 hours to repair: determine which print is defective, replace it and re-start. Assuming that the print board is in stock, it means that the machine loses 30 man hours of running time. Then add the high costs of assembly in a clean room and not meeting delivery

times. It always means that fewer machines than desired can be built per year as a consequence of defective parts." High time for action.

## collaboration

Unfortunately, there is still no collaboration between suppliers, OEMs and knowledge institutes in the chain. There is also no common language to give an insight into the chance of failure. It would of course be highly valuable if an assessment of the makeability of new high-tech products, modules and parts and their associated chances of failure could be made in an early stage of development. Last year, a number of OEMs and suppliers in the Brabant region started a study into improvements in the so-called Life Cycle Management in connection with the Point-One project. The project allows high-tech companies to learn from each other's experiences in this area. This led to a number of

follow-up projects, of which the MoVIP project is a good example of the problems mentioned. MoVIP stands for Modelling van de Voorspelbaarheid van Initiële Product kwaliteit (modelling of the predictability of initial product quality). Four OEMs collaborate on this project: ASML, Assembléon (manufacturer of pick-and-place machines), FEI Company (electron microscopes), Philips Healthcare (medical equipment) and two knowledge institutes: IMEC and TNO and ten suppliers: CCM, Fiberworkx, KMWE, MI Partners, Neways, NTS, Prodrive, Sioux, Variass and tbp electronics in collaboration with Technolution. Two persons are taking part on behalf of Techno-tbp: Gerard Elema (for the production part) and Alex van den Heuvel (for the design part). Dick van Hees is acting as project manager at MoVIP.

#### ZHDR needs to be reduced

Naturally the problem of OEMs receiving defective parts is not new. ASML has previously looked at ways of reducing the ZHDR. While the quality has been greatly improved, it has as yet not led to ground-breaking results. MoVIP could play an important role in this. MoVIP does not only look at what the quality of the product should be, but will also predict the level of quality. Dick: "We normally design a product and see how you can test it. The new approach is 'I want to make a product with a 0.1% Zero Hour Defect Rate and I want to know the associated risks.'" To identify these risks, the strategy is to give an insight into the defect opportunity of quality, placing error and soldering for each part on the piece list. Then we look for a solution for the major contributors that prevent the specified ZHDR from being reached. He sees three possibilities to keep the risks in check: "The best solution is to change the design so that the risk level is reduced. If that does not work, the process at the manufacturer/supplier needs to be changed in such a way that the risk is sufficiently reduced. If the first two possibilities cannot be done or are inconclusive, the last resort is to test so that the specified ZHDR is reached.

#### testing

Given the complexity, testing of a print board is essential to reduce the chance of failure. This means that testing has a very meaningful role right from the start of the design of a new product. Existing test methods, such as Automatic Optical Inspection (AOI), during the pcba (printed circuit board assembly) may be useful in itself, but it does not give enough information about the risks. A complete and thorough test coverage needs to be done to attain the objective of the 0.1% Zero Hour Defect Rate. This means including complete test coverage provisions in the design. All errors occurring during the making of a pcba need to be found and removed by testing.

All defect opportunities for each component must be known and recorded as a quality standard. When selecting the components, these quality characteristics can be taken into account. Dick van Hees: "tbp is the type of company to have collaborated with the Belgian research institute IMEC for years to develop tooling to reduce the chance of errors. It was already noted what can go wrong during the production process of a pcba: defective components, wrong placing on the board, or a wrong connection. These are all opportunities for errors. At the time this was called the slip through. To this end, tbp collected a lot of statistical information that was used for predicting the ZHDR. The challenge for MoVIP now is to develop a model that can assess the expected ZHDR at the design phase. Test provisioning will be increasingly more important. It often transpires that a print that is to be made is not completely testable. To reduce the slip through - the chance of errors - more test coverage provisions need to be included in the design. This may increase the initial costs of the pcba, but the costs do break even. Dick gives an example of the consequences of the various risks: "Imagine that a particular hand-made trafo is placed on a print, but that in practice this trafo turns out to be of inferior quality. The question then arises: what are you going to do about it? Does this require an initial inspection? Should

an end inspection be carried out at the supplier? Should the standards be raised? Should a functional test be carried out? The fact emerges that there is a component with a high rate of failure on the BOM (piece list). The chance of failure of a "normal" component is 1 ppm, but some components have a far higher rate. By inventorising each component, the location of the weak spots can be identified and thus what to do. One solution may be to choose a different component.

