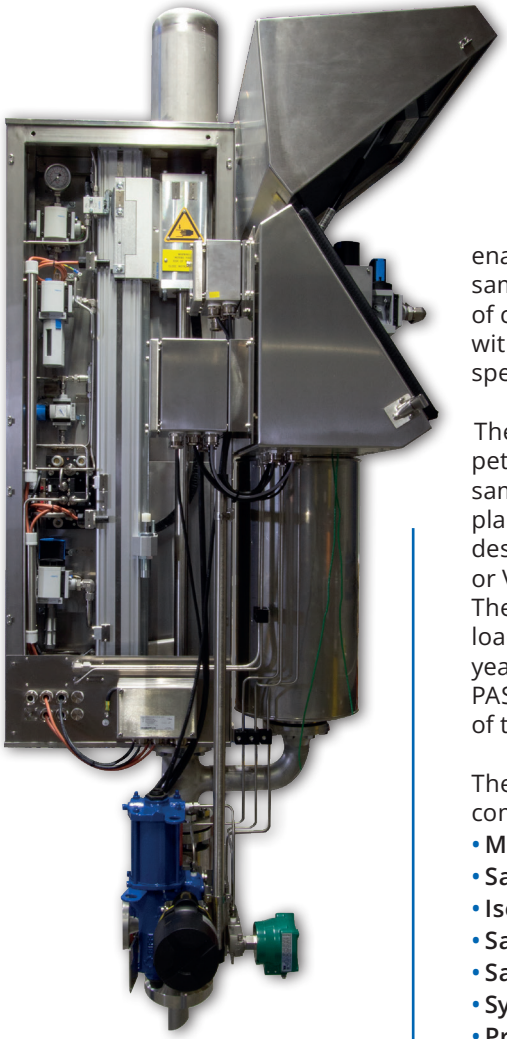
PIER SYSTEM

Type PIER Crack Gas Sample System



One of the key requirements for improving the profitability of steam cracking is the use of process analyzers for consumption, quality control and for monitoring, managing and optimizing the production process. However, the best analyzer can only deliver correct results if the supplied sample is representative and reproducible and in no way falsified. Only the correct sample extraction, supplemented by the right sample preparation, enables an analysis suitable for process optimization. In addition, taking gaseous samples from a petrochemical process at high temperatures and with high levels of corrosive particles requires cooling and cleaning of the sample in accordance with the specification of the desired measurement principle and the technical specifications of the used process analyzer.

The **PIER CRACK GAS SYSTEM** has been developed according to the needs of the petrochemical industry, since 1977, in practical collaboration with users, for gas sampling from cracking or coking processes used in refineries and/or chemical plants. Also the trend to crack heavier feed stocks was taken into account in the design phase. The educts here range from Ethane and Naphtha to Waxy Distillate or Vacuum Gas Oil.
The design of the PIER System is suitable for use in Hazardous Areas with a high load of corrosive and hot particulate and hot temperatures. Over the past 40 years this Sample Conditioning System (designed and developed by Wilhelm PIER PAS e. K.) has been used worldwide in Cracking Furnaces and is regarded as one of the best and most reliable solutions, money can buy.

The PIER CRACK GAS SYSTEM has a modular design and consists of the following components:

- **Mounting nozzle**
- **Sample gas probe**
- **Isolation Ball Valve**
- **Sample gas conditioner**
- **Sample gas transport line**
- **System control**
- **Probe drilling device (if necessary)**
- **Coolant Recirculator**
- **Coolant lines**
- **Coolant**

The **MOUNTING NOZZLE** welded on the transfer line is supporting the probe drilling device or the sample gas conditioner on the sample tap. The mounting nozzle is made of a material that meets the specifications of the process piping and which for sure can be welded on the process pipe.

The **SAMPLE GAS PROBE** should take the gas sample directly from the flow core of the process line. It is important to ensure that the probe intake does not draw any peripheral gases from the wall of the pipe at reduced flow speed, resulting in a non-representative sample.

The **PROCESS ISOLATION BALL VALVE** is mounted between the sample gas probe and the sample gas conditioner. The shut-off valve in front of the sample gas conditioning protects the sample system from high steam temperatures when decoking the cracking furnace and enables maintenance work to be carried out during normal cracker operation.

Digital form at:
www.cgs-company.de/downloads/MDZ_E_D_Pier-System.pdf

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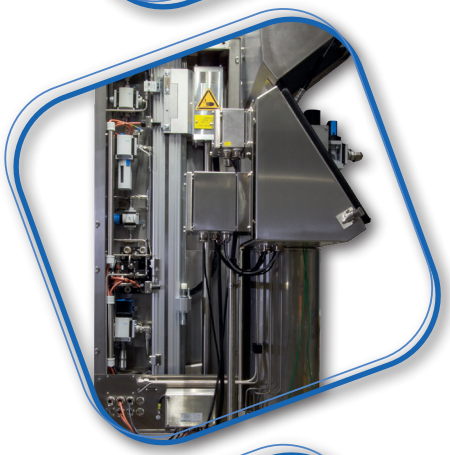

The **SAMPLE GAS CONDITIONER** cools the cracked or decoke gas sample from the process gas stream down to a cut temperature, which can be set to any temperature within the range from +5°C to + 25°C. The function of the conditioner is comparable to a stripper using partial condensation under total reflux. Under these conditions, condensation of the hydrocarbon components and the dilution steam of the sample starts. This condensate is returned as reflux, passing a demister, to the process transfer line. Coke particulates in the sample gas are also separated and washed-out by the condensate reflux flowing back into the process. The sample gas should be raised to a temperature above the selected dew point after it has left the conditioner. It must be ensured that the temperature limit specified by the analyzer is not exceeded.

