

# Level and pressure instrumentation for the chemical industry



Application examples and products



# Measurement technology for the chemical industry

This brochure presents examples of applied level and pressure measurement technology. Here, you'll learn which sensors fit which measuring tasks.

■ <b>Distillation column</b>	Level and pressure measurement	■ <b>Storage tanks for highly toxic liquids</b>	Level measurement and point level detection
■ <b>Bulk storage tanks</b>	Level measurement and point level detection	■ <b>Ammonia tank</b>	Level measurement and point level detection
■ <b>Storage and buffer tanks</b>	Level measurement and point level detection	■ <b>Urea reactor</b>	Level measurement and point level detection
■ <b>Reaction vessel</b>	Level measurement and point level detection	■ <b>Filling silo for colour pigment</b>	Level measurement and point level detection
■ <b>Reactor</b>	Level measurement	■ <b>Silos for bulk solids</b>	Level measurement and point level detection
■ <b>Chlorine storage tank</b>	Level measurement and point level detection	■ <b>Steam boiler</b>	Level measurement and point level detection
■ <b>Tanks for solvents</b>	Level and pressure measurement and point level detection	■ <b>Separation vessel</b>	Level measurement and point level detection
■ <b>Storage tanks for toxic liquids</b>	Level measurement and point level detection	■ <b>Transport containers for liquids</b>	Level measurement

More applications can be found at

[www.vega.com/chemical](http://www.vega.com/chemical)

## Colour pigment production

■ Storage tank	Level measurement
■ Diazotization vessel	Level measurement
■ Coupling vessel	Level measurement
■ Discharge chute of the belt dryer	Level measurement
■ Dissolving tank	Level measurement
■ Filling silo for colour pigment	Level measurement and point level detection

## Urea production







■ Stripper	Level measurement
■ Primary reformer	Pressure measurement
■ Pool condenser	Level measurement
■ Urea reactor	Level measurement and point level detection

## Ammonia production





■ Ammonia reactor	Pressure measurement
■ Gas scrubber	Level and pressure measurement
■ Ammonia separator	Level measurement and point level detection
■ Heat recovery boiler	Level measurement and point level detection
■ Ammonia tank	Level measurement and point level detection

# All sensors at a glance



## Continuous level measurement

Instrument type		Measuring range	Process fitting	Process temperature	Process pressure
<b>VEGAFLEX 81</b> TDR sensor for continuous level and interface measurement of liquids		up to 75 m	Thread from G¾, ¾ NPT, flanges from DN 25, 1"	-60 ... +200 °C	-1 ... +40 bar (-100 ... +4000 kPa)
<b>VEGAFLEX 86</b> TDR sensor for continuous level and interface measurement of liquids		up to 75 m	Thread from G¾, ¾ NPT, flanges from DN 25, 1"	-196 ... +450 °C	-1 ... +400 bar (-100 ... +40000 kPa)
<b>VEGAPULS 62</b> Radar sensor for continuous level measurement of liquids		up to 35 m	Thread from G1½, 1½ NPT, flanges from DN 50, 2"	-196 ... +450 °C	-1 ... +160 bar (-100 ... +16000 kPa)
<b>VEGAPULS 64</b> Radar sensor for continuous level measurement of liquids		up to 30 m	Thread from G¾, ¾ NPT, flanges from DN 50, 2", Mounting strap	-40 ... +200 °C	-1 ... +20 bar (-100 ... +2000 kPa)
<b>VEGAPULS 69</b> Radar sensor for continuous level measurement of bulk solids		up to 120 m	Mounting strap, compression flange from DN 80, 3", flanges from DN 80, 3", adapter flanges from DN 100, 4"	-40 ... +200 °C	-1 ... +3 bar (-100 ... +300 kPa)
<b>SOLITRAC 31</b> Radiation-based sensor for continuous level measurement		up to 3 m	Mounting from outside on the vessel	any (with optional cooling)	any

