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On the way to new dimensions

Pepperl+Fuchs DART workshop at the NAMUR General Meeting

A new technology is making headlines. With Dynamic Arc Recognition and Termination, Pepperl+Fuchs have presented a totally new concept for intrinsically safe electric circuits. It does not prevent the formation of a spark by drastically limiting the maximum effective power, but uses a dynamic electronic circuit, which automatically stops the flow of current, before a spark is able to ignite the atmosphere. At a special workshop during the last NAMUR General Meeting, Pepperl+Fuchs presented its development, which specialists consider a true revolution, and which has developed into the subject of enthusiastic discussion within the process industry. Participants of the workshop were able to discuss practical applications of the new technology for explosion hazardous areas, which will open totally new opportunities for the worldwide process industry.

When it comes to the ex zone and intrinsically safe power supplies, there is one buzzword dominating the scene: DART. Dynamic Arc Recognition and Terminations is based upon a totally new approach to guarantee the intrinsic safety (Ex i) demanded for explosion hazardous areas.

While all known concepts, such as Entity and FISCO, primarily focus on strictly limiting the effective electric energy to prevent the formation of a spark strong enough for ignition (normally less than 2 watts), DART approaches the actual problem in a different way. It sees to it that the formation of any potentially dangerous spark is turned off before it reaches ignition capability. Doing so DART uses the fact that any spark is accompanied by a sudden change of the flow of current within the electric circuit which is characterized by a typical pattern. DART detects this effect and reacts within only a few micro seconds by switching off the circuit.

DARTS puts an end to the presently known power limitations and will allow the use of intrinsically safe field devices with a power rating of up to 50 watts within the explosion hazardous area.

Fieldbus with DART: Intrinsic safety for the high-power trunk

The high-power trunk concept, which was introduced around the turn of the century, was a giant step towards the goal to enable intrinsically safe power supply of field devices within the hazardous area in combination with the Fieldbus (PROFIBUS PA or FOUNDATION Fieldbus H1). According to this concept, the energy for the field devices is provided via a trunk according to Ex e classification. The individual spurs are connected to the trunk via FieldBarriers and form intrinsically safe electric circuits according to Ex ia II C for all FISCO or Entity field devices.

With the help of DART, it is possible to design the high-power trunk intrinsically safe right from the start. The connection of spurs is accomplished via DART segment protectors featuring up to 12 outputs each. The advantage of such a concept is not only a very simple mechanical design, but also an intrinsically safe power supply for far more field devices than with all other concepts known so far.

Start into a new era

Pepperl+Fuchs are convinced that its technology has started a new era, which will provide the process industry with a range of completely new applications, which were simply unthinkable until now. At a workshop on occasion of the NAMUR conference, Michael Kessler, Director of the Components and Technology Division at Pepperl+Fuchs, described the development of the new technology. In 2003 already, the well-known specialist for Fieldbus interface components for the process industry started thinking about a new approach for an intrinsically safe power supply without power limitations. In 2004, the technology was named Dynamic Arc Recognition and Termination (DART) and registered for patenting. „Altogether, we have invested more than 10 years of combined research into DART”, Kessler reported.

At an early stage of development, Pepperl+Fuchs have asked the Physikalisch Technische Bundesanstalt (PTB) in Braunschweig, Germany, to accompany its research work. Under the lead of PTB an open research project named “Power-i” has commenced to make DART available to the market without restrictions. The final goal of the project is to incorporate dynamic intrinsic safety into an IEC standard. Until this is accomplished, DART field devices will be approved as intrinsically safe devices according to ATEX in Europe.

Example of new applications

On occasion of the workshop, Pepperl+Fuchs illustrated the basic principle of DART. For this purpose, it was demonstrated in an impressive way how a clearly visible opening and closing spark within a 40 V/1 A circuit simply disappeared after the DART function was activated. The developers also demonstrated what tremendous challenges had to be overcome in order to realize such a basically simple idea to quickly switch off a spark not only for simple applications with only one device, but also for applications within a Fieldbus infrastructure.

Using a sample application, Kessler illustrated the new opportunities, which will be opened by the new technology.

Basis was one of these analytic devices, which are used in the bio-pharmaceutical industry. Until now, sensors of this type were mounted inside a bypass pipe, since they have a power rating of 10 watts and need to be installed with a fixed electrical connection to comply to demanding safety standards. Unfortunately such bypass installations lead to a considerable loss of accuracy. They also require time-consuming cleaning prior to any change of the process media and are therefore considered to be a rather cumbersome solution.

„With DART, the sensor becomes intrinsically safe despite its high power rating. It therefore can remain directly inside the mobile tank”, Kessler explained the difference between present and future solutions: „In future, it will be possible to measure process parameters within the ex zone at maximum precision without requiring any detour.“

Dialogue among experts

Pepperl+Fuchs is interested in an open dialogue about DART, in order to initiate joint efforts for clearing the way for new applications and more efficient procedures within the ex zone, which were prevented by technical limitations until now. The company is convinced that DART will offer the process industry a wealth of new opportunities to gain higher efficiency, process safety and economic viability.

For this reason Michael Kessler invited the participants of the workshop to participate in a round table discussion, which is to take place in early 2010. It is meant to initiate an intensive exchange between manufacturers and users, in order to include experience and demands from end users, specifically NAMUR member into the development of products and solutions based on DART technology.

Key words: DART, Dynamic Arc Recognition and Termination, explosion protection, dynamic intrinsic safety, innovation, workshop, NAMUR General Meeting

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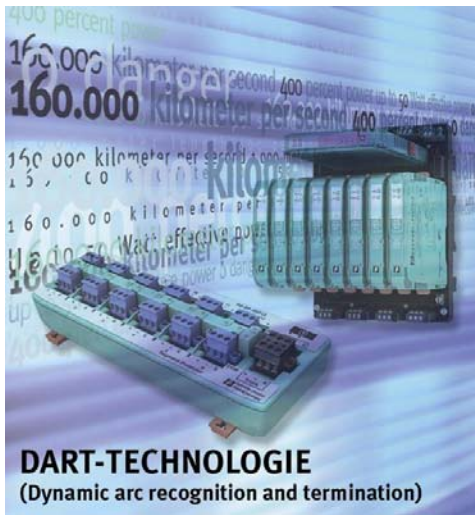


Fig. 1: DART for the Fieldbus – first application on the market

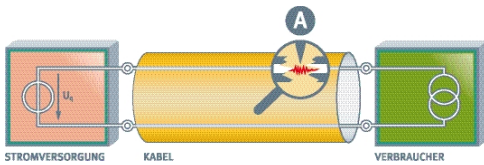


Fig. 2: Fast fault detection – DART reacts and limits the spark to provide full intrinsic safety

Output values	Voltage U	Power P	Cable length
DART	50 VDC	ca. 50 W	100 m
	24 VDC	ca. 22 W	100 m
	50 VDC	ca. 8 W	1000 m
	24 VDC	ca. 8 W	1000 m
Transmitter power supply	16 VDC	ca. 320 mW	1000 m
FISCO Fieldbus	12,8 VDC	ca. 1,4W	1000 m

Fig. 3: Comparison of technical specifications – effective power with and without DART