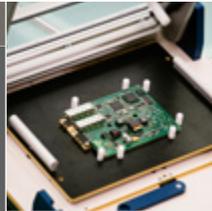




WAY of life



Edition
36
Nov 2013





Steve is off the Job

a low-cost iPhone which ultimately is not low-cost and is actually a copy of the Nokia Lumia? What has happened to Apple's creativity...

Is it a fairly transparent sales gimmick for the iPhone5 which was also not as popularly received as anticipated? Most of its shortcomings appear to have been resolved.

How this has come about, I don't know. An old thought comes back to me: "Not every change is an improvement". That still applies. Perhaps the time is ripe to listen to the customer better and to develop something which people actually want? I look forward to it.

Ton Plooy
CEO

Have you installed it yet? The new operating system of your Apple iPhone? Richard Groenendijk tweets " I really don't know. I've installed that iOS7 but it's a little 'Miffy goes to primary school' "

Why do things that work properly always get changed? It would have been better to resolve the things which don't work with a new software version. The amended menu is an absolute disaster, and the sweeping

away of open apps is now just like Android, read Samsung. The speed also leaves something to be desired and without the necessary amendments to the settings the battery drops alarmingly in percentage within no time. And by then the battery is so warm that you'd rather not keep the device in your trouser pocket...

Might all of the above have something to do with the loss of Steve Jobs?! Launching

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Way of Life is an occasional publication published by tbp electronics. This newsletter is distributed amongst tbp's customers and business associates. Way of Life is printed on chlorine-free bleached paper and uses eco-friendly packaging.
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two new fully operational smt lines

The two assembly lines for the assembly of smd components have undergone a complete metamorphosis. In the previous Way of Life we introduced the new pick-and-place machines which form part of this. This time we shall introduce you to the entire line.*

The production line we are referring to is entirely focused on the installation of components on the blank circuit board - the so-called bare board - and the subsequent soldering process using a reflow-oven. Naturally a lot more is involved when it comes to making a good product. In this article we will explain all of the other facilities such as logistics, advance preparation of the boards (drying process), test equipment, finishing and despatch.

One of the most important reasons to set up a new line is quality improvement and time saving. At every production step inspection equipment checks whether the previous process has run correctly. Ongoing automation reduces the likelihood of errors. An example of this is the MES (Manufacturing Execution System), a quality recording system which also minimises the chance of (human) errors. Result: a higher first pass yield and a better and more reliable end product.

On the shop floor (or the production floor) are two of these new production lines. Would you like to come along for a virtual factory tour to gain further insight?

p04 >>>

* smd = surface mount device; the components lie on the board, in contrast to the through-hole components for which the connecting wires pass through a hole in the board. The abbreviation smt stands for surface mount technology

start

In order to follow the flow properly, we refer to the design of the machine park as seen in figure 1. The production process begins with the acceptance of bare printed circuit boards, the so-called bare boards. These bare boards are equipped with a barcode whereby the MES recognises which product is concerned. A batch of these boards is accommodated in a cassette which is then placed in what's called the loader. A loader such as this can accommodate a maximum of three of these cassettes.

When the green light is displayed on the screen printer the transport of a bare board from the loader takes place. But first the board passes through what is called a cleaning machine. Inside this are two adhesive rollers which remove any irregularities from the bare board. Dust particles, flakes, metal slivers and so on, all cause poor connections!

The screen printer then applies the solder paste to the locations where the solder connections are later to be applied. The process is identical to that of the screen printing machine in print technology. A squeegee is drawn over a thin metal plate (screen) in which holes are situated in the correct places, which presses the solder through the gaps. When the screen is removed the correct quantity of paste remains in the desired locations.

inspection

An important principle in the design of the production line is that an inspection for faults takes place after each step. Should something go wrong - for

whatever reason - we want to know as soon as possible. Fault repair at an early stage is much more efficient than after the process is complete. As the bare board is passed through the screen printer, the first check moment is reached. This is done by the SPI (Solder Paste Inspection) machine. It determines whether paste has been applied to all locations in the right quantities and with the correct dimensions. A camera takes a picture of the relevant board and compares this to the original, preset parameters. In the event of discrepancies an alarm signal is given and the board will not continue. In such an event a machine operator must intervene and clean the board for it to be returned to the loader.

pick-and-place

The machine which appeals most to the imagination is perhaps the pick-and-place machine. In each line there are two, one behind the other. We introduced these to you in the previous issue of Way of Life. These are the MY100DXe-14 from Mydata. Exceptional machines in which placement heads place the various components on the board. The machine contains a large stock of all of the components destined for a particular production run and places the right components in the correct locations. Features such as placement accuracy, speed and changeover times for each production run of the machine play a very important role in this. In terms of speed: this machine is capable of installing some 40,000 components per hour. That is around 11 every second!

The transport route from stock to print is therefore as short as possible. The software even states where the reels or sticks (the type of component packaging) must be in the machine in order to guarantee maximum processing efficiency. For this purpose, on top of the second machine is another so-called tray magazine which can insert exceptional components such as BGA's (Ball Grid Arrays = ic's with connections in the form of rows of contacts with solder points on them). This entire optimisation process is called line balancing.

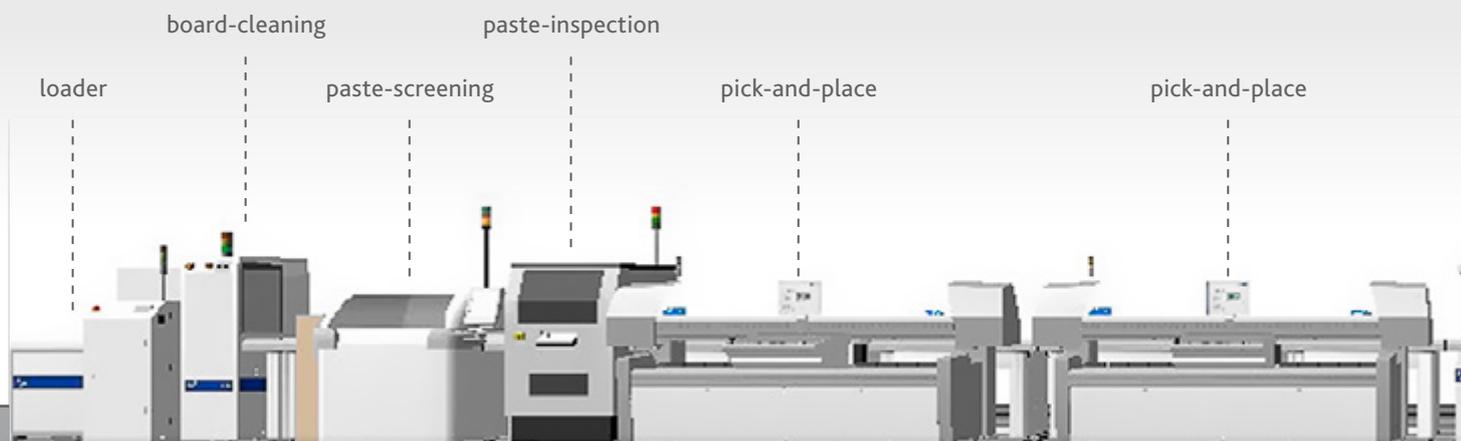
exceptions

There are some components which cannot be processed automatically. For example certain connectors appear to be unsuitable for automatic processing. The manual workstation exists for this. The operator can insert the relevant component on the board using a vacuum tool or tweezers. Up to this production phase in the old situation there followed an end station in which the boards were collected in an unloader. These were then transported to a separately installed reflow-oven. This step is redundant in the new situation.

further inspection

After the manual workstation another check takes place to ensure that the previous production phase has run according to plan. The jargon for this is the pre-reflow inspection. In fact this is also an AOI (Automatic Optical Inspection), but of a special specification. The integral cameras not only check that

figure 1: the schematic diagram of the layout of the new SMT production line



the components are installed, but also that they are of the correct type, with the correct rotation and in the right position. The cameras also read the text on the components and verify them on the basis of the database which relates to the print concerned. If all is correct, the board continues on its way to the reflow-oven. If there is any discrepancy, for example an ic (integrated circuit) which is positioned incorrectly, the board arrives at a kind of buffer. The operator then receives an alarm which he can see on the monitor screen displaying what is wrong and can take measures to resolve the problem. This buffer is situated above the conveyor belt between the AOI and the reflow-oven so that the normal production process is not delayed. Since faults rarely occur, a buffer location is sufficient to enable a continuous flow.

reflow-oven

The heating of the solder paste as a result of which it melts and the soldering process occurs, take place in this environment. Heating is done using hot air. In this process it is important that the correct heating profile is used. Depending upon the quantity of copper and the type of components more heat is required in some places than in others. Too much heat leads to damage of the components on board, too little results in a poor solder connection. Or - in the worst case - makes no connection. These profiles are determined in advance on the basis of the layout of the board with its components. Once a board enters the oven, it must leave the machine again in accordance

with the planned process time. Stopping halfway means irrevocable damage. In order to avoid that risk, this new oven is equipped with an integral emergency power supply.

buffering and inspection

Once the board has passed through the reflow-oven, it arrives at the next interim station. This buffer area is fitted with a fast cool down facility. This means that at the next inspection the boards are cooled sufficiently and therefore cannot emit solder fumes which may damage the metering equipment. The buffer also provides sufficient space for temporary storage. Whatever happens after this station, the oven can always discharge its output.

From the buffer the board then appears in the 3D-post-reflow inspection machine (3D-AOI). This station is comparable to the AOI in the pre-reflow. This checks that the soldering process has been carried out correctly and that there are no (unusual) faults such as tombstoning. With this new machine measurements are made of the quantities of solder and a check that no short-circuits can occur. The position of the components is also checked. To summarise, a very advanced measuring instrument which in a very short time can determine a whether the board is a go or a no-go.

the final station

At the end of the production line is the unloader. This contains two magazines: one for the approved boards and the other for the rejected boards. In principle

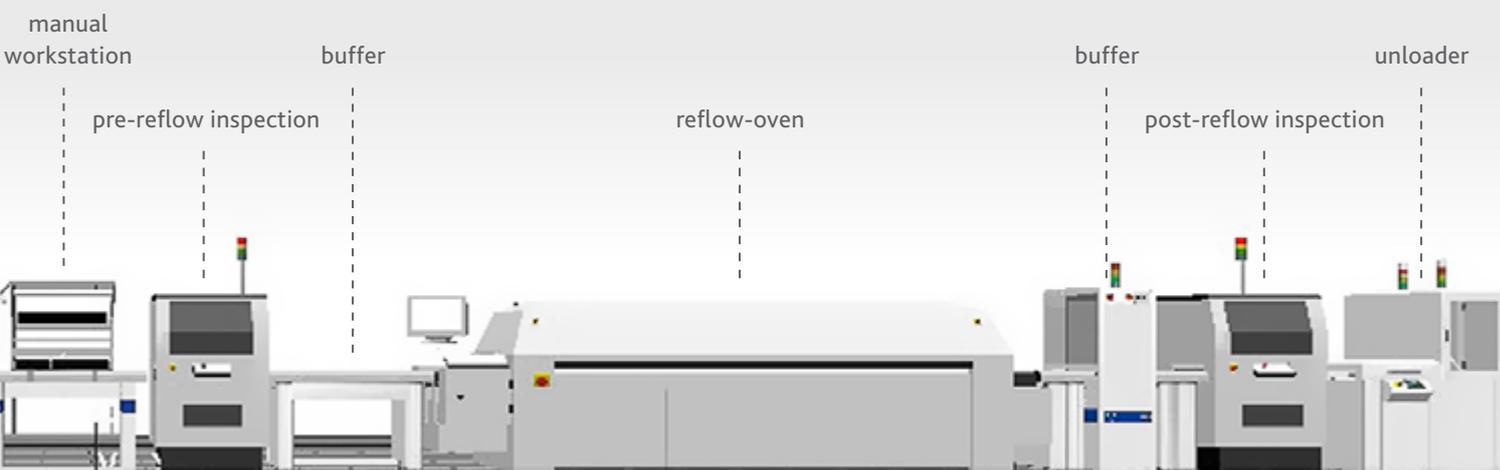
the second one must always be empty, which may sound logical.