## Point level detection

Instrument type		Measuring range	Process fitting	Process temperature	Process pressure
<b>VEGASWING 63</b> Vibrating level switch with tube extension for liquids		up to 6 m	Thread from G¾, ¾ NPT, flanges from DN 25, 1"	-50 ... +250 °C	-1 ... +64 bar (-100 ... +6400 kPa)
<b>VEGASWING 66</b> Vibrating level switch for liquids under extreme process temperatures and pressures		up to 3 m	Thread from G1, 1 NPT, flanges from DN 50, 2"	-196 ... +450 °C	-1 ... +160 bar (-100 ... +16000 kPa)
<b>VEGA VIB 63/VEGA WAVE 63</b> Vibrating level switch with tube extension for bulk solids		Bulk solids from 20 g/l / from 8 g/l	Thread from G1, 1 NPT, flanges from DN 32, 1½"/ Thread from G1½, 1½ NPT, flanges from DN 50, 2"	-50 ... +250 °C	-1 ... +16 bar (-100 ... +1600 kPa) / -1 ... +25 bar (-100 ... +2500 kPa)
<b>MINITRAC 31</b> Radiation-based sensor for density measurement		–	Mounting from outside on pipeline or on vessel	any (with optional cooling)	any

## Pressure measurement

Instrument type		Deviation	Process fitting	Process temperature	Measuring range
<b>VEGABAR 81</b> Pressure transmitter with chemical seal		0.2 %	Thread from G½, ½ NPT, flanges from DN 25, 1"	-90 ... +400 °C	-1 ... +1000 bar (-100 ... +100000 kPa)
<b>VEGABAR 82</b> Pressure transmitter with ceramic measuring cell		0.2 % 0.1 % 0.05 %	Thread from G½, ½ NPT, flanges from DN 15, 1½"	-40 ... +150 °C	-1 ... +100 bar (-100 ... +10000 kPa)





## Chemical industry



### Highest quality as the standard

In no other industrial sector are the demands on instrumentation as high as in chemical manufacturing. The processes are characterized by wide temperature and pressure ranges; the sensors used must be made of chemically resistant materials and function reliably under the most demanding conditions.

VEGA instruments are used in many different areas and have proven themselves even in extreme applications.



### Reliable measurement

Safety is the top priority in all complex processes. VEGA sensors are certified for use in hazardous areas and in safety-related systems up to SIL2.

### Fast and simple

Even though they are all manufactured according to customer specifications, VEGA instruments are usually delivered within a few days. Users appreciate the simple, clear setup procedure, which can also be carried out via Bluetooth and smartphone or tablet PC.



More information



plics® – easy is better

### Instrument platform plics®

The plics® idea is simple: Each instrument is assembled from prefabricated components once the order is received. This modular design allows full flexibility when selecting the required sensor features. You receive your customised, user-friendly instrument within an amazingly short time. The best part: these instruments are more cost-effective and advantageous in every way – throughout their entire life cycle.



### Display and adjustment

The display and adjustment module PLICSCOM is used for measured value indication, adjustment and diagnosis directly on the sensor. Its simple menu structure enables quick setup. Status messages are displayed in plain text. The optional Bluetooth feature allows wireless operation.



### Connection

The VEGACONNECT connects your instrument to a PC via the USB interface. PLICSCOM with Bluetooth enables data transfer with wireless technology. The instruments are configured with the tried and trusted adjustment software PACTware and the appropriate DTM or with an app on a smartphone or tablet PC. For EDD-based systems we also offer graphics-driven EDDs.

### Asset management and maintenance

The integrated self-monitoring function of plics® instruments permanently informs the user on the status of the instruments. Status messages allow proactive and cost-effective maintenance. All diagnostic data can be called up easily and quickly in plain text via the built-in memory functions.







## Distillation column

### Reliable

Reliable level measurement across all pressure and temperature ranges

### Cost effective

Standardized operation in all the measuring principles

### User friendly

Robust and maintenance-free sensors reduce maintenance overhead

### Level and pressure measurement in the distillation of primary products

The process temperatures in a distillation column place high demands on the measurement technologies deployed. The boiling point of the distillate frequently exceeds 400 °C. The aim is to achieve the highest possible product throughput for cost-effective operation of the plant. This means the raw material replenishments need to be optimally controlled by level and process pressure measurement in the column.



