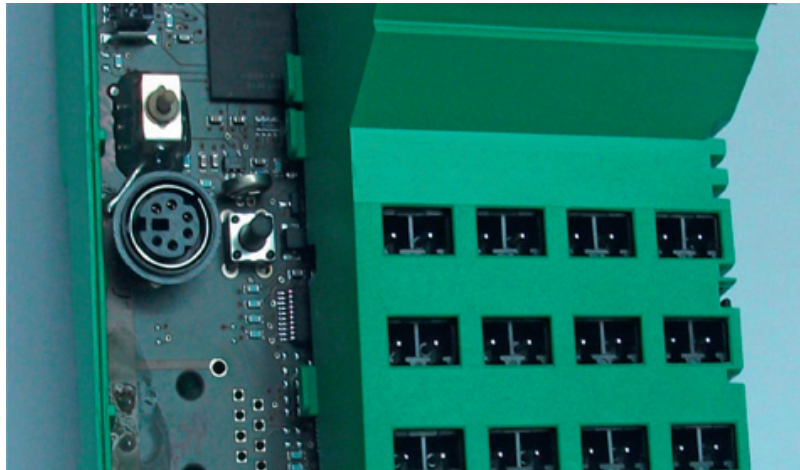


## VALUE MANAGEMENT IN AUTOMATION TECHNOLOGY SUCCESS WITH HOLISTIC APPROACH

Authors:

Hermann Möhlenbein, PHOENIX CONTACT, Bad Pyrmont

Dr. Marc Pauwels, Krehl & Partner Karlsruhe



The company performing the VA/VE is the production site for electronic components of the whole Group. 1300 people are working in the plant, thereof 650 in productions. The other half is working in marketing, R&D and support.

By the merging of marketing, R&D and production, a lot of synergies could be used in the past years. This resulted also in a good savings concerning production costs.

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### Summary

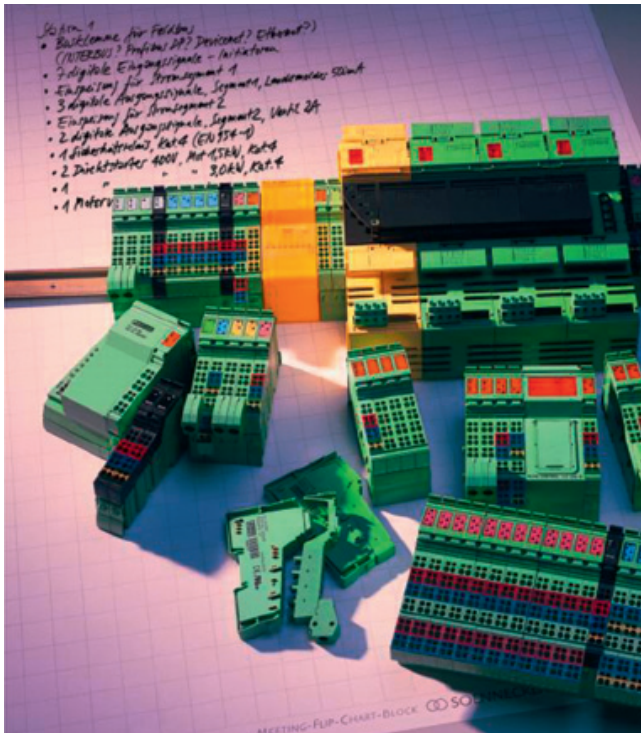
An earlier performed VA/VE project, dealing with the peripheral modules of an I/O-System, resulted in a sustainable success. Now, also the controller and bus coupler of the system should be treated. The project was started in early 2009, when the dimension of the economic breakdown was not yet foreseeable. The results of the VA/VE project could be presented in early

2010, but at this point, there have not been appropriate forces in marketing, R&D and production to support the realization. Therefore, the cost savings and optimizations could only be realized in 2011. The success of the project can clearly be measured also after this delay and it is without discussion that the VA/VE is the reason for it.

## Project description

The result of the pre-analysis of the 2004 project was that there was no way to have a VA/VE on the whole I/O-System family. The differences in the functionality, the hardware and the software as well as the production processes have been and still are too big. That's the reason for having divided the project in 2 parts: first the I/O-modules in the project in 2005 and then the controllers and bus couplers in 2009.