After this production line the boards follow the next route across the shop floor, such as conventional assembly, finishing etc. In many cases additional tests are first carried out. These may include a flying probe test, in-circuit test or boundary scan test, right up to a functional test. Following all of these test processes comes finishing, such as the application of synthetic film for protection (coating) and potentially a burn-in test. Only then is the board ready for despatch to the customer.

first time right

The entire line has been developed with the thought in mind that production complies with the first time right principle. In other words: everything must be right first time. This will never happen in practice of course, but this mindset optimises all processes even further. Learning from your mistakes is a well-known saying, and it also applies in this environment. The MES processes all established faults and gives the process owner the right information to adapt the processes.

No-one wants production faults, especially if they occur several times in one batch. Not only do they disrupt the entire process, they increase costs and reduce quality. That is entirely at odds with tbp's motto: the business of perfection.



It's a real-life case

Can you see for yourself? You submit all of the (digital) information for your new electronics to tbp, agree a price and delivery time and receive the perfect product at the agreed time. Of course you would expect that from a self-respecting EMS-company, wouldn't you? But practice has shown that this is not always achievable. Naturally there is a reason for that. This has emerged from the findings reported by the DfX-engineers at tbp. They investigate whether electronics are feasible and/or the required quality is achievable, prior to the commencement of production. The engineers also investigate whether the design complies with the rules of DfX, otherwise known as Design for eXcellence. A common concept in which all activities to do with the feasibility and testability of the product are packaged. Until recently DfX was a greatly underestimated discipline which fortunately is now receiving increased attention. Rightly so, as designs which leave something to be desired can never fulfil the requirements imposed by the customer on electronics products.

The Extended Boundary Scan tester is the very latest equipment for thorough testing of pcba's which are suitable for this purpose.

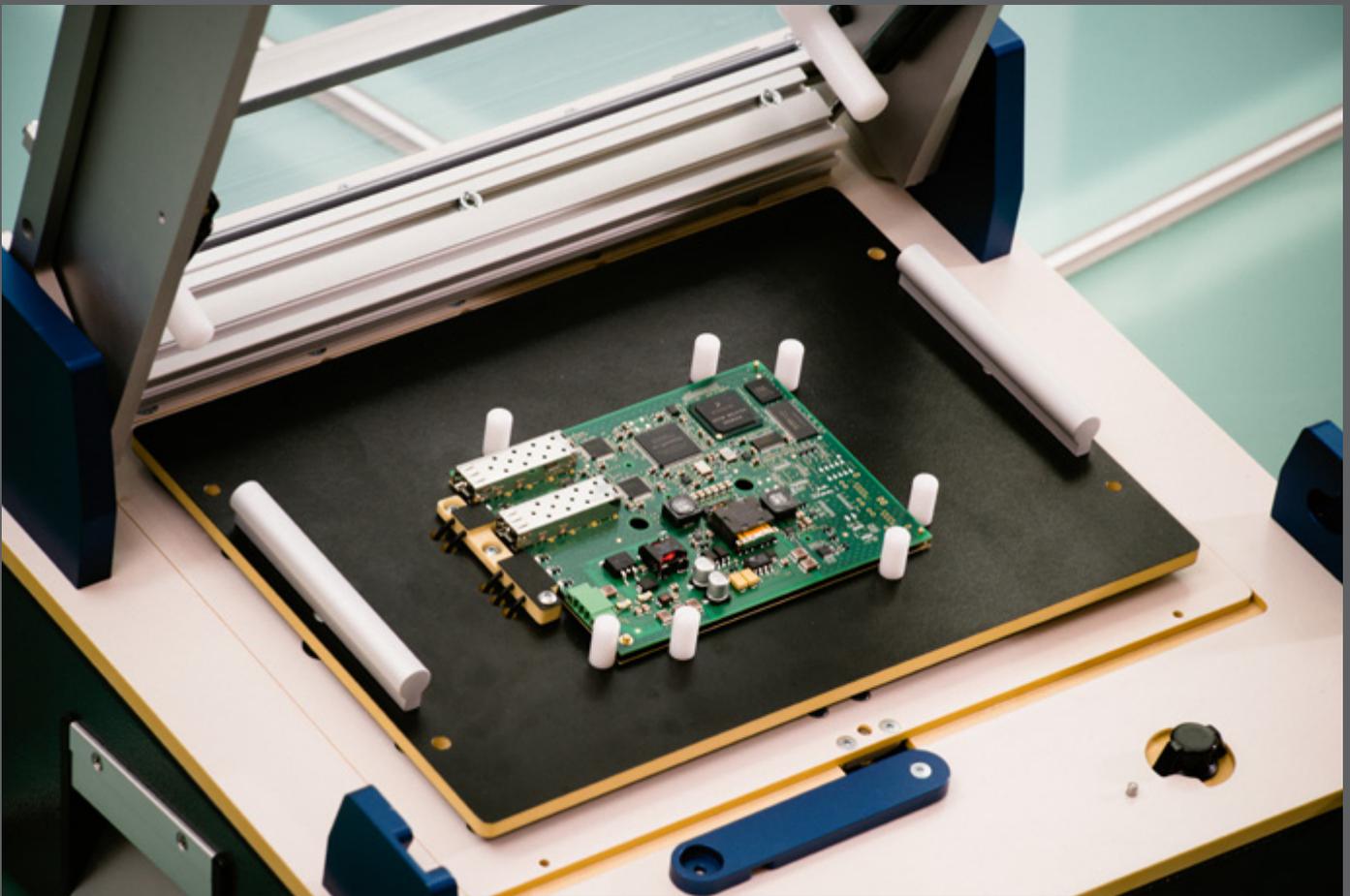


figure 1a - some examples of faults in the BOM

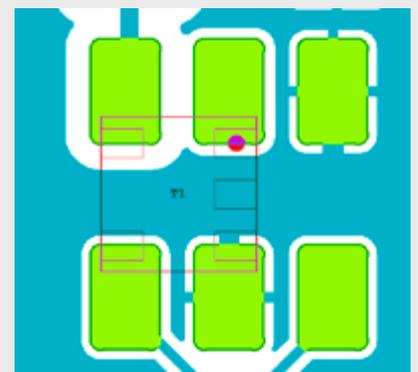
BOM error : 3 different descriptions assigned to 1 MPN Remark

RefDes	Qty	Description	MPN	Manufa	IPN
L25	1	Toroidal Core Potting Boxes (V-RG) for vertical pcb mounting	66352-017	ACE	ZZ5806635201700
L33	1	14 turns, 1mm wire T106-2 (Yellow)	66352-017	ACE	ZZ5806635201700
L32, L34	2	10 turns, 1mm wire T106-2 (Yellow)	66352-017	ACE	ZZ5806635201700

BOM error : Refdes C64 has 2 different component types. Remark

Req	Phantomartikel	Omschrijving	Opmerkin	Artikelnummer fabrika	Aant	Refdes
60	ZZ2850331055456	SMD COIL 30G/100V 0805 NP0 5%	KEMET	C0805C33201GACTU	2	C14, C64
130	ZZ2980101075003	SMD TANTAL 100U/16V 10% D	AVX	TAJD107K016R00	7	C64, C65, C114, C115, C179, C182, C190

figure 1b - components which cannot be installed due to a fault in the BOM



DfX engineering

DfX engineering is the designation of a separate entity within tpb which assesses all aspects of DfX and compiles a report on it. It is a distinctive service which clients can utilise to ensure that a properly functioning electronics product is created which fulfils the stated requirements. That service begins preferably at the moment that the electronics designer begins his assignment. Cooperation between the designer and the engineer will then result in a better quality product. This is due to the fact that the engineer has a great deal of expertise in the production of electronics and the application of test facilities. The result is that pcba's (printed circuit board assemblies) can already be structurally tested to the maximum for all sorts of facets during production. Such tests deliver a much more reliable product. In order to be able to understand what can go so wrong in practice, our engineers will gladly provide a few DfM (Design for Manufacturing) examples. They are all based on harsh reality. Naturally we have omitted the names of the clients and projects but that is all.

basic faults

Errors in the BOM (Bill of Materials, or item list) supplied by the client, occur quite regularly. These include incomplete reference names, several references for various types of components and references which occur in the BOM, but not in the CAD design (lay-out). These errors can lead to incorrect procurement of components which either cannot be installed or in the worst case end up in the wrong place. Figure 1 shows several examples. It is understandable that it happens, but what is absolutely unacceptable are components which are mirrored or rotated through 180 degrees in the design. Certainly if they have different connections (such as connectors) that can have disastrous consequences. This type of fault has occurred on more than one occasion. As an extension of this it occurs regularly that the holes in the board for such TH "through hole" components are not correct or are even omitted. A pin which is too thick in a hole which is too narrow really causes a problem - see also figure 2c.

transport zone

The installation of components right on the edge of the board is to be strongly

advised against. This is all to do with the transport mechanism which leads the board through all its production phases. The likelihood of positioning problems increases. The advice therefore is to stay away from the edge of the board.

footprint

The usual version of electronics is the pcba, the synthetic carrier upon which all components are located and the wiring. The layout must be designed in such a way that there is sufficient space for all components. The designer reserves space by looking at the so-called footprint. That is the English term for the dimensions (the volume) of a component. It has occurred on more than one occasion that a certain component will not fit because another component is occupying that space. It is also a regular occurrence for ic's (integrated circuits) to be used, in which the number of connections does not correspond to the connections on the board. Even more specifically: a 16 pin SMD required to be mounted in a location for a 14 pin DIL. Or what also often happens is the exchange of a specific ic which exists in both narrow and wide versions. A combination of these faults is even possible (see figure 3). p08 >>>

figure 2a - missing connector holes

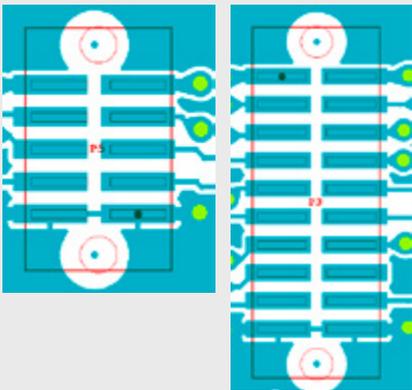


figure 2b - the connector holes are in the wrong position

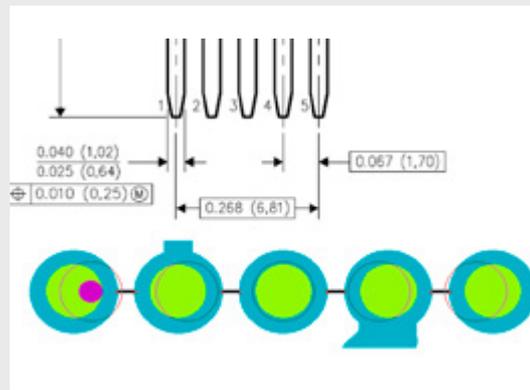


figure 2c - too thick a plug in a narrow hole and connection problems due to drilling



