If left untreated, natural gas or biogas contains hydrogen sulphide (H₂S) and water vapour. When the H₂S percentage in the natural gas exceeds 1%, it is commonly referred to as acid gas.

The gas humidity, i.e., the water vapour percentage, brings about hydrate formation and corrosion. To feed the gas once again into the transport network, limit values for the content of water and other fluid constituents are specified. Therefore, upstream gas must be dried. The drying processes involve mechanical and thermodynamic process steps. During the final drying process stage, the gas is conducted through adsorption towers, in which the residual humidity is collected with the help of highly hygroscopic substances such as glycols. Similarly to the extraction of natural gas, every field station of a natural gas reservoir is equipped with a drying plant for the withdrawn gas. The gas will be conducted plant in three stages: mechanical separation of free water, thermal separation of free water, and finally the use of glycol.

In many cases medium-operated high pressure reducers of the type DM 621 according to NACE are employed. As such, in the process plant in question to comply with the high standards, an exception is made. For example, in accordance with NACE International (National Association of Corrosion Engineers), the material for natural gas valves has to be carefully selected, which means that steels with significantly reduced hardness are taken into consideration. Otherwise there will be the danger of excessive embrittlement of the steel. In the medium mentioned application, the selection of corrosion-resistant stainless steel is demanded. Consequently, the question of material selection became more vital inasmuch as the gas terminal was built in close proximity to salt water, that is to say sea water atmosphere.
Corrosion-resistant Materials

The right selection of material makes the difference

Stainless steel is needed for numerous applications and industries. This material is used for a huge variety of purposes in essential sectors such as oil and gas, chemical, petrochemical, nuclear, aerospace, medical, and military. Stainless steels are the materials of choice for process equipment in industries like chemical, food, pharmaceutical, and medical. They are used in petrochemical plants, refineries, natural gas plants, and power plants.

Stainless steel is characterized by its excellent corrosion resistance, high mechanical strength, and good welding properties. It is available in various grades, each with specific properties and applications. The most common grades are 304 and 316, which are widely used in food processing, pharmaceuticals, and chemical industries.

Mankenberg’s product range of flexible standard valves or project-related special valves is correspondingly broad.

The operating conditions at the customer’s site sometimes require adaptations of surfaces of the valves, instead of using new ones. The same applies to the maritime domain or saline liquids, for which in general sea water-resistant material is needed. It requires special diligence and clarification of all the technical and chemical details in order to properly assess the loading conditions of the material and the interaction between the medium and the environment.

Stainless steels, i.e. corrosion-resistant steels, become resistant to corrosion because a so-called passive layer forms on the surface. Such layer consists of chromium-rich metallic oxide or metallic oxide hydrate preventing the corrosion process. The passive layer is generated by the overall design. The passive layer is not available where the protective passive layer is not formed, as for example due to a lack of oxygen, either giving corrosion (1) or crevice corrosion (2) may occur.

A crevice is a site where the protective passive layer is broken. If oxygen is not available, crevice corrosion may occur.

1. **Pitting Corrosion**
   - Pitting is a particular type of corrosion in which isolated cavities are produced. In the event that the protective passive layer of the stainless steel is interrupted, the stainless steel becomes electrically disconnected from its surrounding material. In this way, the pits or holes, that are often as small as pinholes, can be generated. They arise in the presence of aggressive media. Such corrosion is not visible to the naked eye.

2. **Crevice Corrosion**
   - Crevice corrosion can be found in a variety of industrial processes. It is a form of localized corrosion that occurs in crevices or crevice-like spaces, such as gaps between flanges or welds. This type of corrosion can occur in many different industries, including chemical, petrochemical, food, and pharmaceutical.