#### VEGABAR 81

Measurement of head pressure with pressure transmitter in the distillation column

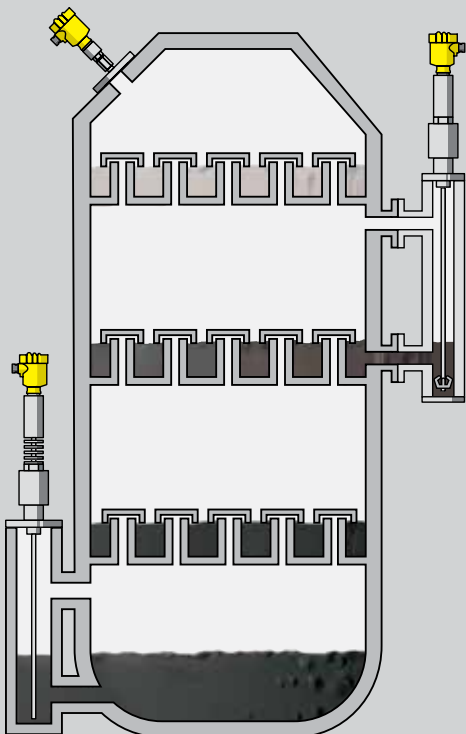
- Reliable head pressure measurement, even with vacuum or overpressure
- Measurement result unaffected by temperature variations during the start up and shutdown of the column
- Durable pressure transmitter can withstand temperatures of up to 400 °C



#### VEGAFLEX 86

Level measurement of the extraction trays of the distillation column with guided radar

- Maintenance-free measuring principle reduces maintenance costs to a minimum
- Delivered as a complete solution with bypass VEGAPASS 81
- Particularly high system reliability through extensive diagnostic functions and SIL qualification according to IEC 61508 (SIL2)





## Bulk storage tanks

### Reliable

Reliable protection against overfilling

### Cost effective

Independent of product and process characteristics

### User friendly

Simple setup and commissioning, maintenance-free

### Level measurement and point level detection in bulk storage tanks

Dependable storage is not only the basis for reliable production and supply, it also protects against raw material shortages and price volatility. In addition to regulations on the use of overfill protection or safety instrumented systems, large storage tanks are also often subject to hazardous area codes of practice in conjunction with level measurement.



#### VEGAPULS 64

Continuous level measurement with radar in bulk storage tanks

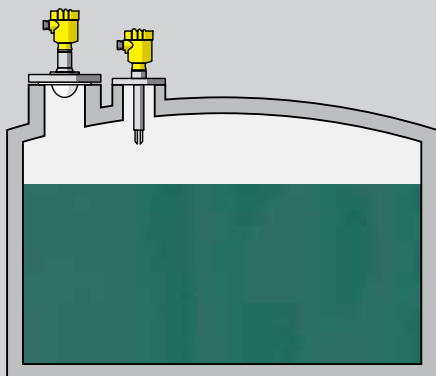
- Reliable measurement, independent of density and temperature changes
- Excellent signal focusing ensures high accuracy
- Long service life thanks to maintenance-free operation



#### VEGASWING 63

Point level detection with vibrating level switch for overfill protection in bulk storage tanks

- Universally applicable as overfill and dry run protection system for virtually all liquid applications
- Accurate level detection thanks to adjustment-free, media-independent switching point
- Highly resistant materials and coatings for long operational life
- Test button for easy testing of instrument functionality during operation





## Storage and buffer tanks

### Reliable

Reliable protection against overfilling

### Cost effective

Independent of product and process characteristics

### User friendly

Simple to set up with maintenance-free operation

### Level measurement and point level detection in small storage and buffer tanks

Storage and buffer tanks enable a reliable material supply for various ongoing processes. The plant operators need to have exact level data from these tanks at all times to ensure timely replenishment and facilitate continuous production. In addition, the measured values form the basis of the statistical consumption analysis for validation and quality monitoring.



#### VEGAPULS 64

Continuous level measurement with radar

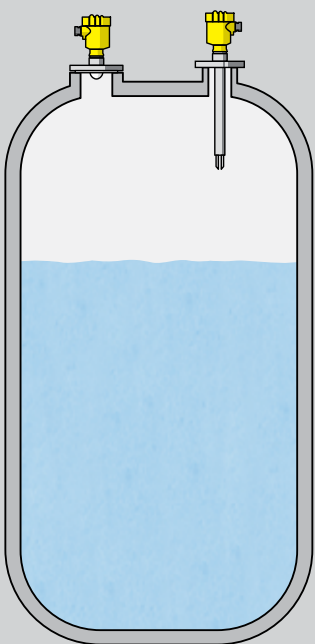
- High chemical resistance through PTFE antenna cover
- Reliable measurement despite changing media
- Maintenance-free thanks to non-contact measurement