With the results from the first project, the production costs of around 430 articles could be decreased significantly and further optimizations for the next years could be identified. The realization of that project is finished now and some of the findings are still the basis of further redesigns and new developments.



Picture 1: I/O-System family (example)

In spring 2009, the project started with a pre-analysis for the right project selection. In the focus have been the 3 different product groups. First step was a comparison and evaluation of volumes, sales figures and profits. The second step and the detail evaluation dealt with scenarios on chances of realization and influence on EBIT. The outcome was that the controllers of the A-class and the same platform of bus couplers would be the right project. In cooperation with the external consultant company Krehl & Partner, the following project was defined:

- » » „VA/VE based optimization of the controller family A-class with a cost saving of 20%“.

The analysis of this controller family also should show results with that the market position could be enlarged. Therefore, the production costs had to be reduced and certain developments of functionality should be analyzed and evaluated in the project.

An interdisciplinary team was established on the experiences of the former project to ensure the holistic approach and to identify really all cost influences. A very important restriction of the project was to avoid incompatibilities within the product family and that all important customers, e.g. OEM, accept the changes. There have been no other restrictions at the beginning of the project, so that also a new design was as accepted as changes of production processes or also the purchasing of the components (make-or-buy-decisions). The project team was established with members from marketing, R&D, production, purchasing, controlling and the coaching company Krehl & Partner.

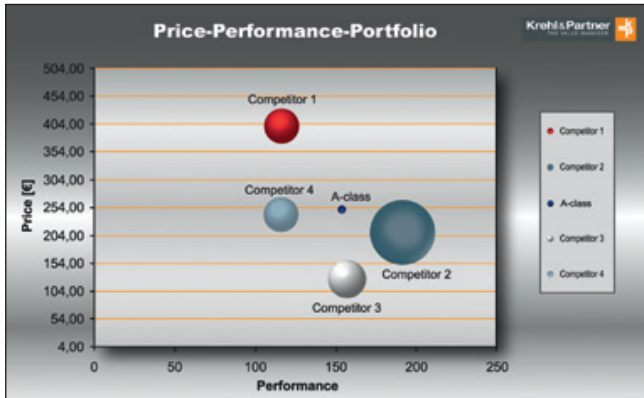


The project goals have been defined in a clear way: the important cost goal was defined as percentage saving of the production cost of the product family with status January 2009. The time plan showed an analysis phase up to end of 2009 and the establishing of a concept proposal up to February 2010. Then, the realization of the ideas had to start. The methodology of VA/VE and the single project steps have been provided and supported by the coaching of Krehl & Partner. The procedure was according the classical VA/VE approach and included besides the initial phase the 3 main topics:

- » » Develop solution ideas
- » » Evaluate and fix solutions and
- » » Documentation with final presentation.

## Analysis

Before developing ideas, the existing system must be analyzed. With the help of the findings of the pre-analysis, the team could start in short time with the competitor analysis. Not only have the real competitors for the “A- class” been included but also the ones for the “C- class”.



Picture 2: The situation of competition

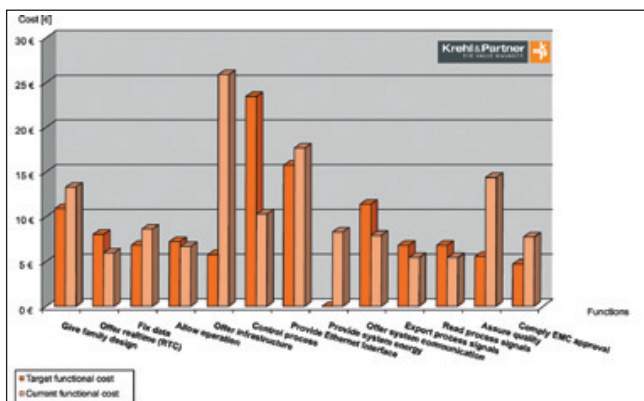
The picture of the “C- class” was relatively consistent. All competitors are more or less at one point of the diagram. But an important difference is the market share. The diagram of the „A-class“ shows that the company has a need for action: it is a small producer for controllers and is standing against some performing big players. The competitors can offer better products for fewer prices.

Competitor 2 is a non-European producer with significant price disadvantages. But in his home region, he has advantages, also with another price structure.

Competitor 1 had just done a step to the right with a new development. Here, the company had to follow quickly.