**Excellent corrosion resistance owing to an increased percentage of chromium and molybdenum.**

**Behaviour of corrosion-resistant stainless steel 1.4529 / 1.4547**

**Extinguishing Water Pressure Regulation and Shut-off on Offshore Installations**

**Vacuum Breaker for the Cooling Water System of a semi-submersible Oil Production Platform**

**Mankenberg Valves in Action**

**The pressurised water of the offshore platform requires pressure-resistant systems and valves as are suitable for the extreme marine atmosphere of a submersible oil rig.**

A vacuum breaker is commonly installed in the cooling water systems to protect the anti-freeze range by means of the vacuum breaker. The high flow rate of the water requires a vacuum breaker (Super Duplex 1.4501), whilst the spring (grade 1.4547) and the spring cap (Stainless steel 1.4404) have been designed here for maximum super duplex 1.4501. The VV 34 is designed as a flexible high pressure vacuum breaker for the cooling water system of a semi-submersible oil rig.
Stainless steels have a percentage by mass of the element chromium of not less than 12 % and of the element carbon that should not exceed 0.12 %. Hence, the percentage of the alloying element chromium is decisive for the corrosion resistance of stainless steel. In case the steel contains further alloying elements such as molybdenum or the like, the material becomes more resistant also to highly aggressive operating conditions.

The suitable valve from the right material for your application:

Our team competently provides comprehensive advice – Take us at our word!

### Used corrosion-resistant materials

<table>
<thead>
<tr>
<th>Material designation</th>
<th>Material number</th>
<th>Standard</th>
<th>Major alloying elements in mass-%</th>
<th>Pitting resistance equivalent (PREN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless Steel</td>
<td>1.4404</td>
<td>X2CrNiMo17-12-2</td>
<td>316L</td>
<td>16.5 - 18.5</td>
</tr>
<tr>
<td>Stainless</td>
<td>1.4571</td>
<td>X6CrNiMoTi17-12-2</td>
<td>316Ti</td>
<td>16.5 - 18.5</td>
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<tr>
<td>Duplex</td>
<td>1.4462</td>
<td>X2CrNiMo22-5-3</td>
<td>A182F51</td>
<td>21.0 - 23.0</td>
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<tr>
<td>Duplex</td>
<td>1.4539</td>
<td>X2NiCrMoCu25-20-5</td>
<td>N08904</td>
<td>19.0 - 21.0</td>
</tr>
<tr>
<td>Super Duplex</td>
<td>1.4410</td>
<td>X2CrNiMo25-7-4</td>
<td>S32750</td>
<td>24.0 - 26.0</td>
</tr>
<tr>
<td>Super Duplex</td>
<td>1.4501</td>
<td>X2CrNiMoCuWN25-7-4</td>
<td>S32760</td>
<td>24.0 - 26.0</td>
</tr>
<tr>
<td>Cronifer 1925Mo</td>
<td>1.4529</td>
<td>X1NiCrMoCu25-20-7</td>
<td>N08926</td>
<td>19.0 - 21.0</td>
</tr>
<tr>
<td>254 SMO®</td>
<td>1.4547</td>
<td>X1CrNiMoCuN20-18-7</td>
<td>S31254</td>
<td>19.5 - 20.5</td>
</tr>
<tr>
<td>Hastelloy® C-4</td>
<td>2.4610</td>
<td>NiMo16Cr15Fe6W4</td>
<td>N06455</td>
<td>14.5 - 17.5</td>
</tr>
<tr>
<td>Titanium</td>
<td>3.703</td>
<td></td>
<td></td>
<td>R50400</td>
</tr>
</tbody>
</table>

The higher the PREN (pitting resistance equivalent), the more resistant to pitting and crevice corrosion. Alloys with a PREN of > 33 are classified as sea water resistant. Hastelloy® C-4 and Titanium are classified as being highly resistant to sea water. PREN of stainless steels = % Cr + 3.3*% Mo + 16*% N. A higher PREN is required for an increasing salt content and/or rising temperature.
Recirculation of Saline Reservoir Water into the Ground