The sample gas stream is passed to the analyzers in the analyzer room through a **SAMPLE GAS TRANSPORT LINE.** The sample line is heat traced using electrical heat tracing (preferred) to approximately 40°C to 50°C resulting in a superheated and relatively dry sample gas.

The **SYSTEM CONTROL** is installed near the sample take-off point, preferably at an easily accessible location. An EEx-pz-Cabinet made of stainless steel protects all electrical equipment and is suitable for the installation in hazardous areas ZONE 2 using a Pressurized enclosure “Ex p”. In this cabinet, all parts are installed to perform the functional program of the system and manage the in- and output signals to the Control System. A programmable logic controller (PLC), which is part of the system control together with a RTD Pt 100 EEx temperature sensor in the outlet of the conditioner, is responsible to maintain the desired cut-temperature and protect the sample transport line against excessive sample gas temperatures.

The **PROBE DRILLING DEVICE** is used in order to clean the sample probe periodically from coke deposits during the cracking operation of the furnace. The number of the daily cleaning operations are programmed in the Pier system controller’s PLC. Typically, one drilling sequence per day is sufficient. Heavy feed stock to the cracking furnace might require the cleaning action of the Drilling Device every 8 hours. If coke deposits are not to be expected, the use of a Drilling Device can be not necessary. The location of the sample gas conditioner with the accompanying Drilling Device mounted direct on the sample pick-up point requires an ex-proof construction.

The **COOLANT RECIRCULATOR** is designed to supply the Sample Gas Conditioner with the coolant, a Water/Ethylene-Glycol-mixture. A refrigeration unit (chiller) is build-in, using the chlorine-free refrigerant R 134 a. The Coolant Recirculator is equipped with one coolant tank, one refrigerator and two circulating pumps which are configured to be fully redundant and are designed to be able to manage longer distances to the conditioners. The possibility to supply the coolant to more than one Cracked Gas Conditioner is reducing the costs for each sample pick-up point drastically according to the number of sampling points.

The **COOLANT LINES** between the Coolant Recirculator and the Sample Gas Conditioner consists of one or two inner tubes, thermal insulation and coating. If more than one Sample Gas Conditioner is installed, then a distribution box need to be mounted in between or the chiller needs more inlet/outlet connections.

The **COOLANT**, the heat exchange medium, consists of a mixture of drinking Water and Ethylene Glycol. A corrosion-inhibitor additive protects the metallic parts of the coolant circuit. The concentration of the Ethylene-Glycol should be adapted to the lowest environment temperature

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Specification

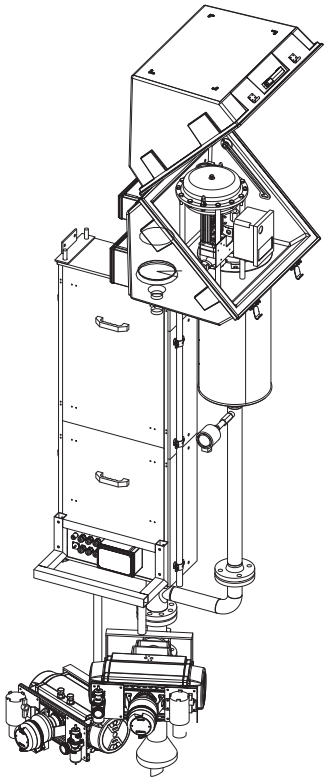
• Mounting:	Vertical (recommended) other mounting angles on request
• Controller:	Integrated Programmable Logic Controller
• Wetted Material:	Standard Material: Stainless steel (1.4571) other material on request
• Process Connections:	Flanged, DN 50 / PN 40 or ANSI 2", 300# RF other connections on request
• Process Isolation Valve:	DN 50 / PN 40 or ANSI 2" x 300# RF c/w pneumatic actuator and ex-proof position indicator
• Sample Temperature:	After Quench Cooler typically 150°C to 450°C other temperature ranges on request
• Inlet Pressure:	Typical 1 - 4 bara
• Probe Drilling Device:	Pneumatically operated, Instrument Air required Air Motor: 1.15 kW, torque 175 NM Stroke Power @ 6 barg: 1,870 N Stroke: typical 500 - 800 mm Approx. Drilling Time: 30 - 60 seconds Air consumption per stroke: 600 - 1400 liters
• Sample Flow:	Up to 5 liters per minute (300 l/hr)
• Area Classification:	Zone 1 / Zone 2, Group IIB + H2 T3

Custom designs on request!

Technical Drawing

Example of one customer specific design with:

- Two isolation ball valves with direct instrument air connection
- Extension pipe with additional temperature measurement
- Pneumatic temperature regulator



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