#### VEGASWING 63

Vibrating level switch for point level detection

- Universally applicable as overfill and dry run protection system for virtually all liquid applications
- Media-independent switching point, reliable level information
- Highly resistant materials and coatings allow use in different media
- Test button for easy testing of instrument functionality during operation







## Reaction vessel

### Reliable

Reliable measurement, independent of both ambient and process conditions

### Cost effective

Highly resistant materials ensure a long service life

### User friendly

Simple installation and setup

### Level measurement and point level detection in the reaction vessel

Changing media, as well as process pressures and temperatures, characterize the typical reaction processes in a reaction vessel. This is a big engineering challenge, because any sensors used to control the process need to deliver reliable measurements under these conditions. To meet the diverse conditions found in reaction vessels, level measurement and point level detection instrumentation must cover a broad spectrum of applications.



#### VEGAPULS 64

Non-contact level measurement with radar in reaction vessels

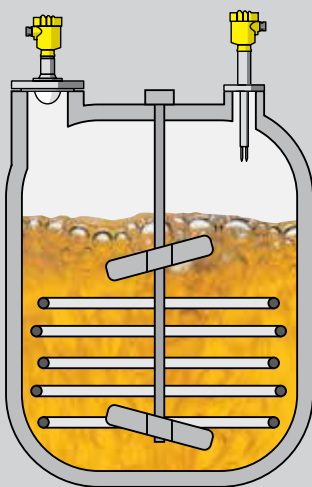
- Measuring result unaffected by agitator thanks to false signal suppression
- High chemical resistance through PTFE antenna cover
- Small process fittings allow easy installation



#### VEGASWING 63

Vibrating level switch for liquids for level detection as overflow and dry run protection system in the reaction vessel

- Media-independent switching point, reliable level information
- Highly resistant materials and coatings allow use in a variety of media
- Test button for easy testing of instrument functionality during operation





## Reactor

### Reliable

Reliable measurement independent of the process conditions

### Cost effective

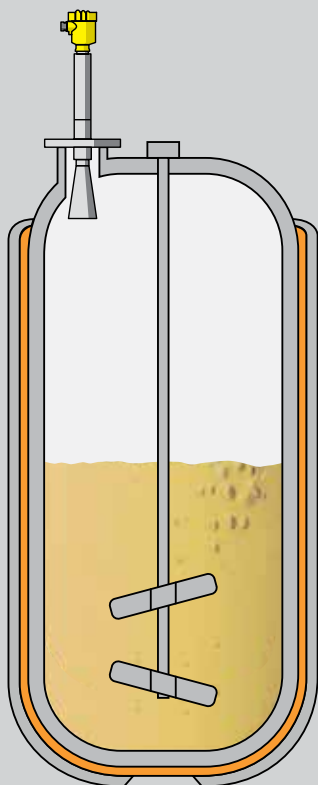
Non-contact and wear-free measurement

### User friendly

Simple adjustment and operation

### Level measurement in a reactor

High temperatures, pressures and vacuums are techniques usually employed to make reaction processes more efficient and economical. This is a big challenge for engineering, because the sensors used have to deliver reliable measurements under these conditions. To be able to meet the diverse requirements of reaction vessels, sensors for level measurement have to meet a very wide range of application conditions.



### VEGAPULS 62

Continuous level measurement with radar in the reactor

- Trustworthy level measurement, independent of process conditions such as temperature, pressure, reaction gases or built-in agitator
- Level is reliably detected despite the effects of changing conditions or mixing processes
- Wide range of applications possible thanks to high temperature and pressure range up to +450 °C and +160 bar



## Chlorine storage tank

### Reliable

All materials are fully chemically resistant

### Cost effective

Universal application, independent of product characteristics and process conditions

### User friendly

Maintenance-free operation

### Level measurement and point level detection in storage tanks for chlorine

Chlorine production and storage places high demands on the chemical and the diffusion resistance of the materials in the production equipment. Extensive process knowledge and experience is required when selecting the sealing materials. In fact it is decisive for the long-term, safe and profitable operation of the plant. Since the processes can only be interrupted at great expense and plant disruption, the reliability of the instrumentation is a top priority.