#### future

MoVIP should lead to the designing and the testing of a modelling process that will enable checks to be carried out at an early stage into the ZHDR of product or parts thereof. It will also make suggestions on improving the design, the fabrication process and the fabrication and testing strategy. It goes without saying that the tools will be available for suppliers and OEMs, because they will after all both derive benefits from it. Knowledge should lead to a lower ZHDR throughout the chain which in turn should ensure better ROI (Return On Investment), faster availability of new products (time to market), lower TCO (Total Cost of Ownership) and greater reliability. All in all, it means a strengthening of our high-tech sector vis-a-vis international competition.



Dick van Hees, projectmanager MoVIP

# the stage is set for...

## Richard Groenendijk



*During the customer & supplier day, cabaret artist Richard Groenendijk performed an act that was based on his solo act "every single day". While Richard certainly cannot be labelled a nerd - he had never even seen a pcb that close before - he was still able to make a wireless connection to his "techie public". His story did not even mention amperes, volts or megahertz. It did mention the questions of life.*

"One of my best female friends asked if I wanted to become a sperm donor. That question was the foundation of *Every single day*." Richard Groenendijk does not beat around the bush when asked about his new act. "You can answer this question with a 'yes' or a 'no', but one of these answers would only be a cover. There is so much more to it than what appears on the surface. It is precisely this point that I want to show in my act. *Every single day* deals with life and death and with everything in between."

*Alle dagen (Every single day)* is Richard Groenendijk's eighth solo performance. He made his début in 1998 with *Mind the Gap* and since then has been a regular at theatres with *Gluur, Nep, Ego, De Adem van de Nachtchinesees, Na de Wedstrijd* and the anniversary show *Terug bij Af*. *Alle dagen*, however, cannot be compared to his previous productions: "I will always try to combine laughter with tears. This is not difficult for me to do with the question about being a sperm donor as just that one question brings so much more to the surface. Do I want to be a father? Do I want to continue the Groenendijk line or end it? To me children are an invasion of privacy and it does not come naturally to have children around me every day. I have very little patience with them. But before you can even have children, you have gone down a long road. If you decide to take on the role of donor, you have to have your sperm tested. The guests will hear and see how this is done later on."

## customer project management

*Jan Lempers started work as customer project manager at tbp electronics at the beginning of this year. His most important task is not only to ensure that customers get what they order, but that the progress of the entire process is optimised. From the idea through the design to the working product. This needs some explanation.*

Jan: "If a customer approaches tbp with a new product that we have never made before, then at tbp we talk about a new project. I lead the project, if possible from design to completion. This involves such activities as planning, activity lists, safeguarding the progress and communicating with the customer." The communication with the customer, in Jan's view, cannot take place early enough in the timeline between idea and end product. "The earlier that we are involved in the initial phase of the development of a new product, the better the quality and the yield. In fact, the highest returns." In this issue of Way of Life we have already highlighted the need for improved collaboration between designer and producer. A good example is described in the article about test engineering (see page 8). Jan plays the role of coordinator between customer, designers and test engineers. A job that is thus related to DfT (Design for Test).



Apart from that, Richard goes further while not avoiding his profession and peers: "I will talk more about the intrigues, gossip and revelations from behind the scenes of one of the production in which I was recently involved. Much of the act is based on my experience and environment. I do not enter into political speculations. I am more socially engaged at the micro level. I do not comment on how Mark Rutte handles the problems around immigration; instead I prefer to share my own experiences with people of non-Dutch origins. By doing this I sincerely hope that the public will agree with me."

For the rest it is not only crude jokes and funny one-liners that have the upper hand: "Of course it is funny. That's what people expect from me. But I also hope to give the audience something to think about. In my previous shows, I tended to give the answers to all the questions, but I don't do that anymore. In actual fact, the question is more interesting than the answer, and many more questions and depth hide behind it. They can sometimes be painful too."

The cabaret artist from Rotterdam will not reveal exactly what his show will be like. But he says that he is inspired by the distinctive British humour such as that found in series such as Absolutely Fabulous and Little Britain and as used by, for example, Catherine Tate.

This is a feature that is to be seen in all his shows. It was described in one critique as 'one man tragicomedies'. The show however, is not only serious. "Of course I also deliver coarse jokes. I also dare to show my vulnerability by saying things that I never dared share before. Sometimes you need to find something scary to be able to do it."

#### his own way

In doing this, Richard count on director Wimie Wilhelm, while his previous shows were directed by Dennis van Galen: "I miss Dennis - it felt so safe - but I have decided to more or less take a new direction. And however difficult this is, it is sometimes better to part. Wimie now acts as my filter. He is strict but honest. I think that for about eighty percent I can feel what works and what does not work. I can be quite stubborn, but when creating a show, Wimie is the first person to hear all the lines. She is also the one to shoot them down. I really wanted to include a particular song, but after listening to it twice Wimie asked *do we really have to listen to it for a third time? It's already loud and clear* ... But even then I can sometimes stick to my guns. She sometimes doesn't like a joke and asks *don't you think you should skip it?* I then decide to leave it in. But then after the 95th show my technician asks "don't you think you should skip it?"