figure 2d - component signed off in reverse

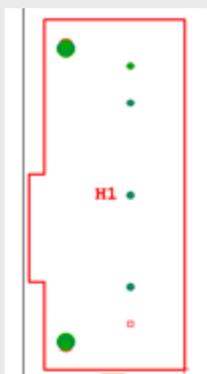


figure 2e - components overlap each other

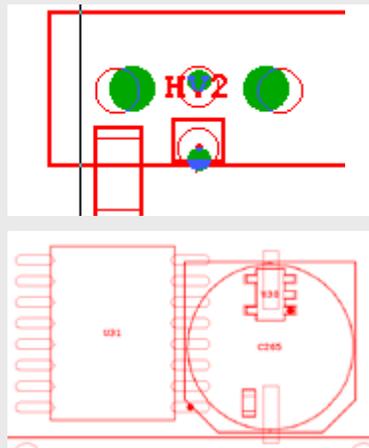
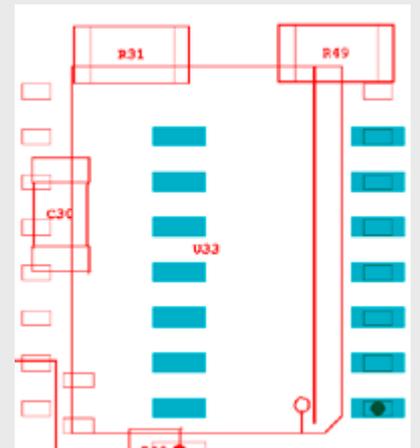


figure 3 - problem: the component exists as an SMD-type in a 16 pin wide-body variant whilst there are two 14 pin DIL-variants. The designer has signed off a 14 pin SMD-variant on the size of the 14 pin DIL-variant



This generic test platform is intended to enable pcba's to be thoroughly tested immediately after production.



p07 >>> With simple components such as condensers and resistors strange situations sometimes arise. A resistor with a specific value is defined in the BOM, as a result of which the dimensions are fixed. Although the resistance value is stated correctly, due to a typing error, the incorrect specification is selected as a result of which the distance of the paths in the footprint on the board does

not correspond with that of the resistor. In brief: correction required! See the examples in figure 4.

tombstoning

Another English language concept. Tombstoning is the phenomenon whereby a component does not remain in its position during the soldering process, but comes loose on one side and raises

up. The cause can usually be traced to thermal imbalance. Because there is a great deal of copper on one side of the component, for example a junction of various connections, and on the other side little copper, the temperature will increase much more quickly during the heating process at the last point. The solder becomes fluid more quickly and capillary forces arise due to that fluidity

figure 4 - examples of incorrect footprints

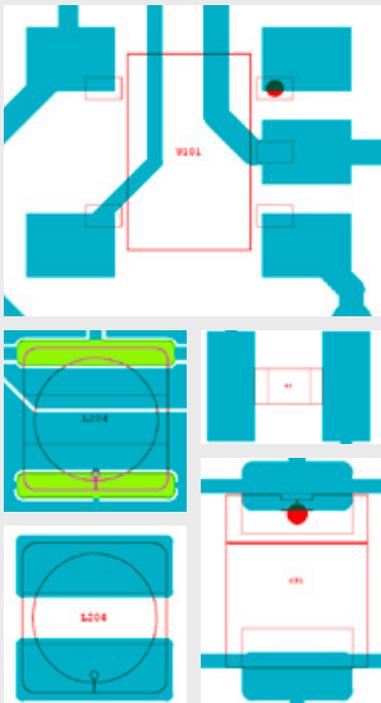


figure 5 - example of the risk of tombstoning with an 0402 type component (with dimensions from 1 mm to 0.5 mm)

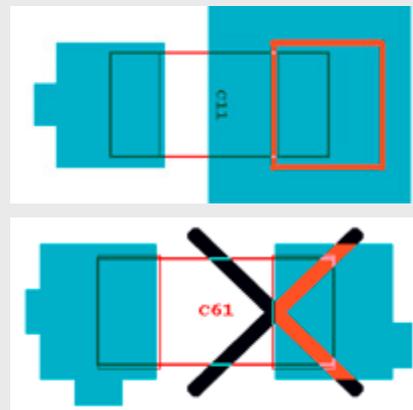
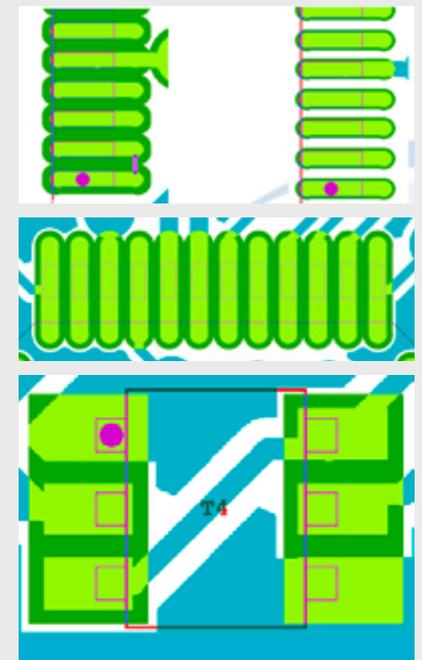


figure 6 - loose cables or short circuits



figure 7a - example of missing SM-dam



which tilt the components, especially those which are light in weight. The solder on the other side however is far from melting and therefore offers no resistance. Heavier components do remain in place, but run the risk of being pulled to one side with all of the inherent risks. In practice too little or no attention is paid to the phenomenon of tombstoning and all of its consequences. Examples of this can also be seen in figure 5. The engineers study thermal management during the soldering process based on the design and determine how great the risk is. It almost goes without saying that they give advice on preventing this phenomenon.

wiring

The engineers often encounter strange things in terms of wiring. Despite the fact that designers often carry out simulation tests in order to be able to assess the layout for value, faults occur. Wires which come to a sudden stop, incorrectly made connections which create short circuits, and so on. These faults often occur because the designer introduces changes to the layout at the last minute and forgets to correct several items. Figure 6 illustrates this.

soldering problems

SMT forms the basis of modern electronics. With SMT (Surface Mount Technology) almost all of the components lie on the reverse side of the board. The components are secured by the momentary heating of solder paste. To a great degree the quantity of paste determines the quality of the connection. The dose is therefore very important. During the soldering process the paste must become fluid and provide a strong mechanical and electrical connection after cooling. There are often connections above and below the board. These connections are made using so-called via-holes. These are copper-lined holes in the board. If such a via is positioned close to a component, certain precautionary measures must be taken. If this is not done, after the solder paste becomes fluid, solder will flow through the via to the other side. This results in a poor connection and on the other side a disruption of the surface which can create problems later on. Fortunately there are various techniques to eradicate this problem. One solution is to introduce a kind of dam (SM-dam or Solder-Mask dam) around the hole as a result of which the paste does not escape.

Such a dam is often also applied in an ic, whereby the risk exists for short circuit of connections which are close to each other. The supplier of the bare board, the bare printed circuit board, applies such a dam. Naturally this is subject to the condition that this information is present in the digital information supplied by the client! But this is perhaps preferable to replacing something in the vicinity of the via. This all depends upon the specific circumstances. In a case like this the engineers provide advice in addressing this type of problem. Figures 7a, 7b and 7c illustrate a few practical examples of how this can go wrong.

better product

The above examples are merely a glimpse of some of the incidents which our DfX-engineers often encounter. It is their job to seek out such deficiencies before an assignment goes into production. The client receives a summary in the form of a report, so that improvement actions can be taken (see figure 8a and b). That is the only way which can ultimately lead to the product that the client wishes to receive.

figure 7b - example of VIA-holes in the thermal surface of an ic

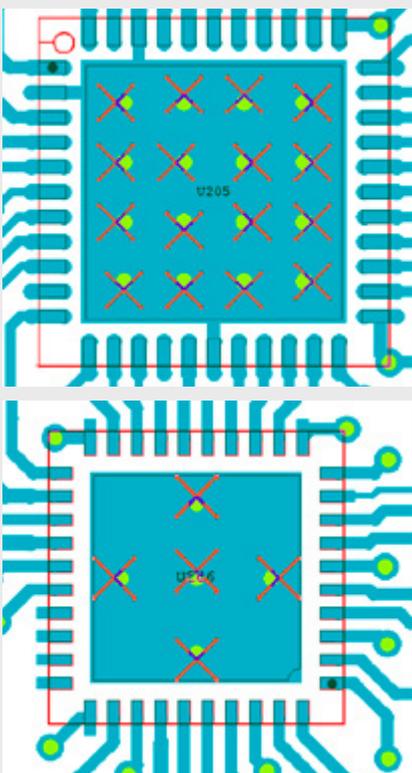


figure 7c - example of VIA-holes too close to the components and/or solder paths

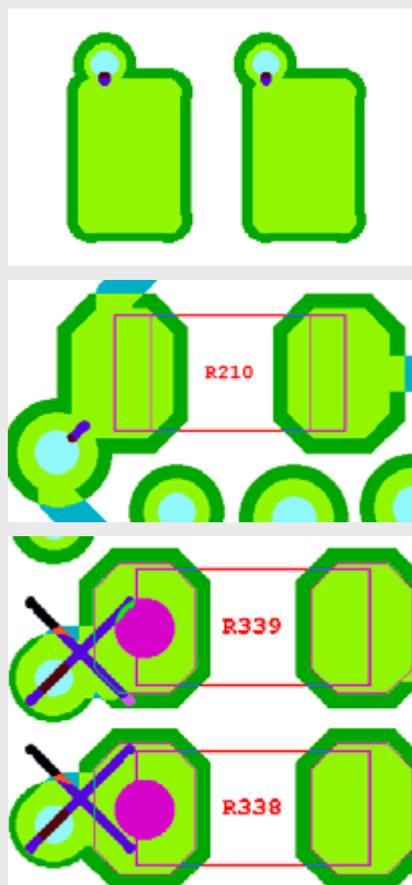


figure 8a - index of improvement points

5. INDEX		
2. INFORMATION		
Global information		
2.1. View Top side		Remark
2.2. View Bottom side		Remark
3. BOM ISSUES		
All remarks related to the BOM information. For instance: database not found.		
3.1. In BOM not in CAD		Remark
4. GENERAL REQUIREMENTS		
All these remarks refers to the automatic assembly requirement. For instance: If and components and fixtures are within the transport zone they may interfere with the support risks during processing.		
4.1. Solder paste clearance		Major Improvement
4.3. Features to profile		Warning
4.4. Board length		Warning
4.5. Board width		Warning
4.6. Pad/cut to convex edge		Warning
5. COMPONENT ISSUES		
All issues related to components. For instance: component overlapping		
5.1. Pad inflow design		Major Improvement
6. SOLDER QUALITY ISSUES		
All remarks related to the solder quality are described in this section. For instance: the thermal balance of chip components. Bad thermal balance increases the risk of a bad solder joint or tombstoning.		
6.1. No Electrical connection on PTH pads		Major
6.2. Soldermask dam too small		Major
6.3. Tagged to tagent (passive components)		Major
6.4. Missing soldermask dam between pads		Major
6.5. Vias in a SMD pad		Major
6.6. Vias in a thermal pad		Major
6.7. Soldermask dam too small between via and smd-pad		Major
6.8. Bad thermal connection on SMD pads / thermal imbalance		Major
6.9. Soldermask coverage too small		Minor
6.10. Silkscreen too close to pad		Improvement