#### VEGAPULS 64

Level measurement with non-contact radar sensor in the storage tank for chlorine

- Reliable level measurement under all process conditions
- Optimum chemical resistance is ensured by a diffusion-tight, 8 mm thick PTFE disc
- Maintenance-free operation with very long service life



#### VEGASWING 63

Point level detection with vibrating level switch in the storage tank for chlorine

- Reliable level detection under all process conditions in wide temperature and pressure ranges
- Various highly resistant materials are available to meet widely different demands on chemical resistance
- Simple function check with test button on the sensor







## Tanks for solvents

### Reliable

Reliable protection against overfilling

### Cost effective

Independent of product and process characteristics

### User friendly

Simple to set up and maintenance-free operation

### Level measurement, point level and pressure measurement in the storage and transfer of solvents

Low viscosity solvents can degrade many types of plastics. This places increased demands on the process instrumentation. A separate level detection system is required for protection against overfilling. It increases plant safety and ensures protection of human health and the environment.



#### VEGAFLEX 81

Level measurement with guided radar in the solvent tank

- Different sealing and housing materials ensure long-term and maintenance-free operation
- The SIL qualification (SIL2/3) and the approval for substances hazardous to water (WHG) allow use as part of an overfill protection system or safety instrumented system



#### VEGABAR 82

Pump pressure measurement with pressure transmitter in the pump line

- Robust ceramic CERTEC® measuring cell withstands pressure surges or vacuum shocks in the pump line
- Reliable level measurement qualified to WHG and SIL



#### VEGASWING 63

Point level detection with vibrating level switch for overfill and dry run protection in the solvent tank

- Additional safety thanks to glass feedthrough, which provides an additional process separation (Second Line of Defense)
- Simple testing of the measuring system during operation via test button





## Storage tanks for toxic liquids

### Reliable

Configuration of the measuring system ensures maximum safety for people and the environment

### Cost effective

High availability and maintenance-free operation

### User friendly

Fast installation and simple setup

### Level measurement and point level detection in toxic liquids storage

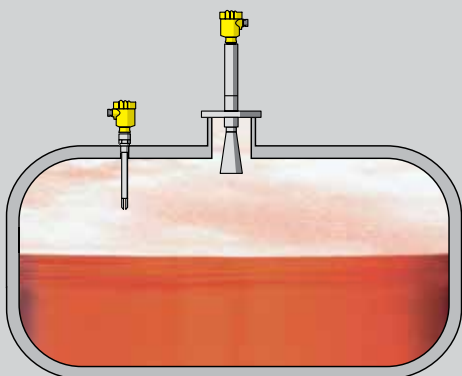
Some chemical processes generate extremely toxic intermediates that have to be stored under the most stringent security measures. In order to be used in this application, the measurement technology must meet specific requirements in terms of design and functional reliability. A redundant sealing concept, an optional glass feedthrough (Second Line of Defense) and highly resistant materials provide the necessary security for the storage and processing of toxic media.



#### VEGAPULS 62

Continuous level measurement with radar in the storage tank for toxic media

- Non-contact measuring principle is independent of media properties
- Maximum safety with toxic media, thanks to ceramic process separation and additional glass sealing
- Highly resistant materials ensure a long service life
- Maintenance-free operation



#### VEGASWING 63

Vibrating level switch for point level detection in the storage tank for toxic media

- Universally applicable for almost all liquids
- Additional safety through glass seal that ensures even better separation from the process (Second Line of Defense)
- Simple setup without calibration
- Test button for easy testing of instrument functionality during operation



## Storage tanks for highly toxic liquids

### Reliable

Redundant measurement  
for maximum security

### Cost effective

No additional process fittings  
on the tank necessary

### User friendly

Maintenance-free and reliable  
in operation

### Level measurement and point level detection in highly toxic media

For extremely toxic substances such as phosgene, absolute control over the process is a necessity. In industrial applications, these products are only used in hermetically closed circuits. To minimize the inherent risks, independent protection devices form an integral part of the tank equipment. Moreover, it is important to keep the number of tank openings as small as possible. An external level measuring system that includes point level detection is ideal for such situations.