In oil fields the oil is not available as pure crude oil, which means that during oil extraction a mixture of oil and water or crude oil and sand is conveyed from the ground. The proportion of oil is separated in order to obtain crude oil that is suitable for further processing. After separation of the oil content, the saline water contaminated with aggressive particles is pressed into the ground through small and vastly branched injection boreholes around the periphery of the oilfield. Thus the pressure on the oil-bearing strata increases, whereby the mixture of oil, solid particles and water is delivered at the drilling site. An oil production facility in Sudan has installed pilot-operated backpressure regulators of the type Mankenberg RP 820 Eck. Since the operational area of the single-seated angle valves requires a very high level of resistance to corrosion, they have been entirely manufactured from Duplex steel (1.4462) and designed for temperatures from -10 through to +100 °C. A maximum pump capacity of 100 m³/h flow rate was indicated. At zero extraction rate, the maximum delivery pressure is 83 bar at up to 95 °C, so the nominal pressure of the valve has been designed for PN 160. The backpressure regulators have been arranged in the course of the injection line directly downstream of a strainer. The valves have the task of building up a constant counterpressure to the pumps and, in so doing, they offer protection from damage through cavitation.

Pressure Reduction of Corrosive Fluids in the Chemical Industry

The production cycles in many chemical industries release caustic waste, often in liquid form, which must be reliably removed from the current process. The discharge of such fluids proves to be rather difficult since many processes take place under excess pressure. By the use of medium-operated pressure reducing valves, the hazardous medium can be brought down to a lower level, thus the handling of caustic or corrosive media turns out to be less dangerous. The diaphragm-controlled pressure regulating valve DM 652 adV used in this case is exposed to severe corrosion depending on the caustic medium and the ambient conditions such as temperature, pressure etc. The design of the DM 652 must take various corrosion types into consideration: surface corrosion may be avoided through properly selected material, the correct combination of materials impedes contact corrosion and elaborate design details counteract crevice corrosion. Hence, the valve’s body is manufactured from the solid. The high material costs pay for themselves thanks to the longer operational lifetime with reduced maintenance costs and downtimes.
Pressure Regulating Valve

1. Exchangeable pilot control
   Flexible application possibilities

2. Precise regulation through pilot valve
   Highest regulating accuracy without auxiliary energy

3. High pressure drops possible
   Simple plant structure because single-stage control is sufficient

4. Sturdy valve mechanism
   Easy-to-maintain

5. Available in special materials
   Also suitable for extreme environmental conditions / applications

6. Compact design
   Minimum space required, easy-to-transport

7. Can be supplied in accordance with NACE
   Use in acid gas atmosphere in compliance with all specifications for corrosion resistance

8. Optional elastomers
   Suitable for ozone, adaptation to varying conditions of use

9. Various connection possibilities ...
   No adapters or fitting pieces required

Pilot-operated Pressure Regulating Valve
RP 820 Eck
Corrosion Resistance in Clean Steam Systems

The principle of steam drying is used for clean rooms, for example hygienisation in the food and medicinal production and in hospitals. Under this process, the components to be dried are exposed to steam which is generated from distilled water and must be as free as possible from condensate. Using the centrifugal principle, the Mankenberg liquid separator AS 2 self-actingly separates the condensate from the steam under operating pressure. A condensate separating performance of up to 99 % can be achieved. The liquid trap built into the separator body operates instantaneously and its operation is not impaired by backpressure or pressure fluctuations. The collected liquid is safely drained by the float control. No additional energy input is required. The interaction between high temperatures and the highly reactive pure water quickly leads to intergranular corrosion, which is also called intergranular attack. Therefore, low-carbon stainless steel was selected for the AS 2, which ensures a high corrosion resistance in the event that very aggressive media are separated.