figure 8b - list of positions of detected problems

ERROR LOCATIONS					
ID	Check	Value(mm)	X(mm)	Y(mm)	Layers
1	CHK-CAD Self Spacing	0.004	-42,131	-34,867	top top
2	CHK-CAD Self Spacing	0.004	-50,800	-38,152	bottom bottom
3	CHK-CAD Self Spacing	0.004	-54,800	-38,152	bottom bottom
4	CHK-CAD Self Spacing	0.005	-44,267	-27,450	bottom bottom
5	CHK-CAD Self Spacing	0.005	-53,650	-42,233	top top
6	CHK-CAD Self Spacing	0.005	-53,550	-44,233	top top
7	CHK-CAD Self Spacing	0.005	-53,650	-38,233	top top
8	CHK-CAD Self Spacing	0.005	-53,650	-41,233	top top
9	CHK-CAD Self Spacing	0.005	-53,650	-39,233	top top
10	CHK-CAD Self Spacing	0.005	-37,333	-24,850	top top
11	CHK-CAD Self Spacing	0.005	-53,650	-43,233	top top
12	CHK-CAD Self Spacing	0.005	-42,267	-27,450	bottom bottom
13	CHK-CAD Self Spacing	0.005	-43,267	-27,450	bottom bottom
14	CHK-CAD Self Spacing	0.006	-53,050	-7,200	top top
15	CHK-CAD Self Spacing	0.007	-22,053	-35,800	top top
16	CHK-CAD Self Spacing	0.007	-22,053	-32,200	top top
17	CHK-CAD Self Spacing	0.013	-47,044	-55,800	top top
18	CHK-CAD Self Spacing	0.013	-44,044	-55,800	top top
19	CHK-CAD Self Spacing	0.013	-36,044	-55,800	top top
20	CHK-CAD Self Spacing	0.013	-35,156	-23,000	top top
21	CHK-CAD Self Spacing	0.013	-45,156	-55,800	top top

management information in optimum form

The transition from release 3 to 4 of our Isah business information system (ERP-system) has gone entirely to expectations and within budget. Not only have the possibilities been enriched, communication with the user has also improved considerably. The display screen has been given a more straightforward design and the presentation of information satisfies demand better. This also means that users can request bespoke reports. This is down to the enhancement and refinement of the filter options. Users themselves select the parameters for the compiling of reports and save them, for example in an Excel spreadsheet. Almost every computer user is familiar with this software. The planning module has also been abandoned. Restrictions in the way in which certain production runs were entered previously applied, now it works more flexibly. The client will not notice any difference but everything is running more smoothly internally.

database

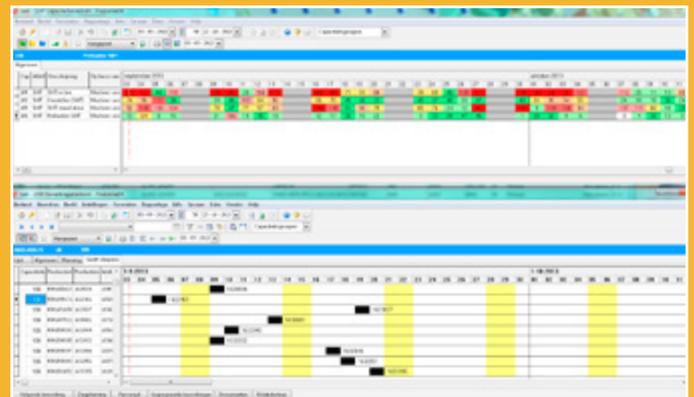
Ultimately all information comes from a database. Until recently this was a Sybase database, but for the transfer to the new release a Microsoft SQL database was selected. The reason for this is obvious. Since MS Office-software is the general standard - think Word, Excel, Outlook - seamless integration can be achieved between Isah and MS Office. This means that both graphic and technical possibilities are utilised most effectively.

server

All information ultimately ends up in the memory of a server. A crucial point in the information chain to which high standards are quite correctly attached. Various scenarios were reviewed and ultimately the solution was found in the purchase of a new server which is used exclusively for Isah applications. To increase commercial security an extra server runs (this is referred to as redundancy) so that if a disaster occurs, all of the information remains available. It goes without saying - also within the context of risk management - that this server is situated in an external location.

up and running

All employees who are involved with Isah have undergone training so that they can benefit properly from its advantages. In practice the system appears to function very satisfactorily. Although clients are not directly involved in this and in fact will hardly notice this, we assume that they will reap the rewards indirectly. Internally that information which is required to manage all production runs is processed swiftly and comprehensively. No more, no less. We can expect that from a perfect management information system.



In the upper screen we see the planning load in daily percentages for four machine groups. On the screen below we can see which assembly projects belong here.

The desired lines can be highlighted using filters. Underneath we can retrieve various extra information (total, average, etc.).



The list of favourites from the initial screen (upper left) can even be configured according to requirements. Each web page can be displayed in the right hand screen. Dashboards with performance indicators are also available if required.

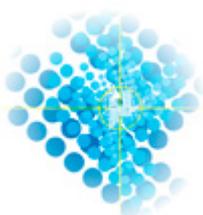


tbp before and after the fair

LOOKING FORWARD TO THE PRECISION FAIR AND A QUICK LOOK BACK AT ELECTRONICS & AUTOMATION

For the first time in history tbp electronics will be present at the Precision Fair. This fair, which the Mikrocentrum is organising for the 13th time, is considered to be the meeting place for precision technology. In the meantime the fair has built up a national and international reputation. Time for tbp to put out the feelers so it can explore new markets. It appears to be a promising event. In addition to the over 250 exhibitors the programme also contains some 60 or so lectures on subjects including measurement, micro-processing, motion control and engineering. You can attend the tbp lecture by Gerard Elema entitled early involvement on 3 December at 15.20 in room 19.

p12 >>>



Precisiebeurs 2013

Precision Fair - tbp stand 196

Tuesday 3 and Wednesday 4 December 2013

NH Conference Centre Koningshof, Locht 117, 5504 RM Veldhoven
 opening times: 9.30 to 17.00
www.precisiebeurs.nl

early involvement

It is exactly this subject that the designer or purchaser of electronics must (begin to) address. In brief, this philosophy means that the designer of electronics receives early support from a manufacturer in terms of feasibility and testability. Bringing about this synergy from the start of a project, yields better products in terms of quality. The likelihood of "hidden costs" emerging, created by lower quality products, reduces considerably.

How do I convert this into practice? The client, usually a buyer in a company, approaches an EMS company*, requesting an offer. Not every EMS company offers an early involvement service so there are visible price differences between the offers submitted. A selection made on the basis of price alone is like comparing apples with pears. This is only apparent upon the delivery of the first products. What is left out of the calculations is the extra cost of repairs, potential design amendments and so on, all due to defective electronics. Could that have been avoided? To this tbp answers a resounding: yes! If designer and manufacturer had cooperated more closely, this would have resulted in a better product. Furthermore, it has been proved that if the costs are considered over the entire life cycle of a product, these work out cheaper if early involvement had been applied.

At the Precision Fair a practical example will demonstrate how important this subject is. Very briefly, it happens that a final product is described, to which the requirement applies that the failure rate must be very low. Should that product not function correctly, commercial losses will occur and high costs will be incurred due to the difficult circumstances in which repair must take place.

engineering advises

Due to years of experience tbp is aware of many of the problems which mean that a product does not meet expectations. That is also the reason why a team of DfX** - specialists in this field combined forces. A service which preferably begins at the moment when a client decides to create an electronics design. The engineer then gets the opportunity to assist the designer in creating a perfect product. You can read more about the usefulness and necessity of DfX in the article which draws on case studies on page 06.

First

In addition tbp is seizing the opportunity at the 2013 Precision Fair to launch brand new, distinctive structural testing technology in the form of the Extended Boundary Scan test (EBS test). This is a newly developed testing technique which enhances quality and in doing so allows the TCO or Total Cost of Ownership to fall. On balance the client achieves a much better buy!

Boundary scan is a technique which has been in use for some time to enable testing of connections on a printed circuit board assembly (pcba) in a relatively simple way. The technique which the Joint Test Action Group (JTAG) has developed for this purpose, has generated a large number of potential applications and it is no wonder that this can also provide tbp with test facilities. Boundary scan was originally only suitable for the testing of digital circuits and the minimum requirement is that at least one component in the circuit is suitable for this technique. The underlying concept is to carry out measurements if a data pattern is presented to the board to be tested. The results measured determine whether or not a board contains faults.

New to tbp is that a solution has been found to allow a board which is in production to undergo a boundary scan-test in which analogue circuits are also subject to a test. In order to make this possible special test technology has been designed and built. This test technology has been designated Extended Boundary Scan test (EBS test). The EBS test technology makes use of a needle bed. The pattern of the needles must naturally be fine-tuned to this board (one per product), but it is then suitable for carrying out affordable test measurements on a whole production series of the same boards. The secret lies with the test technology itself. The test installation contains components which comply with the IEEE-1149 specifications and these ensure further communication. The test installation generates both analogue and digital signals and via the needle bed as interface it can be determined whether or not connections on the board have been made properly. EBS test has been developed in-house by tbp in close cooperation with boundary-scan supplier JTAG Technologies in Eindhoven (www.jtag.nl).

in practice

The carrying out of EBS-tests is a new service. Three basic conditions apply to this service provision: qualified personnel, an EBS test system and a needle bed as interface with accompanying software. The needle bed is generated as a one-off together with the accompanying software, written for a specific print. A one-off investment which will pay for itself very quickly. The tests show at an early stage whether a board has been properly manufactured. And not only when the board is occupying its position in the environment in which it must function. Repair at a later stage always involves higher costs!

* Electronics Manufacturing Services

** Design for eXcellence



WORLD OF
TECHNOLOGY
& SCIENCE

A DATE FOR YOUR DIARY
30 SEPTEMBER TO 3 OCTOBER
JAARBEURS UTRECHT
WWW.WOTS.NL



Ton Plooy presents the Marketing Communication Cup on behalf of the FHI (www.fhi.nl) to Dirk Stans, director of Eurocircuits.

looking back

We usually look to the future and not very often to the past. But when we think back to our participation in the Electronics & Automation fair, we found it to be very successful! Whether it was down to the Belgian draught beer or the good food, we're not sure, but there was a constant stream of business contacts who came along for chat. Not only were contacts consolidated, new business partners also got in touch. Subjects such as early involvement often came up for discussion. Frans Geerts, business development executive at tbp, sees this as a positive development: "We are noticing that issues such as DfM and DfT are becoming the topic of conversation much more often. Clients understand that extra care during the pre-project phase pays dividends later on. Even better, it yields profit!" It is not only he who knew how to convey this philosophy to the visitor to the Fair. Gerard Elema did exactly the same thing in his presentation within the context of the theme "Design for eXcellence". In it he related his account of the control steps carried out by tbp on the design data such as item list, cad-data, net list and manageability prior to proceeding to production. His account came directly from practical experience and indicated where problems can occur. This is expertise which

designers can include directly in their design process. The peak in visitor numbers was visibly during the happy hour. Presumably encouraged by the jolly sounds of the trio Small Talk (www.smalltalk.nl) many visitors were drawn to the stand. But that was not the only reason. Opposite the stand was the area kept free for the awarding of the biannual Marketing Communication Cup. This trophy was instigated for the exhibitor who attracted the most number of contacts in relation to the size of their stand. Using this formula, both small exhibitors as well as the larger ones have a chance of winning the main prize: stand space at the next Electronics & Automation (www.eabeurs.nl). The award winner was Eurocircuits (www.eurocircuits.be), the manufacturer of bare boards who cooperated with tbp at the fair and took home the trophy and not for the first time. Although tbp "only" won third prize, you wouldn't have known it from the massed crowds. So everyone left in a very good mood!