The cabaret artist explains that the hand of Wimie Wilhelm will be visible, but mostly it will be heard: "Having studied

the Dutch language and culture, Wimie is very aware of words and their order. I tend to use a lot of clauses, but she removes these. The show is honed in terms of full-stops and commas, but is subject to change because every evening has a different public."

#### using talent

In the last theatre season, Richard could be seen in the musical *Herinnert u zich deze nog?! (do you still remember this?!)* And before that could be seen in other musicals. It is the variety of productions that makes the theatre world appeal to the Rotterdammer: "I enjoy using my talent. I like the variety and enjoyed my roles in *Les Misérables* and *Hairspray*. I like doing a frank solo show, and then joining five gays to do a guest performance with the Dolly Dots. I don't want to be labelled. I enjoy showing different sides of myself."

*Every single day* was a fixture in Richard Groenendijk's calendar up to the end of March 2012. The question remains if he really will become a sperm donor. "Just as in the show, I won't answer that question myself. So I won't reveal it here either. People will just have to come to the theatre themselves!"

[www.richardgroenendijk.nl](http://www.richardgroenendijk.nl)  
Keep an eye on the website as *Every single day* will be re-run in 2013!

Contact with the customer is of utmost importance when making a new product. The discussions will cover aspects such as how do you make something, how large should the yield be, what requirements are there and to what extent should you test. All of these come with a price tag that needs to be in proportion to the product itself. Project managers know where the bottlenecks arise. You naturally want to deal with these straightaway and, if necessary, consult with the customer to arrive at a suitable solution. Thus, Jan is in discussion with various designers who are starting new products for their customers. The designers turn to him for help as they too derive benefits from a perfect end product while operating under time constraints. A properly functioning prototype needs to be made. A short time to market in this world is very important. The gap between designer and producer is, thanks to Jan's role, being bridged.



Jan Lempers, customer project manager at tbp



# Art at Dirksland

## exhibition of contemporary art

On our temporary exhibition walls on the first floor, you can admire the works of two artists: Geert Vrijdag and Pieter Konkel. Pieces which each have their own character and which will trigger different reactions in each viewer - as is always the case with art.

Geert Vrijdag (1943 - 1999) studied at the Academy of Art in Tilburg and the Design Academy in Eindhoven. He uses different techniques in his art. He explains his work as follows. "I see my works as a practical search for the roots of inspiration and the visualisation process. The work arises independently of figuration, without a preconceived idea or image, and without thought through plans. A meditative attitude that makes intuitive exploration possible. Something looms from the dark; something unknown that wants to be known. It is the meeting with that unknown that I record in shape, colour, movement and material. At the same time it is also a challenge to renounce routine and tradition and it requires an openness and willingness to go further than the tangible reality."

The other artist is Pieter Konkel who specialises in paintings and screen printing. The title - Return to Innocence - can be seen as the thread throughout the work of this Polish Dutch artist. Born in 1963 in Poland as the youngest of a family of seven children, he fled in 1974 with his mother and sister to the Netherlands from the hard existence of the then communist regime. He expresses himself through his paintings which are all related to his childhood in Poland, his Catholic upbringing and his love of making the unrecognisable recognisable. His work is about the primary and emotional longings of humanity. He subtly weaves these conscious and unconscious longings into his work. To do this he uses powerful archetypal images supported by text. Pieter sees his work as a recording of his past from where it flows like a journey to undiscovered inner landscapes.

For more information about the art library: [www.kunst.nl](http://www.kunst.nl)

# The Conversation Company

*Social media. Do feel connected to it? Some people see it as a useless hype. Others see it as a useful, almost essential addition to communications. tbp sees it this way too. It is for this reason that tbp invited Steven Van Belleghem to be a guest speaker at the customer day to explain to the audience what social media can mean for you and for us.*

Van Belleghem sees everyone in your company or organisation as a potential source of conversation. Customers and colleagues share their experiences with each other and thus influence the public's view of your organisation. Social media is a real catalyst to get people talking about your company. New media technologies like social media make it possible for you to share, with just a few clicks of the mouse in the shortest time-span, anything you like. A successful 'Conversation Company' succeeds in converting this word-of-mouth advertising into something positive by making full use of the power of conversation of employees and people who were previously the public.