Bleeding and Venting of Filters for Thermal Water in a Thermal Bath

The brine for the thermal water in many thermal baths is withdrawn from the ground in many different ways. In unprocessed condition it can seldom be used directly for medical purposes. Thus, various types of brine are treated and, in doing so, they pass through a large number of different filter systems. The latter have to be effectively vented. Using valves in thermal baths places the highest demands on the material to be used. The thermal bath water is tapped at a depth of approximately 770 m. It is heavily mineralised (fluoride-containing sodium chloride thermal water) and, owing to the usually high salt concentration, it is extremely corrosive. In addition, due to the fact that the bleeding / venting valves are installed on top of a pipeline, they come into direct contact alternately with water and atmospheric oxygen, which poses additional requirements on the corrosion resistance of the employed materials. Given the high temperatures and high mineralisation of the brine, the customer replaced the normally coated bleeding and venting valves with valves from titanium. This material is particularly resistant to external influences because, when getting in contact with oxygen from water or air, the surface of the titanium forms a thin layer of titanium oxide that protects the material. The employed float-controlled bleeding and venting valve EB 1.2 is designed for temperatures up to +80 °C and a flow rate of 12 m³/h at a differential pressure of 2 bar. The body and internal parts of the valve are made from titanium (3.7025 / 3.7035), the clamp is fabricated from CrNiMo steel (1.4404).
Corrosion-resistant Materials

The right selection of material makes the difference

Stainless steel is needed for numerous applications and industries. This material is used for a huge variety of purposes in essential sectors such as raw material extraction, pharmaceutical and chemical industries, plant construction, oil & gas, offshore applications etc. Mankenberg's product range of flexible standard valves or project-related special valves is correspondingly broad.

The operating conditions at the site sometimes require attractive surfaces of the valves whilst other valves must be capable of sustaining the flow of dirty or highly corrosive media. Hence, the optimum solution is selected in close consultation with our experts, technical sales staff. A particular challenge is to select the suitable material for applications in chemical-technical processes, in which caustic and/or corrosive fluids are used.

The same applies to the maritime domain or saline liquids, for which in general sea water-resistant material is needed. It requires special diligence and clarification of all the technical and chemical details in order to properly assess the loading conditions of the material and the interaction between the medium and the environmental conditions.

Stainless steels, i.e. corrosion-resistant steels, become resistant to corrosion because a so-called passive layer forms on the surface. Such layer consists of chromium-rich metallic oxide or metallic oxide hydrate preventing the direct contact of the metal with the corroding medium. Even in the event of small lesions, new passive layers are formed on the metal and the corrosion process is stopped. The protective passive layer is self-regenerating and the metal is passivated.

Stainless steels are subjected to a variety of stress conditions. They fail in the event that oxygen which is necessary to form the passive layer is not available.

1) Pitting Corrosion

The formation of pitting corrosion occurs in the presence of the salt water. The salt water contains a high concentration of chloride ions. In the event that oxygen which is necessary to form the passive layer is not available, the passive layer is destroyed on the metal surface.

The operating environment in which pitting corrosion occurs typically includes the presence of chloride ions in the corrosive environment. To realize a passive function of the stainless steel, the chloride ions must be present in the environment. If the chloride ions are present in the environment, the metal surface is passivated.

Pitting corrosion is a particular type of corrosion where the microstructure of the stainless steel is still passivated. The microstructure of the stainless steel is passivated by the presence of the chloride ions in the corrosive environment. This allows the corrosion to penetrate the passive layer and form pitting corrosion on the metal surface.

2) Crevice Corrosion

Crevice corrosion can be found in the vicinity of existing gaps or fissures which are often produced by the joining parts. The passivated layer in the crevice can be damaged by the presence of aggressive media such as molten salts or acid. This allows the crevice to act as a chemical cell and the corrosion process to occur. Crevice corrosion can also occur in the event that oxygen which is necessary to form the passive layer is not available.

Behaviour of corrosion-resistant stainless steel 1.4529 / 1.4547

Excellent corrosion resistance owing to an increased percentage of chromium and molybdenum.

Mankenberg Valves in Action

Extinguishing Water Pressure Regulation and Shut-off on Offshore Installations

Offshore installations are good for the storage of oil and gas. The platforms are located and working again for the workforces employed there. As the upheaval and construction are operated independently, some of the platforms are left after a short period of operation and the equipment and installations are handed over to new platforms and are not in operation any more. Hence, it is necessary to shut down the equipment and installations to ensure that the pressure in the system is reduced to the required value in the circular pressurised parts of the system. The shut-off valve is required to be able to shut down the equipment and installations in the event of a fire alarm in the system.