The situation of the company for the „A-class“ can be summarized as follows:

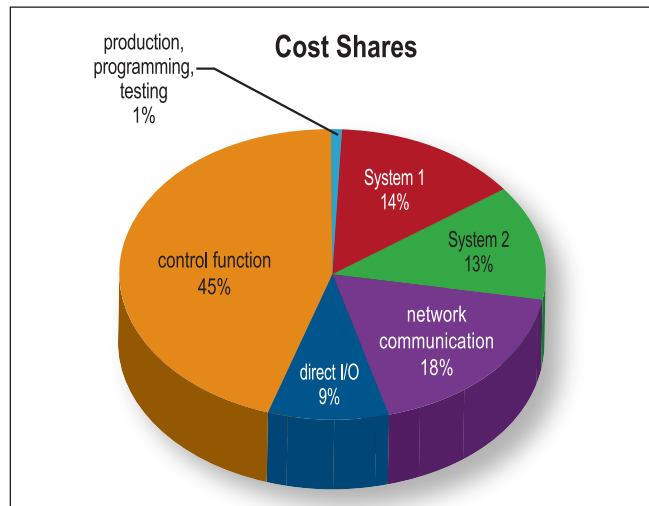
» » „The A-class must be optimized concerning functionality and cost!“



Graph 1: Functional cost diagram

## Function Analysis

costs have been established in detail by R&D and production. This was the basis for the functional cost analysis. 27% of the cost is invested to integrate the controller into the I/O-Family. 18% of the cost are invested for the network communication – that seems to be OK, although the 9% cost of the direct I/O on the board are relatively expensive. The main functions concerning “control” has a relative cost share of 45%. While all cost shares in the current situation seem to be appropriate, the direct comparison between current and target status shows some differences.



Graph 2: Cost shares

Especially the functional costs for

- » » “Give EMC-approval”
- » » “Allow testing” or “assure quality” and
- » » „provide infrastructure“

show that the customer is not willing to pay for them. And the main portion of these costs is spent only for the integration into the I/O-family. These costs have been necessary for the system integration, but should be reduced drastically now. It is also interesting that the costs for testing in production have been that high. Of course the customer is asking for quality, but he is not willing to pay such high cost. The same is valid for approvals. Most of the customers only need one or two approvals, which are necessary for their international business. All the other functional costs are more or the less appropriate.

In the following phase of idea finding, more than 70 ideas or measures have been found and evaluated, whereof a lot have been of good quality and with a good chance for realization. It became apparent that the analyzed sub-assemblies had their origin in an early stage of the company’s controllers. One example is the use of “modern” memory. At the time being, it was possible to get more memory space for a better price. But a redesign was necessary and therefore also a lot of design work, tests and approvals.

There have also been some contradictions in the evaluation of the proposals. As an example, for the company it has been cheaper to buy and use several different capacitors for the A-class controllers. As the purchasing volumes have been only around some 10.000 pieces per type, this was in total cheaper than buying only one type that could have replaced all other types. For this a little bit more expensive type, the cost jump was only existing at several 100.000 pieces. So it was cheaper to use the several different ones.

## Describe potentials

Out of the long list with possible improvements and changes that have been established with the help of VAVE and function analysis, the team filtered the ones with the biggest chance of realization and clustered them into different concepts. In total, 4 (5) concepts have been established and evaluated.

**Concept 1:** „Quick Wins“, i.e. the ideas to be realized easy and fast:

- » Full compatibility with former versions, no redesign necessary → low invest
- » No additional functionality (increase of customer value)
- » Shortly to be realized
- » Low to no risk for realization
- » Market launch: March 2010

**Concept 2:**

- » Maximum cost reduction without consideration of the customer
- » Higher market risk
- » Limited compatibility with former versions, no redesign necessary → low invest
- » No additional functionality (increase of customer value)
- » Shortly to be realized
- » Low to no risk for realization
- » Market launch: April 2010

**Concept 3:**

- » New product without new features
- » Complete redesign
- » Incompatibility to the existing controllers
- » Maximum cost saving
- » No chance to enlarge the market
- » The customer can clearly identify product changes
- » The change will need time for development and testing
- » Market launch: October 2010

**Concept 4:**

- » Maximum increase of customer value
- » Maximum effort
- » High invest
- » Incompatibility to the existing controllers
- » Totally new product
- » Not to be realized in existing housing
- » The change will need time for development and testing
- » Market launch: June 2011

**Concept 4a:**

- » Some new functionality
- » Balanced compromise between customer value and cost reduction
- » Same basis of housing
- » Full compatibility with former versions
- » The change will need time for development and testing
- » Market launch: March 2011

The mentioned market launches have been the estimation at the end of the project, but as already mentioned, due to the economic situation, the realization was delayed a little bit. The cost for realization as well as the amount of cost savings have been calculated and evaluated.

