

# One for All

## From Cooling Water to Tar: Flow Measurement at the BP Plant in Cologne

Translation of an article in the FLEXIM Newsletter UPDATE 6 (2005)



*The BP Plant in Cologne*

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**When it comes to flow measurement, the measuring and test engineers of the department of special measurement at BP Cologne are constantly confronted with various challenges: a multitude of media needs to be measured, from cooling water to tar, most them at high temperatures up to 300°C and in explosion hazard areas. FLEXIM's clamp-on ultrasonic measuring system has risen to the challenge in order to meet all of BP's needs.**

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Towering shining silver tanks fill the sky as far as the eye can see. Polyethylene, ethylene oxide and many other hydrocarbons are produced in BP Cologne's fractionating columns, reactors and boilers. Around 4,3 million tons of petrochemical products are produced every year. This makes the Cologne plant the fifth largest petrochemical site in western Europe and BP's largest production site in the world. The site has 1900 employees and produced in 2003 a sales volume of 1,74 billion Euro. BP Cologne is a petrochemical company that combines the mineral oil industry with the chemical industry.

The raw material in petrochemistry is naphtha, a petroleum distillate derived while refining crude oil. Naphtha is delivered by pipeline or ship and is then transported to the cracking facility, the so-called cracker. There it is thermally cracked at temperatures of up to 850°C. During this molecular decomposition, ethylene, propylene, the so-called C<sub>4</sub> fraction (butane plus fraction) and cracked gasoline are produced. They are then further processed in the plant to obtain many important starting substances for the chemical industry.

### **Numerous Applications**

The sheer countless running production processes at this site offer the testing and measurement specialists an equally diversified and broad field of assignments. This includes measuring vibrations and sound as well as monitoring the radiometric measuring units and gas detectors. Last but not least, they are responsible for the portable flow measurement on the closed pipe systems. The FLUXUS ADM 6725, a portable ultrasonic measuring system, is exactly suited for this purpose.



*The FLUXUS ADM 6725 measuring on-site*

The applications for portable on-site flow measurement are numerous and very diversified. In every production facility, with its many boilers, reactors, tanks, fractionating columns, and cooling towers, there are scores of sites which only allow for mobile on-site flow measuring. The latter might be necessary in order to control the function or accuracy of permanently installed flow measuring units. Even a simple flow control can be very important in order to draw conclusions about a running production process. This is especially important when dealing with media that tend to leave deposits or abrade, for example tar. Such media can rapidly lead to problems or inaccuracies. In such cases, the company is quite glad that a simple and fast control can be done under normal operating conditions, without the need to remove a permanently installed measuring instrument or cutting into a pipe.



*Standard clamp-on ultrasonic flow transducer*

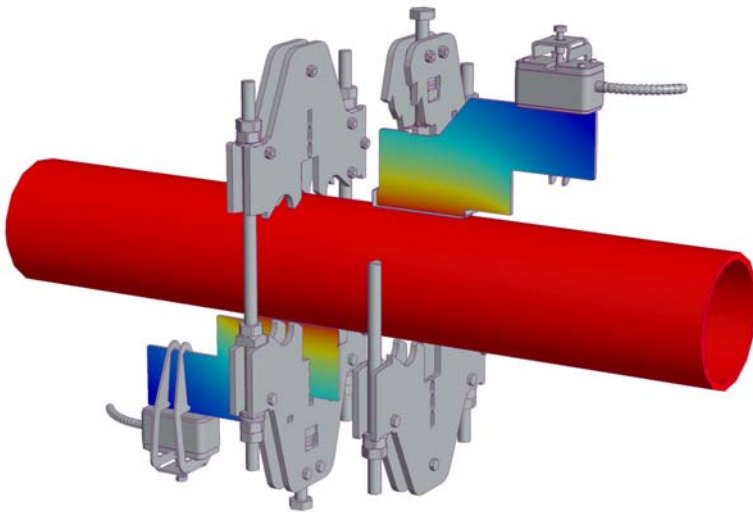
Furthermore, various cooling water flow in the entire plant or liquid flow (ca. 300°C) in the crackers have been documented. At some of these particular measuring points, there are no permanent

measuring units that could determine the flow. The portable ultrasonic flow measurement results give important information as to the condition and the efficiency of the facility.