### SOLITRAC 31

Radiation-based sensor for continuous level measurement  
in storage tanks for highly toxic substances

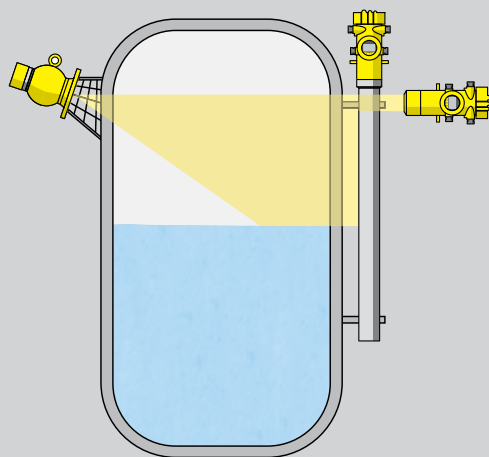
- Maximum safety and process integrity, regardless of media properties
- No container opening required, the measurement is carried out on the outside of the tank
- Maintenance-free operation, no wetted parts



### MINITRAC 31

Radiation-based level detection for overfill or dry run protection  
in storage tanks for highly toxic substances

- Reliable monitoring of the minimum or maximum level, independent of media properties
- No container opening required, the measurement is carried out from the outside through the container wall
- Maintenance-free operation, no wetted parts







## Ammonia tank

### Reliable

Special sealing concept prevents diffusion

### Cost effective

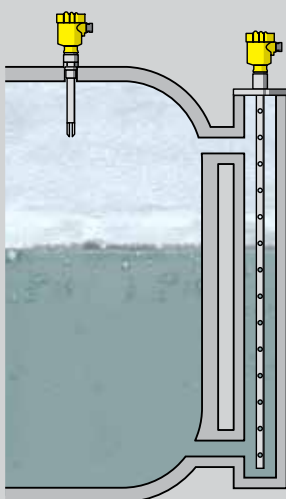
Maximum tank utilization

### User friendly

Minimal maintenance costs

### Level measurement and point level detection in the ammonia tank

The diffusion behaviour of ammonia is extreme, which means it can eventually pass through any conventional process fitting or elastomer seal. To avoid any long term leaks and unwanted outages, gas-tight process sealing and special safety configurations are therefore mandatory, which considerably restricts the choice of instrumentation. The high risk potential and tough environmental restrictions also make reliable control of the level absolutely necessary when handling ammonia.



### VEGAFLEX 81

Level measurement with guided radar in the ammonia tank

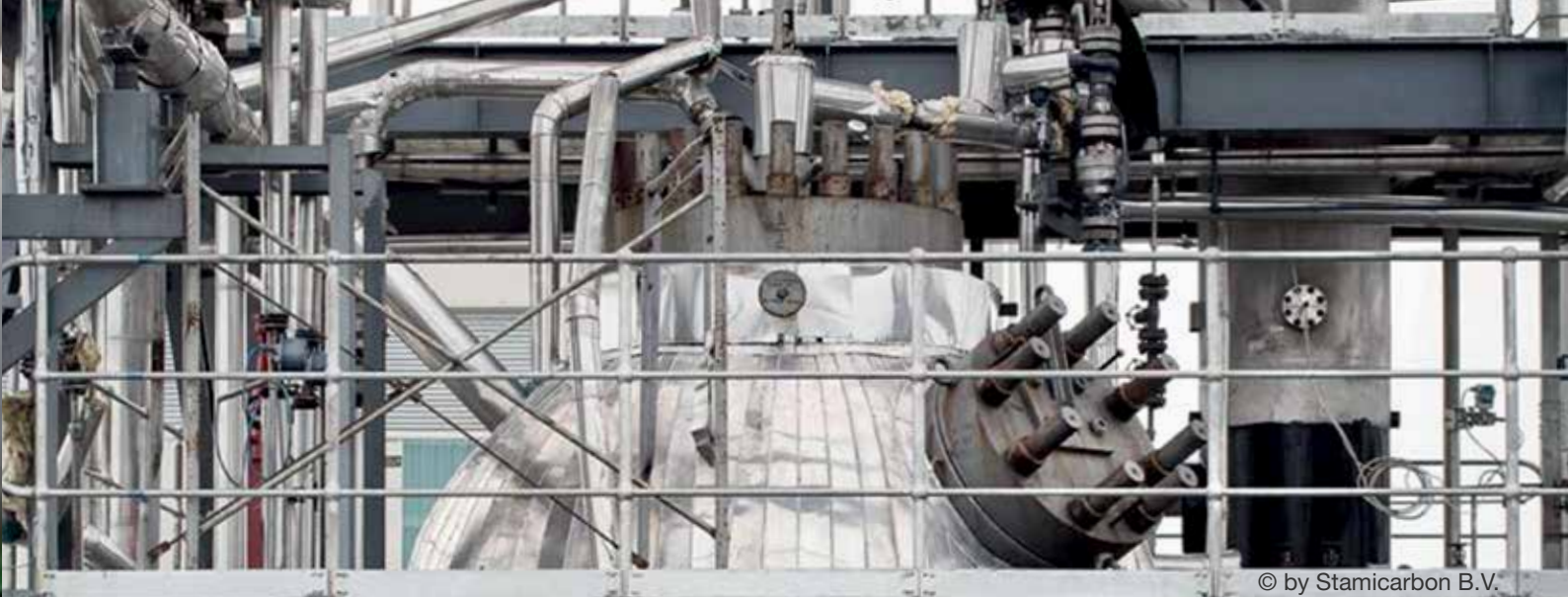
- Measurement is unaffected by the ammonia atmosphere
- Protection against ammonia diffusion using special sensor sealing concept
- Precise measurement data enables high process reliability