**ELECTRONICS
& AUTOMATION**





tbp's way of life to the point

For the sixth time tbp organised the successful tbp customer and supplier days. Over two afternoons - on 30 and 31 October - our auditorium was filled with 180 guests in total who were served up various presentations on various subjects. It was summed up nicely in the invitations: it will be an engrossing and enjoyable afternoon which is entirely focused on your field of expertise. Engrossing due to the quantity and diversity of information, enjoyable due to the entertainment provided. The fact that there was also scope for networking and the day was rounded off with an especially good Indonesian rice banquet made the event into a useful and pleasant occasion. It was an animated get-together in the Grand Café!

Ton Plooy



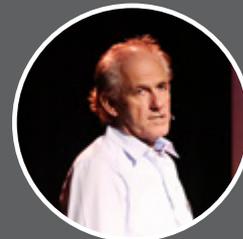
Wiljo van Okkenburg



Gerard Elema



Marcel Swinnen



Kees du Pree



the programme

The afternoon programme consisted of six in-house presentations and one by TU Delft:

1. Ton Plooy - CEO, host and chairman for the day - grasped the opportunity to talk about the recent extension to the

machine park and to outline what is due to happen in the future.

2. What state is tbp in? Is the business healthy? Wiljo van Okkenburg presented the business's financial position based on the key figures.
3. One topic which deserves more attention than some people realise: tbp's

early involvement. Gerard Elema and Marcel Swinnen proved its usefulness and necessity.

4. It is not without reason that tbp promotes itself as *the business of perfection*. You can only award yourself that title if you do absolutely everything to achieve the highest quality.

zooming in further

We would like to highlight briefly a few exciting details from the various presentations. It would be a mammoth task to reproduce all of the lectures. So to get straight to the point: with suitable pride Ton Plooy presented the new product lines. But those are not the only changes. There are many new plans in the pipeline. Next year Ton expects to create extra production capacity in a new area to be built at the front of the business's premises. "The foundations are already in place, hidden from the eye by a pebble garden. So it doesn't have to take too long to realise our idea", says Ton. The logistics centre, our automated warehouse-shuttle, is also reaching its maximum capacity. "We are thinking about copy-paste for a second shuttle line. VanderLande Industries (www.vanderlande.nl) is formulating our wishes further." And that's not all. Upgrading of the clean room is also on the programme for next year. More and more often clients require products which are manufactured in an extra clean environment. In the area of information exchange EDI²⁾ (see also page 25) will play an increasingly important role. We shall make extra efforts to configure this phenomenon - which is in the interests of our clients - as well as possible. Finally we mention our collaboration with GO College (www.gocollege.nl). The training institute at Goeree-Overflakkee to which tbp is firmly committed and which is expected to introduce more qualified technical personnel to the employment market.

Even in these times of high unemployment it is certainly not easy to attract suitably qualified personnel!

key figures

The question has already been asked: Is it going well at tbp? That can only be demonstrated by hard figures. Tbp's most important objective is to be the top player in the EMS sector. That means continued investment in equipment and expertise, therefore sufficient financial resources must be available for that purpose. As we know, banks are no longer the most obvious parties to approach for investment. As ING bank executive Rindert Ekhart himself states: You shouldn't go to the bank for innovation". Contemporary opportunities arise through: investors such as investment corporations, older business people and so-called financing and supply chain finance. It is high time to investigate these forms of finance further in order to obtain the necessary investment. Finally two important parameters which financial experts consider: with its excellent liquidity and solvency position tbp can work further toward a healthy future.

early involvement

A theme that regularly returns in *Way of Life*. As an EMS company it is necessary to become involved in the development of electronics at an early stage. The most important reason for this is that the quality of the product to be made can only be guaranteed if all the information required to manufacture that product complies.

That all sounds very logical but practice shows that something quite often goes wrong. An example for illustration. Say a pcba³⁾ contains dozens of components. Countless opportunities then arise for something to go wrong during assembly. A component might be defective, not installed properly, not soldered properly and so on. We call these Defect Opportunities. An average board achieves a DO with values between 1,000 and 20,000 very swiftly! Faults can also occur on the production line. Plainly if such a board is produced, that swiftly yields a production run of which there is uncertainty about whether several percent of the end products are up to standard. In order to prevent this. tbp engineering provides advice with DfT⁴⁾ and/or DfM⁵⁾ to the designer so that the yield figures are higher. The key concept: Select the correct test strategy. Because only then can you considerably improve the quality.

quality issues

Continuing the drive toward improvements in quality, the necessary precautionary measures must not only be taken during the preliminary phase or in the p16 >>>

¹⁾ Electro Static Discharge. This phenomenon occurs when people wear unprotected clothing and footwear. These electrical discharges can irrevocably damage semiconductors (chips)

²⁾ Electronic Data Interchange

³⁾ Printed Circuit Board Assembly

⁴⁾ Design for Test

⁵⁾ Design for Manufacturing

Arnold de Vos



Hanneke van Wageningen



Jacob Herrewijnen



Marius Knol



Stefan van der Kleij



Kees du Pree provided further enlightenment on the matter.
5. A well-known theme for those who had been guests before during the tbp customer or supplier days: *tbp the logistic way, part VI*. Hanneke van Wageningen and Arnold de Vos investigated the importance of good chain

collaboration.
6. There are always risks lurking in disruptions to the production process. Risk management inventarises all of the possibilities which may occur. Jacob Herrewijnen has fully identified the risks and explained how tbp is minimising these using several examples.

7. Those who are familiar with tbp know that the company sponsors the DUT Racing Team. You can read more about the successes of this team on page 22. Marius Knol and Stefan van der Kleij provided a report on this with the theme: *Become a better engineer: build a racing car.*

p15 >>>

design phase, the finger must be on the pulse across the entire production process. The overall system MES, Manufacturing Execution System, provides the tools to prevent faults as much as possible. With the implementation of the Aegis MES the likelihood of faults can be reduced further, whereby tbp aims to achieve

INNOVATION IS RIDING THE RIGHT WAVE, BUT ONLY FOR PEOPLE WHO ARE NOT AFRAID TO GET WET

values around 10 DMPO⁶⁾. The slip through - the percentage of pcba's for which it is unknown whether they are 100% good - is therefore considerably improved. Without measures such as DfT and DfM the current levels of slip through would never have been achieved! Consider that the repair of defective pcba's afterwards is indeed possible, but it brings with it relatively high costs.

MES has current information about quality during the entire production process. As soon as a relevant disruption is established, an alarm is given and direct intervention in the process can take place. It almost speaks for itself that all of the data monitored during the process is recorded. Within the context of traceability this information is then available if it is required at a later stage.

the logistic way

Naturally, in addition to the digital data, for the production of pcba's, the bare print card (bare board) and components must also be available in time. Order processing manages forecasts for clients and buyers at tbp enter into contracts with subcontractors for this purpose. These contracts establish what types must be delivered and at what times. Theoretically that process should run flawlessly. In practice it is slightly different. That's why buyers

also monitor problems here so that threats to production can be prevented. Supplier performance is assessed in accordance with the QLTC-model. Quality, Logistics, Technology and Costs, to which the last factor Communication can also be added. In previous presentations during customer & supplier days a great deal of attention

has been paid to these concepts. During this session the emphasis is on the factors of risk and communication. To summarise: when a problem occurs for whatever reason and delivery time is at risk, that must be discussed immediately. An appeal to suppliers then: pick up the phone right away! Because together a solution can be arrived at which protects the entire chain collaboration.

risk management

Clients assume that their order will be delivered on time. Nevertheless there are always risks that there will be a kink in the cable. Clients rightly demand guarantees that tbp will fulfil its supply obligations. It is therefore necessary to analyse these risks further and to act on them. An inventory has been made for the production facility in Dirksland in accordance with the so-called Coso-model. In doing so 35 risk factors were considered, along with the degree of risk of something going wrong and its impact were assessed. The degree of risk that the assembly line will be threatened is immediately visible in the form of a matrix. To illustrate: if an aircraft crashes on the business premises the impact is maximum: possible injuries or deaths, no production and loss of production resources. Some risks are covered by insurance. Only in the long

term will we be up and running again. The chance of such an accident happening is fortunately very small. On the other hand take the example of a server failing. Almost no-one can continue to work, so the production process stops. True, it is less of a disaster than the aircraft, but the impact is high. So tbp has taken measures against this by running a server in parallel to the company server, which is situated in a different location. This type of redundancy reduces the risk enormously. Work is ongoing on all of the 35 risks described in order to minimise the risk.

become a better engineer: build a racing car

Stefan van der Kleij and Marius Knol, two prominent figures in the DUT Racing Team, demonstrated the point of this practical exercise in their presentation. They made it clear that although college study covers all of the theory involved in a subject, the link to practical reality does not come about by itself. The students who worked on the project - the construction of an (electric) racing car - did experience this however during the completion of the design. The idea that you can create a good product using an electric screen in the office and a CAD file was quickly nipped in the bud. Issues such as DfT and DfM were unknown, and the design of pcb's appeared to be even more difficult than was originally thought. But you learn by doing and it's there to do! So the electronics which fulfilled expectations were produced on time and in the end that led to the ultimate result: champion (see page 22)!

entertainment

After the presentations it was entertainment time. This was different on both days. On the customer day Thijs van Domburg (famous from radio and tv)

⁶⁾ Defects Per Million Opportunities



the opinion of our guests

The events have delivered a positive contribution to tbp's image. The completed questionnaires also confirmed that. The majority considered the event to be informative and worthy of recommendation. What was striking was the difference in the evaluation of the presentations between the two days. Expectations became reality: on the customer day the most appreciation went to technology, whilst on the supplier day there was more interest in the theme of logistics. People agreed on other things however: it was an educational event with an interesting programme, contained enough humour and there was nothing but praise for the food and catering.



Thijs van Domburg



Robert de Vries

appeared on stage with his science fiction cabaret. An act which reminds you of a stand-up comedian who makes regular jaunts to the year 2017 and back. Comical sketches with "fatal consequences" in which electronics no longer play a role in our world.

The following day it was the turn of Robert de Vries with his magical cabaret. He entertained the public with his amazing sleight of hand. He regularly involved those present who probably had cause for concern as to whether they would get their clothing or money back. Robert not only has all the blarney but also knew how to lead the audience up the garden path.

factory tour

Returning to serious matters it was time for the *factory tour*: an updated machine park and essential repositioning of existing machines. Naturally ESD¹⁾-safe clothing was donned prior to this. The guests filed through the production area and the logistics section in groups, accompanied by a guide, who provided the necessary explanation and answered questions. The feedback questionnaire also indicated that people were very impressed with these clean and spacious areas. It was truly impressive to see the two new 26 metre long SMT production lines in operation. Only a few people had ever seen that.



Pep Rosenfeld

international customer day

For international customers and suppliers tbp organised a similar get-together on 6 November. They enjoyed the same programme as our guests during the customer & supplier days, but in a slightly more compact form. On risk management Marinus de Pooter provided an assessment of the consequences for clients in the event of disasters. Marinus specialises in wealth management and advises the commercial sector on putting their internal affairs in order.