Concept	Cost saving	Increase customer value	Estimation of volumes	Return on invest	savings/a
	Relative value from list of potentials		How many pieces we can sell at the specific customer value per year?	Pay back in months	
Current	0%	0%	7.500		
Concept 1	19%	0%	7.500	1,4	192.508 €
Concept 2	21%	0%	7.500	1,1	218.908 €
Concept 3	24%	0%	7.500	7,9	251.468 €
Concept 4	10%	41%	15.000	27,2	201.436 €
Concept 4a	19%	33%	12.000	7,2	317.149 €
Concept 4a (same volume)	19%	33%	7.500	7,2	198.218 €

Table 1: Evaluation of the concepts

On the basis of this table, the short term realization of concept 1 was decided. The high customer value of concept 4 is unfortunately only achievable in context with an incompatibility with the current products. In a second step, the concept 4a had to be realized.

## Realization

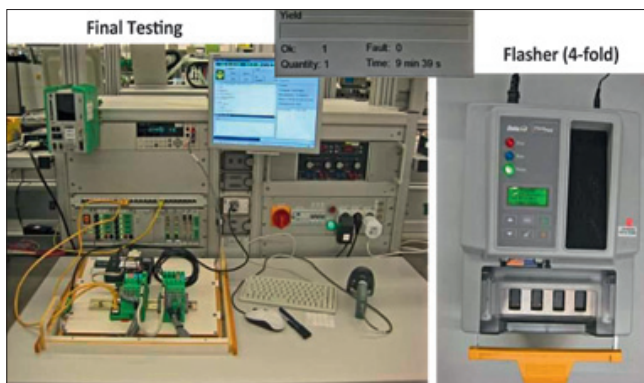
The realization of the quick wins started partially already during the project. Examples are optimizations of the used components by new purchasing channels or the use of „Second-Source-components“, which have been released by R&D.

The biggest cost block within production, the testing of the sub-assemblies, was treated very fast. The time for software download to the controller and the following testing was almost ten minutes. And this time is the basis for the cost calculation including the used equipment and the worker. So a new test concept was established by the testing department and was realized in two steps:

*1. Separate download and testing: By having two separate adapters, the time could be cut into half. The possible disadvantage that the download could also be executed onto a defect board was accepted, because here the failure rate is below 5%.*

*2. The software was further split, so that first only a part with minimum functionality was loaded to the board to be tested: The hardware could be tested completely. Afterwards, the rest of the software was loaded on a functioning board. Another part of the software is already implemented in a programmable component and has not to be loaded anymore. By these measures, the time for download and testing could be reduced to less than 4 minutes.*

After having realized the short term measures (concept 1), also the realization of concept 4a started. According to the project's goals, the use of only one board in several controllers and the prevention of rework were realized. In addition, components of the newest memory technology have been integrated.



Picture 3: Workstation for testing and final assembly

Further cost savings have been realized in the last months, which have been identified in the project 2009/2010, but that couldn't be realized at that time. One example is the optimization of the SMD production for printed circuit boards. By the multiple use of the same board in different controllers in the A-class the volumes could be increased and the setup times could be reduced.

With the increase of volumes it was also applicable to buy an in-circuit adapter to test the hardware and to download most of the software in parallel onto 4 sub-assemblies within one harness. The times for these production steps have been moved from assembly to SMD, but there the work is much more efficient, as it will be done before the cutting of the harness.

## Conclusion

The application of the methodology of VA/VE on existing products in automation technology resulted in economic success. Key factors in this project have been the holistic approach and the interdisciplinary project team: all participants are convinced that by the application of VA/VE they got a new perspective onto the product. In opposite to the fear at the beginning it was possible to clearly separate good and realizable ideas from economic uninteresting ones. And all participants have been motivated to work on the realization of the concepts and to get the cost savings.

The VA/VE project was very successful for the company. The implementation of the results, which still today leads to further cost savings, as well as the use of VA/VE in other projects show clearly the possible application in automation technology.