### VEGASWING 63

Vibrating level switch for overfill protection in the ammonia tank

- Absolutely diffusion-tight fully welded structure
- Simple setup without calibration
- Function test during operation reduces maintenance costs and increases process availability



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## Urea reactor

### Reliable

Reliable, redundant measurement

### Cost effective

One detector type for all measuring tasks

### User friendly

Maintenance-free operation

### Level measurement and point level detection in the reactor during the distillation of urea

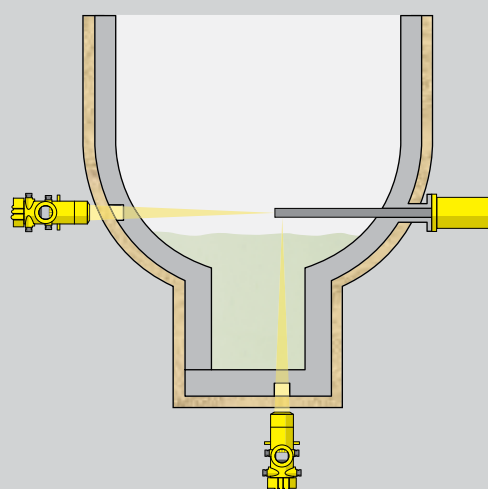
In the production of urea from ammonia, high process temperatures and the urea itself limit any sensor material selection considerably. The thick container walls further complicate the installation of measurement technology. A reliable monitoring of the level is essential to enable the cost-effective production of urea.



#### MINITRAC 31

Continuous level measurement with radiometry under difficult process conditions

- Maintenance-free measuring system for exact, reliable level information
- Compact design allows installation even in difficult-to-access, cramped spaces
- The radioactive source can be inserted into a double-walled, closed immersion tube in the wall of the urea reactor



#### MINITRAC 31

Radiation-based level detection protects against overfilling

- Reliable detection of the minimum and maximum limit levels for maximum process reliability
- Precise switching signal, regardless of the process conditions
- Qualified up to SIL2



## Filling silo for colour pigment

### Reliable

High measurement reliability, even in extremely dusty environments

### Cost effective

Maintenance-free operation

### User friendly

Simple to set up

### Level measurement and point level detection in colour pigment packing

In the last production step, the finished pigment powders are pneumatically conveyed into packing silos. The conveying system generates very high dust levels and air movement inside the silos. To control the filling process, the levels in the silos need continuous monitoring. A high level detection switch is used for safety shutdown in case of overfilling. The pigment powder is then filled into sacks via the bottom outlet.