The entertainment was also slightly adapted to the more international character of the day. It was no less than Pep Rosenfeld, one of the founders of Boom Chicago, who knew how to unleash the enthusiasm of his audience. Boom Chicago is famous for its funny performances in the Rozengracht theatre in Amsterdam and participation in the Comedy Central TV shows. But this team also does a lot of bespoke performances.



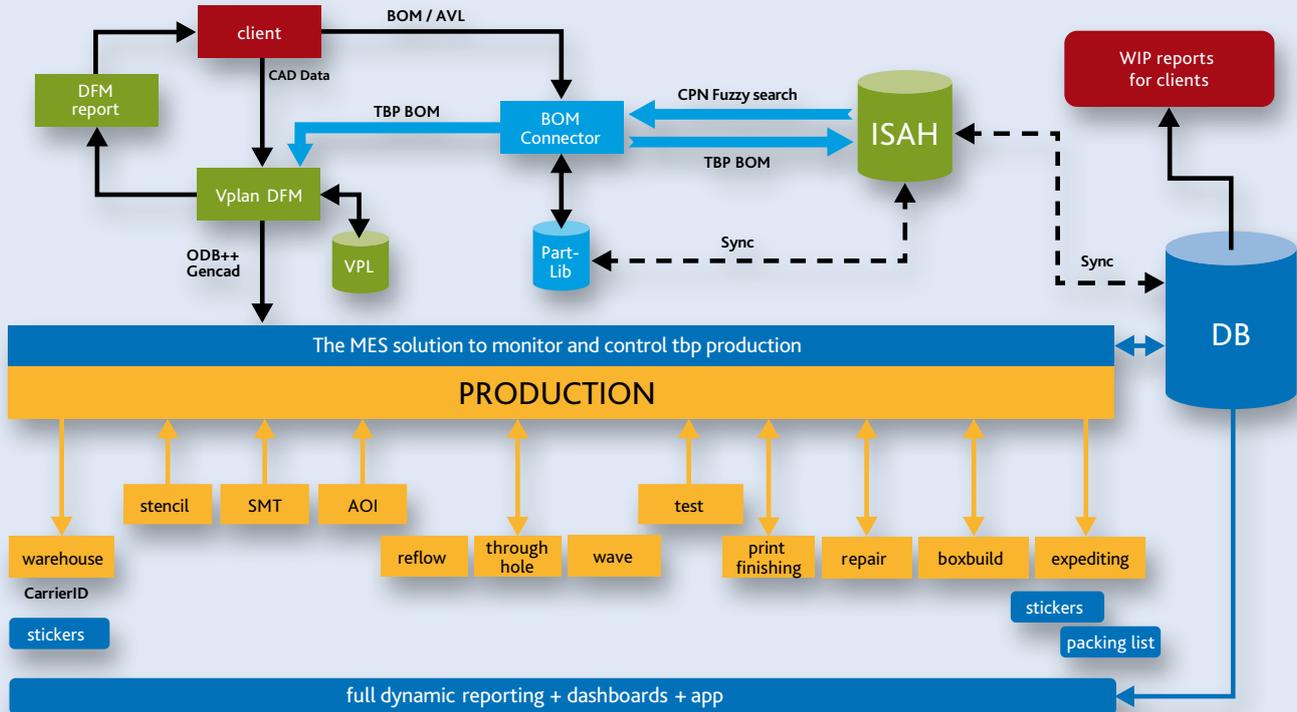
open day

Immediately after the customer & supplier days the (biannual) open day took place on Saturday 2 November when family, friends and local residents could come and have a look around tbp. This is a special event as the shop floor (production area) is not normally accessible to the public. Adults looked with interest at how the production of electronics takes place. For many this is a somewhat magical world which commands a great deal of respect. The younger ones were given the opportunity to try their hand at assembly and soldering. By manually assembling a bare board with a few components an electronic dice could be put together. A nice souvenir!

The DUT13 racing car which was present also attracted attention. A few students provided a full explanation if required and every now and then a young driver was allowed to get behind the wheel. Rest assured the starting key remained safely under lock and key.

The GO College was also present of course. Young and old were able to find out more about what this educational establishment can offer. The main advantage of this type of education is that the students can become directly involved on the practical side in addition to their theoretical education. This goes a long way to bridging the gap between what is learnt in school and practical experience.

figure 1 - the general structure of the MES



nothing escapes MES

After the introduction and implementation phase *tbp* commissioned the MES system just before the summer vacation. MES, which stands for Manufacturing Execution System, makes it possible to measure, control and report on the assembly of *pcba*'s* during the various process steps. This software from Aegis was explained in detail in *Way of Life* number 34. Figure 1 illustrates once more how MES is implemented across the entire production process.

factory model

Without going into great detail of all aspects of the MES, in this article we pay attention to several eye-catching benefits. The first benefit that we hope to achieve with MES is an even greater degree of *standardisation* in the selection and outcome of process steps which are necessary in the assembly process of a product. For this purpose all process steps which can be applied

in principle are laid down in a so-called "Factory Model (FM)". Now, if our work preparers have to create a work instruction, they can select the process steps for that specific product very swiftly from the FM. They immediately receive the correct set of work instruction templates which they only have to complete. The result is a standard format (figure 2) and a structured sequence of process steps (figure 3).

quality improvement

The second point that we want to pay attention to here is quality, which we want to improve with MES by monitoring and adjusting the various process steps. Thus the input of the serial numbers of the printed circuit boards is further automated by the application of so-called inline scanners. These scanners are located on the SMT lines and elsewhere (figure 4). This method

* *pcba*'s: printed circuit board assemblies

figure 2 - standard format of a work instruction for better recognition by our employees resulting in fewer errors when applying instructions

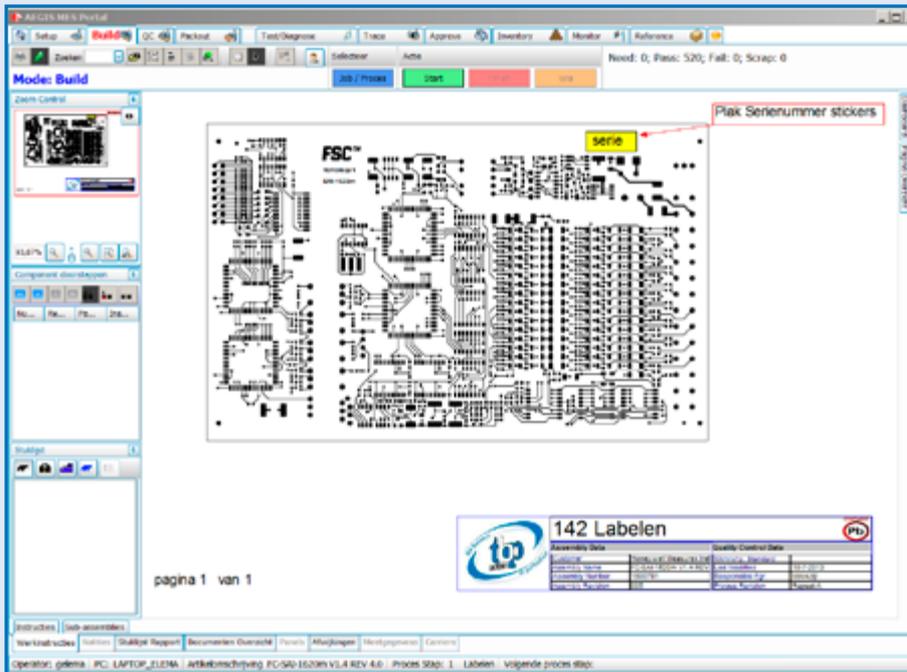
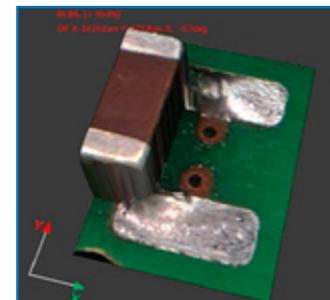
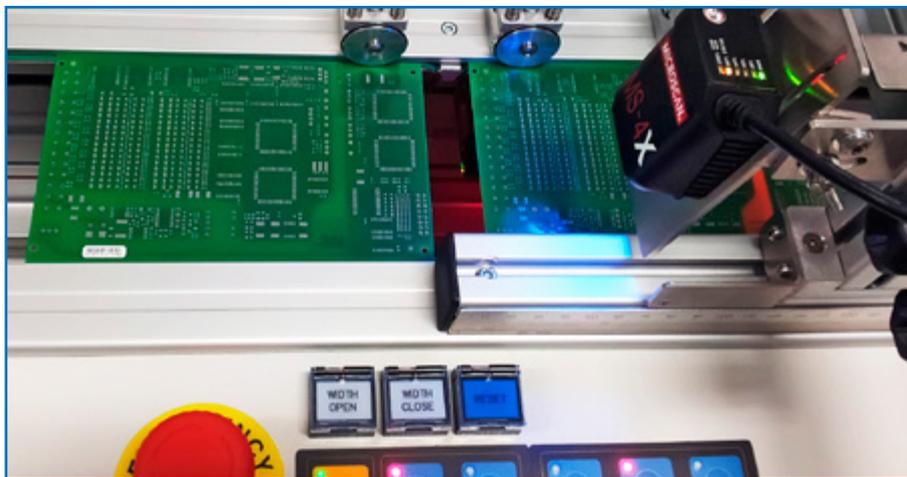


figure 3 - example of a number of mandatory process steps

Mandatory fields	
Name process step	
Line – wave soldering	
16	Wave soldering
17	Pcba finishing
Process group – ICT	
Line - ICT1	
18	ICT
<	
19	PTR test pre-coat
20	Automatic coating
21	Pcba finishing 2
22	Burn In
23	Inspection
24	Packaging



above: figure 5 - the position of this component clearly requires an X offset

left: figure 4 - an inline scanner reads the serial number of every board

is preferable to manual input (prevents typing errors). By monitoring everything that happens at each process step, we can improve the step further. An example of such an improvement are the details of the AOI-machine (Automatic Optical Inspection) with which we measure the accuracy of the installed components (figure 5). These measuring results yield corrections to the installation programme of the component or for the

machine loading, should these be necessary.

conclusion

Clients are increasingly placing demands on issues such as track and tracing, historical production details and reporting for potential repairs of modifications. As all product information is updated, detailed information about a particular product can still be provided

years later. In addition to standardisation and quality improvement we also place emphasis on process optimisation, materials management and the improvement of internal procedures. In summary, the roll-out phase of the MES will still provide the necessary challenges. More about this in a future edition of *Way of Life*.



Jos Schellevis, Chief Technical Officer at Deciso

Deciso - if you identify with safe data traffic

Deciso a highly innovative company that is becoming more well known as a manufacturer of network appliances and middleware software. With its focus on the interface of business networks with the internet, resulting in network products to which security and reliability of the data traffic are central. The company also produces advanced business telecommunications equipment (up to some 200 connections), solutions for specific network applications and acts as system integrator. Most of its clients are from the SME sector, but it also supplies operators of data centres and several large companies. In the latter category, this mainly involves high end systems.

network products

Jos Schellevis, Chief Technical Officer at Deciso, emphasises that security of network traffic is becoming increasingly important. It is essential therefore that businesses which make use of the internet, must ensure that there is a well-protected connection. Jos states: "Our firewall acts as an access portal between the internet and the company's local network. This regulates precisely what data traffic is and is not permitted. We are also developing equipment for secure data connections using encryption. Data is encrypted before it reaches the internet and the data is then returned to its original format when it arrives with the recipient."

Deciso also provides total solutions. Specialist professionals refer to UTM (Unified Threat Management) applications: packaging of functions (we won't go into any more detail here) such as firewall, anti-virus, anti-spam, VPN, load balancing, proxy servers, fail safe facilities and security.