The Mankenberg pressure regulating shut-off valve is designed to be able to shut down the system in the event of a fire alarm. The shut-off valve is designed to be able to shut down the system in the event of a fire alarm. The shut-off valve is designed to be able to shut down the system in the event of a fire alarm.

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Vacuum Breaker for the Cooling Water System of a Semi-submersible Oil Production Platform

The semi-submersible "atching platform" is located 150 km off the Brazil coast and considered to be one of the world's largest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The mega-platform is one of the world's biggest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The semi-submersible oil production platform is located 150 km off the Brazilian coast and is considered to be one of the world's largest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The semi-submersible oil production platform is located 150 km off the Brazilian coast and is considered to be one of the world's largest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The semi-submersible oil production platform is located 150 km off the Brazilian coast and is considered to be one of the world's largest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The semi-submersible oil production platform is located 150 km off the Brazilian coast and is considered to be one of the world's largest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The semi-submersible oil production platform is located 150 km off the Brazilian coast and is considered to be one of the world's largest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The semi-submersible oil production platform is located 150 km off the Brazilian coast and is considered to be one of the world's largest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The semi-submersible oil production platform is located 150 km off the Brazilian coast and is considered to be one of the world's largest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The semi-submersible oil production platform is located 150 km off the Brazilian coast and is considered to be one of the world's largest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The semi-submersible oil production platform is located 150 km off the Brazilian coast and is considered to be one of the world's largest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day.

The cooling water system of the offshore platform requires vacuum breakers and vacuum valves to ensure that the marine atmosphere of a "atching platform" is not sucked in. A vacuum breaker is currently installed in the piping system to protect the anti-pressurization range from the "atching platform". The vacuum breaker is installed in the piping system to protect the anti-pressurization range from the "atching platform". The vacuum breaker is installed in the piping system to protect the anti-pressurization range from the "atching platform".
Corrosion-resistant Materials

The right selection of material makes the difference

Stainless steel is needed for numerous applications and industries. This material is used for a huge variety of purposes in essential sectors such as chemical engineering, pharmaceutical and chemical industries, plant construction, oil & gas, offshore applications etc. Mankenberg's product range of flexible standard valves or project-related special valves is correspondingly broad. The operating conditions at the customer's site sometimes require attractive surfaces of the valves whereas other valves must be capable of sustaining the flow of dirty or highly corrosive media. Hence, the optimum solution is selected in close consultation with our experts, technicians and sales staff. A particular challenge is to select the suitable material for applications in chemical-technical processes, in which caustic or corrosive fluids are used.

The same applies to the maritime domain or saline liquids, for which in general seawater-resistant material is needed. It requires special diligence and clarification of all the technical and chemical details in order to properly assess the loading conditions of the material and the interaction between the material and the environmental conditions.

Stainless steels, i.e. corrosion-resistant steels, become resistant to corrosion because a so-called passive layer forms on the surface. Such layer consists of chromium-rich metallic oxide or metallic oxide hydrate preventing the direct contact of the metal with the corroding medium. Even in the event of small lesions, that are often as small as pinholes, that form more readily. As long as the exposure persists, the pits or holes will enlarge. Hence, the optimum solution is selected in close consultation with our experts, technicians and sales staff. A particular challenge is to select the suitable material for applications in chemical-technical processes, in which caustic or corrosive fluids are used.

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Excellent corrosion resistance owing to an increased percentage of chromium and molybdenum.

Behaviour of corrosion-resistant stainless steel 1.4529 / 1.4547

<table>
<thead>
<tr>
<th>CI-ppm</th>
<th>% of CI-ppm</th>
<th>% of CI-ppm</th>
</tr>
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</tr>
<tr>
<td>100000</td>
<td>1000</td>
<td>1000</td>
</tr>
</tbody>
</table>

1.4529 and 1.4547 have a similar chemical composition.

1.4529 and 1.4547 have a similar chemical composition.