### **Flexible application and straight forward operation**

An all-round equipment which could adapt quickly and trouble-free to the required measuring application was searched. An ultrasonic measuring system with clamp-on technology was actually the only serious option. Clamp-on ultrasonic transducers are simply installed on the outer surface of the pipe. It is not necessary to open up the pipe system. The main criteria for choosing the FLEXIM measuring system were its robust transducer design, as well as the easy handling and operation. A fast starting up of the measuring system and reliable test readings are of utmost importance, even under extreme application conditions.

One could ask: can such a versatile instrument only be operated by experts? The answer is: no. Despite its versatility, operating the FLUXUS is simple and straightforward. The transmitter automatically recognizes all transducers and adapts the entire menu navigation in consequence. The unit only asks for the pipe's and the medium's parameters in logical order. The internal database contains countless pipe materials and media with their physical properties. This database can be enlarged to include customer specific materials and media.



*Temperature profile of the WaveInjector*

### **Rugged transducers even in hot spots ...**

In an often harsh, humid or aggressive environment, a transducer needs to be robust and durable. For this reason, the transducers are entirely made of stainless steel. Even the connecting cable has been encased in flexible stainless steel tubing. Only the contact surface to the pipe is made of PEEK, an extremely hard plastic which is resistant to acids and caustic solutions. The instruments meet the IP 65 standards of splash water protection. There is no connecting plug directly on the transducer. This area requires high mechanical stability which a plug can not offer.

The standard transducers can be used at temperatures from  $-30^{\circ}\text{C}$  to  $130^{\circ}\text{C}$ . The high temperature version allows for  $-30^{\circ}\text{C}$  to  $200^{\circ}\text{C}$ . For temperatures up to  $130^{\circ}\text{C}$  resp.  $200^{\circ}\text{C}$ , the transducers can thus be mounted directly onto the outer surface of the pipe. To improve acoustical coupling, special coupling pastes or soft coupling foils are used. For applications above  $200^{\circ}\text{C}$  the transducers are not mounted directly onto the pipe but onto the stainless steel coupling plates of the WaveInjector<sup>®</sup>. This device is a mounting fixture which extends the temperature range of ultrasonic measurement up to

400°C. It consists of a pair of stainless steel plates which keep the transducer away from the surface of the pipe while ensuring optimal acoustical contact. At the same time, they provide cooling of the transducers by heat radiation. The mechanically robust mounting fixture maintains a high contact pressure. Specially designed metal foils insure optimal contact and long-term stability. This measuring system has already been successfully tested in applications at up to 400°C.

### **... and explosive situations**

In chemical plants, measuring in explosion hazard areas is all in a day's work. This poses no problem at all for FLEXIM'S flowmeters. They can safely be used in zone 2. By special permit and with an external detector, the BP department for special measurements even uses the FLUXUS® ADM 6725 for quick measuring in zone 1 hazardous areas. In addition, FLEXIM offers special transmitters and transducers for use in zone 1 ATEX.



*Explosion protected flow meter FLUXUS ADM 8027*

Ultrasonic flow measurement is a well proven alternative to conventional measuring methods. The clamp-on technique provides the optimal solution for the wide variety of tasks done by a special measurement engineer. The FLUXUS® ADM by FLEXIM stands out among the many flowmeters on the market because of its exceptional flexibility and easy operation. Be it cooling water or tar, at room temperature or at 400°C , the possible applications are nearly countless - as are the tasks that need to be completed by the special measurement department's technicians at the BP facility in Cologne.