Deciso has developed its own hardware platform upon which open source software turn-key solutions are offered. Open source software is software to which the source code is accessible to everyone. This is in contrast to proprietary software which is usually only visible to the manufacturer. Both systems have their own advantages and disadvantages. With open source solutions Deciso thinks it is able to offer the best choice.

hardware

For the development of a new network product it was necessary to seek a partner who could think along the same lines during its realisation. Jos states: "in terms of functional requirements we already had our own ideas down on paper. After all that's our speciality. But we lacked knowledge of issues such as testability and feasibility. Our ambition is to create a top product at an affordable price which puts the products from China in the shadow." This vision links completely to the philosophy of tbp, which states that if attention is paid to DfX (Design for eXcellence), this translates into a much better quality product. "At the beginning of the development of the electronics we already wished to engage a partner who could provide us with advice and practical assistance. One who would think along with us in the design, the

choice of components with a view to testability and how to make smart electronics. Questions such as 'Do we need to make use of boundary scan products? Where should you utilise these, where do you apply further testing points? And all manner of questions such as this. However we wanted a high quality product. That had to be the case even if many examples are to be produced. We wanted a slip through which closely approaches the theoretical limit of 0%."

Deciso's chosen strategy to involve tbp at an early stage of the design process (designated early involvement) is reinforced by previous experiences in China. The company was previously involved in hardware which originated from there. Those products were developed and produced there, with the result that the Chinese also entered the market for other applications. An additional disadvantage was that the quality lagged behind what the company expected. In terms of quality: that will always vary by country/supplier. Some manufacturers supply top products, but there are suppliers in lcc's (low cost countries) who perform below par. Jos notes: "There is visibly a great deal of variation in the quality of products. It is clear that the suppliers of the bare board are frequently interchanged, different components are used to those which have been agreed and the solder connections are sometimes doubtful. We can do without that."

In the meantime Deciso is convinced that production in our country is no more expensive than in China. "If you develop and manufacture in the right way, you more than earn back your investments during the pre-project phase in the quality of your product."

The time was now ripe to begin to develop electronics on home soil. And that step was taken last year. On the pile was a new product with a new generation AMD microprocessor as its beating heart. That led to tbp entering the picture. An EMS company which happened to be in the neighbourhood, but that was just a lucky coincidence.

contact

The first contacts with tbp had already been made at a much earlier date. Jos states: "We had been there a couple of times. They told us what they had to offer, but at the time we had our

suppliers in Asia. The opportunities for our own development were out of our reach at the time and we had to be satisfied with what was available. One of our American clients asked us last year if we could develop electronics for a specific application. We therefore needed information and got in contact with tbp. They advised us as to how we could develop efficient electronics. We purchased the necessary *tools* and set to work. And that's ultimately how our new network product, the A10, took shape." Although this product has already been launched in the press, it is not yet on the shelf. The first prototypes have been built and are currently undergoing all sorts of tests. There is also regular contact with the DfX engineers at tbp electronics. During this phase measures can still be taken to improve efficiency and test strategy and therefore to increase quality further.

The first examples will be delivered at the end of this year in order to conquer the market in 2014. A juicy detail is perhaps that in the meantime AMD has included the product in the Embedded Solutions Guide, and a close cooperation with this company has come about. That's an acknowledgment which you don't get every day.



Deciso's business premises in Middelharnis

Deciso
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DUT Racing Team champion

Do you remember the story about DUT Racing Team in the previous newsletter? How the team prepared for the races last summer? What is it all about again? To summarise: a competition between student teams from universities and colleges all over the world to design and build the best electric racing car. A professional jury assesses each car in all sorts of aspects and the performance must be demonstrated on various circuits. This year a team of enthusiastic students from the Technical University in Delft (TUD), joined together*

in the DUT Racing Team, designed and built an electric racing car and took it to three events: Silverstone in England, Hockenheim in Germany and Spielberg in Austria. The students themselves consider the event in Hockenheim to be the most prestigious to take part in, and to their great satisfaction they achieved first place there. This gave rise to the somewhat cryptic title of "unofficial champion". Tim de Morée, one of the drivers and since the summer also team manager, talks about his experiences with relish.

WORLD RECORD

The successful DUT12, the unofficial champion car of last year, delivered astonishing performances in September.

On the start and landing strip of former airfield Valkenburg the DUT12 was able to accelerate from 0 to 100 km/h in a time of 2.13 seconds. This beat the old record by more than half a second. The

measurements were taken in the presence of officials so that the performance was included in the famous Guinness Book of Records!



On 14 June the entire DUT Racing Team was presented to their parents and invited guests

electronics

Electronics play a crucial role in this racing car. They are responsible for controlling the propulsion. Something called an ECU (Electronic Control Unit), the electronic heart of the car, takes care of controlling the power of the motor. This supplies an electric motor whereby each wheel has its own motor. The art is that this ECU does its job whereby the car responds optimally to the commands of the driver. The car has to have a lot of power (150 pk / 110 kW), to be able to accelerate quickly (0-100 km/h in 2.4 seconds) and cannot be heavy (175 kg). This places great demands, not only on the driver, but also on features such as the car's stability and handling. Various sensors in the car control the conditions and control the power of the motor in conjunction with the driver's commands. At the beginning of this year tbp entered the picture as sponsor supplier of the pcba's**. At the time the students had completed their design according to the best of their ability and thought the required boards would be available to them after a brief period of production. It was apparent almost immediately that what they wanted was almost impossible. In the designs no account had been taken of issues such as DfM (Design for Manufacturing) and DfT (Design for Test). The consequences made their presence known: faults in the design led to faulty products. Through intensive consultation between several students and tbp electronics a solution was sought in great haste and fortunately one was found. The first prototype appeared to be unsuitable, but the second version could be used after a few amendments had been made. The 14 June 2013 was the roll-out of the so-called DUT13. It was on this sunny day that the electric racing car was first shown to the public. The DUT13 was

entirely finished on that date but testing did not go well. Not the demonstration run as planned, unfortunately. At that time both the hardware and the software of the new racing car contained faults which first had to be corrected. To be precise, safety could not yet be guaranteed. Naturally in that case it could not run! Also the battery, which had developed a few supply problems, was not yet suitable for use. A few days later all of these problems had been resolved. By the way: by way of compensation on 14th June a demonstration was put on using the racing car which had been successful the previous year. There was still a party in the market square in Delft.

electronics problems

During trial runs there had been a few problems with the electronics, but they were mostly to do with the wiring and motor issues. The pcba's had performed superbly. The designers had in fact underestimated the thermal behaviour of the ECU. At a given moment its temperature rose too high, which caused some problems. Whilst driving the signals from the gyroscopes were no longer processed properly. These signals, which are processed in the yaw-rate controller, ensure that steering into and out of bends is as smooth as possible. By giving the wheels on the inside of the bend a different amount of torque than those on the outside of the bend, the car can literally be catapulted into the bend which makes driving around a bend easier and quicker. The amount of oversteer and understeer can also be controlled using this controller. Depending upon the circuit the driver can set the effect he wants at that time himself.

Tim on the subject: "We found a solution by water-cooling the ECU. That

appeared to work. We had very few faults after that. It was just before the race in Hockenheim (Germany) that we discovered a problem with one of the electric motors. There was no time to resolve the problem back at base so we had to take the motor apart in the back of the truck on the way. Luckily we were able to repair the fault quickly. The other problems encountered were with mechanical parts such as the wings. We also knew how to fix those defects in time."

in practice

The yaw rate controller proved itself, especially in Spielberg (Austria), but also in Hockenheim. Tim: "We were probably the only team that had got this controller working properly. That worked out really well, even when running on a wet track surface. It had rained really hard and the circuit was really slippery. Compared to the other racing cars our car appeared to be able to negotiate the bends effortlessly. We left the competition way behind. Traction control on each wheel determined our success." The team also knew it needed to score in all three events. The DUT 13 also proved itself in terms of factors such as reliability. For a moment it appeared that an important last-minute repair might be necessary at one of the events, but the electronics held together superbly. The controls worked entirely according to plan. So in the endurance trial the car appeared to perform better than originally expected. That scores points of course!

* DUT stands for Delft University of Technology

** pcba's = printed circuit board assemblies or ready-made assembled printed circuits



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how are we contactable digitally?

Whereas in the beginning telephone and post were the only forms of communication between tbp and its clients other than direct human contact, times have changed dramatically. And in terms of communication: greatly improved. We now have a range of options at our disposal, each one with its own specific features. We'll outline them all for you.

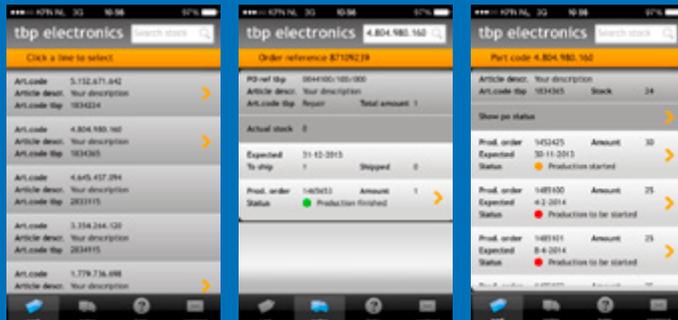
Telephone, post and fax need no introduction. The fax is even already in decline. Some people still use it, but almost everyone these days uses email. Swift and easy to process information. Just like using websites. It's sometimes hard to believe that barely twenty years ago the use of the internet was available to a very restricted number of users.

apps

Lately the smartphone has gained a significant position as a means of communication. Apps provide a swift response to all sorts of things. The app for order tracking is of course a well-known one. This provides a lightning-swift answer to questions about the status of your product. In which production phase is our project currently? Will my product arrive at the agreed time? Is there a stock of it? Have the products been despatched but there are problems with logistics? All issues in the area of track and tracing. An app like this works as easily as this. And should clients wish to install this app via the app store (for iPhone or iPad) or via the QR-code, that can be done.



order tracking app QR code



item summary

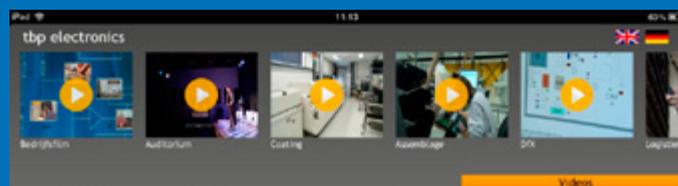
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order progress

Much newer is the app which provides direct access to the published editions of *Way of Life* and our company videos. If you remember a publication about a subject you can browse directly in the archive. Or should you wish to leaf through an older edition, that can easily be arranged. Furthermore the functions of both apps are available via tbp's website (www.tbp.nl) under the order tracking and news buttons. In addition you can inspect all assembly process remotely by clicking on the short videos on our website (available on almost all pages) and the app also provides you with professional film clips for each process.



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online quotations

Would you like to request a quotation or order a new or existing product? You can do this entirely digitally with the *request-quotation* via the website. After logging in to the secure environment, a client states what he wants. Using this route he can request a price for example for batches of 10, 25 or 100 units of an existing product. If it involves a new product, naturally all of the required information is added such as cad-data and BOM (item list). For the client this method of enquiry yields another extra benefit: the structured questioning prevents information being omitted. The enquiry goes straight into the business information system (Isah) so that the account managers can get on with it straight away.