## Steven Van Belleghem

Steven Van Belleghem is managing partner of InSites Consulting, an international and innovative research agency. Van Belleghem's

passion is to help customers take strategic marketing decisions targetted at the consumer. Together with his team, he helps companies reach the present day consumer through branding, advertising and conversation. Van Belleghem published his first book, "De Conversation Manager", in 2010. It became a best-seller in management literature and won the Marketing Literature Prize in the Netherlands. Steven is also part-time Marketing Professor at the Vlerick Management School. Check his site at [www.stevenvanbelleghem.com](http://www.stevenvanbelleghem.com).

Steven Van Belleghem's latest book "De Conversation Company" shows what social media can do for a company. Some critiques say that it is a recipe for better company operations because it uses hidden potential. To this end, tbp gave a copy of the book to all visitors at the tbp customer & supplier day.



## tbp too uses social media

The use of social media is becoming increasingly more important. More and more companies are making use of services such as Twitter, LinkedIn, Hyves and Facebook to stay in touch with their constituency. Countless companies looking for suitable colleagues go through the profiles of people to see if they can find the employee they are looking for. Politicians, VIPs and anyone who thinks that they have something to say, tweet about it and without much effort get their audience. It is a fact: social media has conquered its place in all the communications channels that we have. This development spread in record time. Anyone claiming to have had a LinkedIn profile ten years ago is lying. There was virtually nothing in the area of social media then. The best known, LinkedIn

and MySpace, were created in 2003; Hyves and Facebook in 2004; Twitter in 2005; and the Dutch language version of Facebook in 2008. We simply forget how popular these media have become in a relatively short space of time. Young people in particular see it as a "must" to have a presence on social media. tbp is swimming with the tide too. We have good reasons for doing this: we believe that we can reach the right people at the right time with useful information. Or perhaps we can find the right people for whom we can mean something. In order to set up our new media properly, we have a new staff member, lelya van Dam (marketing assistant). lelya's job is specifically to set up these communication paths and ensure that everything runs smoothly.

You may even receive a tweet from tbp shortly about the successful customer & supplier days or the introduction of a new service. lelya will initially concentrate on Twitter, LinkedIn, Hyves and Facebook. If you don't want to miss anything, on behalf of tbp, he invites you to follow us. Once everything is running as it should, we can look at further expanding. As a "dry run" we would like to tweet that "tbp is in the business of perfection".



# to app or not to app

*Before something is produced it is common practice to request a quotation. Normally, customers ask for a quotation, an RfQ (Request for Quotation), by setting all the necessary information on paper and the necessary files are either sent by email or uploaded onto an ftp server. tbp will extend this methodology further through digital technology. You will shortly be able to request digital quotations by providing information through the internet and by adding a few files. This service will initially be provided to tbp's existing customers. New or potential customers will first need a log-in account, which can of course be requested in advance.*

## **always traceable**

Requesting a quotation through the website has advantages for both parties. The person making the request only needs to fill in or click on a few screens and knows immediately that everything is registered at tbp according to his/her requirements. For tbp, when the request is received, the project engineering and procurement departments supply their share to achieve the desired result. As the request is included in the company's automation system (Isah), its status can be viewed at any time and there is no chance that it "disappears". This also means that the shorter through-put times mean that the quotation is compiled more quickly.

## **simple to fill in**

Filling in an online RfQ is simple as it is step by step. After providing some practical information such as if it refers to an existing or a new product, the necessary files can be uploaded to make a pcba. These could be all CAD data, the BOM (piece list) and test information such as boundary scans. Then there is a report about the finishing (cleaning/coating) and the batch sizes (on time or a number

of batches per time unit). Finally, there is an option to specify whether it is a prototype, if it needs to be produced lead free, and if there are any existing agreements with suppliers.

## **processing**

When a digital request arrives an announcement is immediately sent to the account manager. There is then the first check to make sure that all the details needed are indeed available, and whether it relates to a new or an existing product, or even to a modified product. The next step is to gather all the information. This may include inputting by the work preparers (project engineering) and buyers. Once these parties have added their information, all the ingredients for the quotation are ready. The customer receives the quotation promptly by email.

## **order tracking app**

Another step we have taken in expanding our services is to order the addition of an app so that mobile phone users can track their orders. This means that customers can see in real-time while on the road the status of their current orders and whether there are sufficient stocks of their items at tbp. The logical next step is of course an app for a quotation request ... watch this space!

*Do you want an account or do you have any queries about this issue? If so, please contact Dana Wolters on T +31 (0) 187 602744 or E [dwolters@tbp.nl](mailto:dwolters@tbp.nl)*