Extinguishing Water Pressure Regulation and Shut-off on Offshore Installations

Mankenberg valves are set up for the rigorous conditions of oil and gas work. The platforms are being asked to perform a wide range of tasks. The work on and installation of the equipment employed there. As the materials and installations are operated independently from the continuous 24/7 of gas and oil extraction processes, they are not necessarily located for the event of a fire. A highly efficient fire protection system is indispensable to prevent fire and disasters.

The Mankenberg pressure regulating shut-off valve DM 668E is designed to reduce the pressure to the required value in the circular pipelines. To maintain a uniform pressure throughout the entire platform, the hydrant valve is selected in close consultation with our engineers, technicians and sales staff. A particular challenge is to select the suitable material for applications in chemical-technical processes, in which caustic or corrosive fluids are used.

The right selection of material makes the difference

Excellent corrosion resistance owing to an increased percentage of chromium and molybdenum.

Mankenberg Valves in Action

Extending the reach of Mankenberg's vacuum breakers: In the cooling water system to protect the under-pressure range by means of an adjustable element. The body and cone of the Mankenberg VV 34 vacuum breaker are made from Super Duplex stainless steel (1.4501), whilst the spring cap is made from 1.4571 and the spring from CrNiMo steel (AISI 316). The VV 34 has been designed for a temperature range of -10 °C through to +60 °C. Its outdoor installation required a protective cage to avoid unintended intrusion of foreign particles or sea birds when air is sucked in.

Vacuum Breaker for the Cooling Water System of a Semi-submersible Oil Production Platform

The semi-submersible oil production platform that is the biggest in the world is named the Kraken. It is located in the Norwegian sector of the North Sea. The platform is operated by Shell Oil Exploration. The platform is located 150 km off the Brazilian coast in water depths of up to 2000 m. The world's biggest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The mega-platform is considered to be one of the world’s biggest platforms, 1.8 km long and 2.5 km wide. The semi-submersible oil production platform is 325 m high, while the drilling rig is made from one 315 m. The semi-submersible oil production platform is one of the world’s biggest platforms. It processes 180,000 barrels of oil and 6,000,000 m³ of gas per day. The Kraken is considered to be one of the world’s biggest platforms, 1.8 km long and 2.5 km wide. The semi-submersible oil production platform is 325 m high, while the drilling rig is made from a single piece 315 m.
Bleeding and Venting Valve

Made in Germany

Your Specialist and Partner in the Field of Corrosion-resistant Materials

We reserve the right to make technical changes. Images non-binding. 08/2014

Bleeding and Venting Valve

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1. compact design
2. minimum space required, easy to maintain
3. deep-drawn version possible, good price-performance ratio
4. optional elastomers suitable for valves, a seal for valves to a variety of application conditions
5. available in special materials, also suitable for rerouted clients
6. special coating possible, different applications in different environmental conditions
7. also for media with low density, for example NAFTA
8. available in special materials, also suitable for extreme demands

Bleeding and Venting Valve for Highest Flow Rates

EB 6.54

Mankenberg clamp system

Mankenberg Valves in Action

Careful Material Selection for the Use of Valves in Acid Gas Environment

If left untreated, natural gas or biogas contains hydrogen sulphide (H₂S) and water vapour. When the H₂S percentage in the natural gas exceeds 1 %, it is commonly referred to as acid gas. The gas humidity, i.e. the water vapour percentage, brings about hydrate formation and corrosion. To feed the gas once again into the transport network, low values for the content of water and other fluid constituents are specified. Therefore, workable gas has to be dried. The drying process reduces mechanical and thermodynamic process steps. During the final drying process stage the gas is conducted through adsorption towers, in which the residual humidity is collected with the help of highly hygroscopic substances such as glycols.

Similarly to the extraction of natural gas, every field station of a natural gas reservoir is equipped with a drying plant for the withdrawn gas. The gas is conducted in the process plant in three stages: mechanical separation of free water, then pressure reduction and finally the use of glycols.