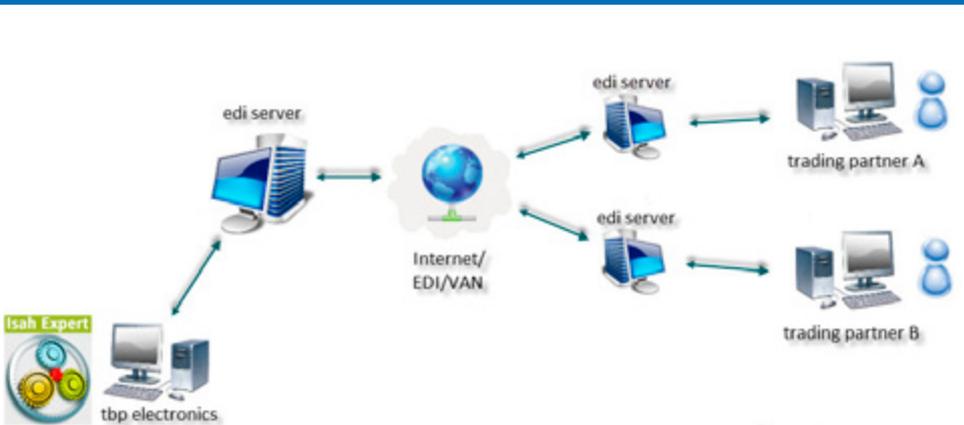
edi

A new form of communication which is already utilised on the purchasing side, but not yet on the client side, is EDI. EDI stands for Electronic Data Interchange and is in fact a standard for the electronic exchange of business information. Various companies, especially in the area of logistics, have been using it for some time now. This technology lends itself exceptionally well to the transmitting and processing of orders and the forecasting and confirmation of orders. In fact it involves the transmission of small text files in which the information is contained in a standard format. Familiar standards are XML files, Edifact, VDA, Odette, and so on. EDI is strongly preferred to email due its structured processing. Due to the lack of structure in normal email messages a direct link to business systems is almost impossible. XML is a standard which is used in web traffic, amongst other things.

An example for illustration. Imagine a client wants to place an order. He wants 25 prints of type ABC123 delivered on 5 January 2014. He enters his requirements into his business information system (ERP-system or Enterprise Resource

Planning). The ERP-system summarises this information in a text file and sends that via the internet to a digital post office. This post office then delivers this file in accordance with an agreed method to tbp's business information system (Isah). When the assignment can be fulfilled, a confirmation automatically takes place in reverse order: from tbp to the post office and from the post office to the client's business information system. Production and despatch follow entirely according to plan. In the event of any problems such as for example perhaps the delivery is required on a Sunday the order processor receives a signal that an order has been placed which requires special attention. Further investigation must explain what the problem is so that a solution can be sought in consultation with the client.

Several trial projects are running at the moment and all of the signs indicate that it is going to be a success. This means that EDI exchange will probably become an all-year-round reality.



social media

The icons on the website tell the story: tbp is involved in all of the social media to inform you of the nice-to-know messages. Because articles in journals, nominations, open days and sponsorship and so on are an important part of tbp's way of life.

So you know about our various communication routes. But let us not lose sight of the fact that ultimately it is all about people, however digital we become. Contacts between people ultimately form the success of the business. We should cherish that.

working smartly with energy

Energy. We can't get by without it. We need it to keep our lives going. That we need to use it sparingly is news to no-one. The ever-increasing prices of our primary energy sources make this more important than ever. The call for alternative energy sources is getting louder and louder. But of course it doesn't rest there. There is a great deal to be gained from the side of energy consumption. Or in other words: saving energy. The need to look critically at energy management is taking on serious forms.

energy neutral

In various locations in our country experiments are taking place with (business) premises in which total energy consumption is extremely low or even zero. This is called being energy neutral, which means that viewed over the long term, as much energy is generated as is used. That is probably not yet the case for an average household. A little while ago in Dirksland it emerged from the business premises of architect's bureau Casa Ratsma and Fit & Fysio Dirksland, that according to calculations it should be possible to operate energy-neutrally. Upon completion of the premises the practice learned that this requirement had not been fulfilled. Architect/owner Krijn Ratsma took another critical look at the installations, made a few small adjustments, made use of intelligent control techniques and achieved success: there is now even an energy surplus. As a result of this success Casa Ratsma, the Ministry of Infrastructure and the Environment, the borough of Goeree-Overflakkee and Rabobank Goeree-Overflakkee have commenced the pilot project Energieke Regio. The project completed by Casa Ratsma serves as a source of inspiration for other (business) premises in Goeree-Overflakkee. Using a QuickScan the possibilities for

energy saving and sustainable energy are being looked into. We are also looking into areas where improvements in comfort can be achieved. Many companies and institutions in the region are showing interest in having such a scan carried out. The outcome delivers visible results: A study like this usually pays for itself within one or two years. That's a really swift payback. This activity links in perfectly to the ambition of this South Holland island: the target is for it to be entirely energy neutral by 2020. This means the further expansion of windmill parks, the use of solar panels and even the construction of a tidal generator in the Brouwersdam. Although the island is now behind the national average, in a few years it will probably occupy a pioneering role.

tbp

tbp was invited by Rabobank to be the guest host of the first meeting and also the first participant in the pilot. Although modern business premises comply with the applicable EP Standards (Energy Performance) and therefore energy consumption remains within the anticipated pattern, a great deal of surplus heat is generated as a result of industrial processes. So for example the air humidity in the production area needs to be considerably lower than the norm. The reason for this is that the materials used for the pcb's* must not contain any moisture. Moisture is one of the "enemies" during the soldering process, which leads to poor connections. But drying air requires a lot of energy. Drying

occurs by the cooling of outside air. But on the other hand cooling also produces heat. Part of this heat cannot be used and dissipates in the usual way. Research has begun into how the drying process can be carried out in a sustainable way.

epa

For some time now we have had the EPA (Energy Performance Advice). It came into being in order to inform the owners of (business) premises about vulnerability from the perspective of energy management. This rectifies the balance and consists of recommendations which are aimed at reducing energy consumption. Certified EPA advisors compile a so-called energy label. This label has been compulsory in the sale of houses since 2008.

It's no coincidence that tbp also works with a certified EPA advisor. He is closely involved in analysing and advising how energy costs can be controlled further. The company has also already taken many energy-saving measures. So the lights are only on when absolutely necessary and a critical view is being taken of appliances which consume energy which are left switched on for no reason. The sustainable generation of electricity by solar panels is also an option which is being looked into. tbp was recently in receipt of an SDE+ subsidy for this purpose.

More information: Casa Ratsma
www.energiekeregio.nl



business premises of Casa Ratsma and Fit & Fysio Dirksland (photo: Wim Vossen)

* pcb = printed circuit board or the synthetic board upon which components are placed, creating a pcba; a printed circuit board assembly



cycling or walking against cancer

Under the same title we covered the running of the Alpe d'Huez in the previous edition of Way of Life. Do you remember? Cycling or walking to the top of the French Alpe d'Huez and back, in return for payment by sponsors. The proceeds are to be used via the Queen Wilhelmina Fund to fund research in the fight against cancer. In addition to the participants there are also a large number of volunteers who do their very best to ensure that it is a complete success.

One of the participants in the spotlight was Paola Steijger. She made up part of a team of four women and two men going by the name "Sport = art". Before the start she had a number of ambitions. What was the outcome?

cold

It is half past three in the morning and the team members are assembling at the start. Paola: "I was really pleased at how enthusiastically the local people were getting involved. The participants set off to loud applause. Our team started at quarter to five. It was a really nice sight with all the lights on the mountain roads." What was less enjoyable was that the higher you went, the lower the temperature sank. At the top of the mountain it began to wreak its revenge: "We had to wait 20 minutes before we were allowed to make the descent. It was a safety

requirement. But it was only 4°C. And we were standing still. So we were shivering. But the worst was yet to come. The descent was fast, around 50 km/h, there was less exertion and so you cooled down even further. When I reached the bottom I appeared to be hypothermic." Thankfully the organisers had provided good assistance. The volunteers made sure that she was quickly back on her feet so that she had enough energy for the next lap. On the fourth trip to the top the weather changed. Halfway round the ride came the message that it was hailing badly at the top. She thought the risk was too great and decided to turn back and await more favourable conditions. Unfortunately that did not happen on that day. The next day there came another opportunity for a second chance to achieve a result. Paola's condition was sufficient again and together with another team member they decided to ride the tour for a second time. That motivation probably received an extra boost as Paola's father had been diagnosed with cancer once more.

success

You take part as a team, but in fact you ride as an individual. Every racer knows their ideal speed. Racers who just can't keep up with the pace of their colleagues will ride themselves to death, as they say in that world. Despite the bitter conditions the six-person team put in a fine performance. In total they managed € 23,000 worth of cycling! A sum which will be used directly for researching and fighting cancer. Next year Paola hopes to be the only one in the team who takes part in this event for a second time. She certainly found it worth taking the time to prepare for this useful and sporting event.

For more information about the event visit the website opgevenisgeenoptie.nl.



cycling for charity in GO-Classic



from left to right Leen Biesemans, Marcel Swinnen and Guido Caeyers

It all began with enthusiastic amateur cyclists from the Goeree-Overflakkee Rotary Club. That club regularly organised pleasure rides around the island on racing bikes. Surely more people would be interested in this activity, they thought. Time to put our heads together. Motivated by the Rotary's mission to work with charities, the idea came about to combine cycling with raising money for charity.

Organisation is one thing, but how do you find all these people who want to cycle with you? Thanks to an extensive network, contact was made with Leontien van Moorsel, multiple world and Olympic road racing champion. Leontien immediately said "yes" to lending her cooperation to the GO-Classic. And her husband, Michael Zijlaard, declared his willingness to help the organisation with advice and practical assistance. The cornerstone for the GO-Classic cycling event was laid.

the bike performers

Some 500 participants gathered on Saturday 7 September in Middelharnis to ride the 115 kilometre (or 70 km) route. A few enthusiasts at tbp also wanted to make their contribution. Under the team name The Bike Performers one lady: Leen Biesemans and three men: Peter Karsmakers, Marcel Swinnen and Guido Caeyers got on their bikes for a trip around the island. No electronics, just muscle power. "It was a nice trip and we enjoyed ourselves immensely on the road. It rained a bit but that didn't spoil the fun. It was strange though that we were mostly riding into the wind." said Leen at the end. "We were very aware that

we were riding for various charities though, which gave us an extra boost. a bit of fatigue at the end soon went away."

There were another two very sporty tbp colleagues riding, but under a different team flag: John du Pree and Jacqueline de Blok.

charities

Leontien has been working on behalf of people with eating disorders for several years now. She set up the Leontien Foundation (www.leontienfoundation.nl) especially for that purpose. So as part of her cooperation with the GO-Classic she laid down the condition some of the funds raised would go to benefit her Foundation.

But this is not the only charity to which all of the participants dedicated their efforts. Part of the funds raised by the GO-Classic is destined for a local charity. For GO-Classic 2013 this is the joint project between the Middelharnis children's farm foundation (www.kinderboerderijmiddelharnis.nl) and the Speultuun (playground) foundation (www.speultuun.nl). The aims of these foundations are to set up a children's farm and a new playground in the Zuidwester site in Middelharnis.

Zuidwester is a care and service organisation for people with (mild) learning disabilities. One of Zuidwester's sites is on the edge of Middelharnis and generally better known than Hernesseroord. The buildings here are surrounded by greenery and water features. The park-like area is loved by many residents of Middelharnis and Sommelsdijk.



GO Classic Tour - 70km

GO Classic Tour - 115 km