In many cases medium-operated high pressure reducers of the type DM 621 according to NACE are employed. In the cases in the process plant is necessary to comply with the latest standards, as described in MR0175, for example. In accordance with NACE International (National Association of Corrosion Engineers), the material for natural gas valves has to be carefully selected, which means that steels with significantly reduced hardness are taken into consideration. Otherwise there will be the danger of excessive embrittlement of the steel. In the above mentioned application, the question of corrosion resistance is consequently of major importance, because the question of material selection becomes even more critical as the gas terminal was built in close proximity to salt water, that is to say sea water atmosphere.

Please send us your enquiry and allow us to advise you.

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Industrial Valves

Your Specialist and Partner in the Field of Corrosion-resistant Materials
Bleeding and Venting Valve

Mankenberg Valves in Action

Careful Material Selection for the Use of Valves in Acid Gas Environment

If left untreated, natural gas or biogas contains hydrogen sulphide (H₂S) and water vapour. When the H₂S percentage in the natural gas exceeds 1%, it is commonly referred to as acid gas. The gas humidity, i.e., the water content, leads to hydrogen formation and corrosion. To feed the gas once again into the transport network, both values for the content of water and other fluid constituents are specified. Therefore, welding procedures are often used. The drying process involves mechanical and thermodynamic process steps. During the final drying process stage, the gas is condensed through absorption towers, in which the residual humidity is collected with the help of highly hygroscopic substances such as glycols. Similarly to the extraction of natural gas, every field station of a natural gas reservoir is equipped with a drying plant for the withdrawn gas. This gas is then transported through pipelines in three stages: mechanical separation of free water, then pressure reduction and lastly the use of glycols.

In many cases medium-operated high pressure reducers of the type DM 621 according to NACE are employed. The valves in the process plant are designed to comply with the latest standards, for example, in accordance with NACE International (National Association of Corrosion Engineers), the material for natural gas valves has to be carefully selected, which means that steels with significantly reduced hardness are taken into consideration. Otherwise there will be the danger of excessive embrittlement of the steel. In the medium mentioned application, the selection of corrosion-resistant steel, consequently, the question of material selection became more vital, even as the gas terminal was built in close proximity to salt water, that is to say, sea water atmosphere.

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Mankenberg clamp system  
easy to maintain  

optional elastomers  
suitable for valves, adaptable to a variety of application conditions  

ideal for media with low density  
for example, NAFTA  

may be used in the petrochemical industry  

suitable in special materials  
also suitable for reduster elements  

compact design  
maintains space required, easy maintenance  

low dead volume possible  
pay-off in performance ratio  

special coating possible  
selective applications in different environmental conditions

Bleeding and Venting Valve for Highest Flow Rates

EB 0.54

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Careful Material Selection for the Use of Valves in Acid Gas Environment

If left untreated, natural gas or biogas contains hydrogen sulphide (H₂S) and water vapour. When the H₂S percentage in the natural gas exceeds 1%, it is commonly referred to as acid gas. The gas humidity, i.e., the water content, leads to hydrogen formation and corrosion. To feed the gas once again into the transport network, both values for the content of water and other fluid constituents are specified. Therefore, welding procedures are often used. The drying process involves mechanical and thermodynamic process steps. During the final drying process stage, the gas is condensed through absorption towers, in which the residual humidity is collected with the help of highly hygroscopic substances such as glycols. Similarly to the extraction of natural gas, every field station of a natural gas reservoir is equipped with a drying plant for the withdrawn gas. The gas is then transported through pipelines in three stages: mechanical separation of free water, then pressure reduction and lastly the use of glycols.

In many cases medium-operated high pressure reducers of the type DM 621 according to NACE are employed. The valves in the process plant are designed to comply with the latest standards, for example, in accordance with NACE International (National Association of Corrosion Engineers), the material for natural gas valves has to be carefully selected, which means that steels with significantly reduced hardness are taken into consideration. Otherwise there will be the danger of excessive embrittlement of the steel. In the medium mentioned application, the selection of corrosion-resistant steel, consequently, the question of material selection became more vital, even as the gas terminal was built in close proximity to salt water, that is to say, sea water atmosphere.

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ideal for media with low density  
for example, NAFTA  

may be used in the petrochemical industry  

suitable in special materials  
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