### VEGAFLEX 82

Continuous level measurement with guided radar in filling silo

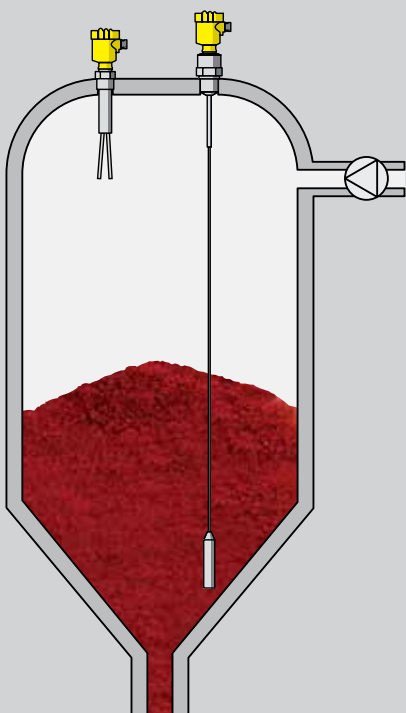
- Accurate measurement despite extremely dusty environment
- Reliable level measurement, even in media with low dielectric constant
- Simple and fast setup with display and adjustment module



### VEGAWAVE 63

Vibrating level switch for protection against overfilling

- Simple setup without calibration
- Reliable detection despite changing density of the medium
- Dependable function thanks to product-independent switching point







## Silos for bulk solids

### Reliable

Reliable measurement, independent of media properties and container geometry

### Cost effective

Maintenance-free operation

### User friendly

Universally applicable for almost all bulk solids

### Level measurement and point level detection in silos

In the chemical industry, many different kinds of bulk solids are produced or used as raw materials. To ensure reliable measurement of silo contents, many factors must be considered: different bulk densities, abrasive properties, dust generation and the requirements of explosion protection. Implementation of the most suitable level sensors ensures optimal production planning and reliable logistics for the finished products.



#### VEGAPULS 69

Non-contact radar level measurement in bulk solids silos

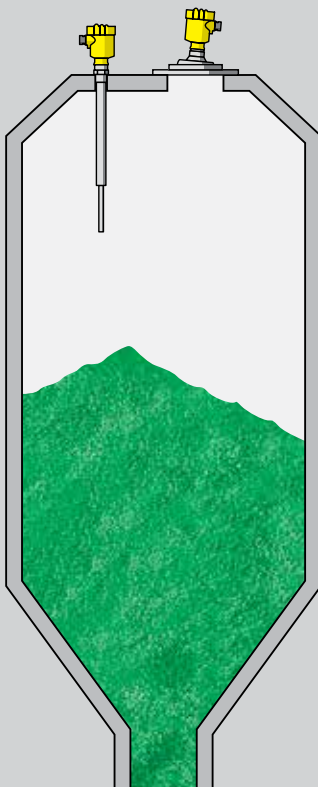
- Reliable measurement even with large amounts of dust and filling noise
- Suitable even for high, narrow silos or segmented containers, thanks to good signal focusing
- Can be used in media of differing consistency and in different measuring ranges
- Simple installation and calibration, even on filled silos



#### VEGAVIB 63

Point level detection with vibrating level switches in bulk solids silos

- Universally applicable for all granulated bulk solids
- Wear and maintenance-free measurement
- Simple, adjustment-free setup and commissioning





## Steam boiler

### Reliable

High operational reliability  
under all process conditions

### Cost effective

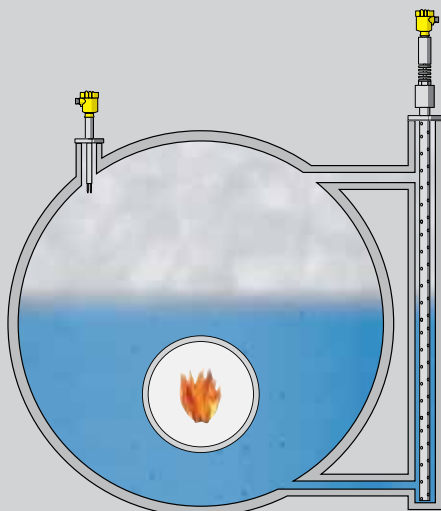
Simple to install, even in existing  
plants

### User friendly

Maintenance-free operation

### Level measurement and point level detection in process steam generation

High process pressures and a highly compressed vapour phase are the normal operating conditions inside boilers. The size of the steam generator is what determines the quantity of saturated steam that can be fed into a heat exchanger. Reliable control of the water level and limitation of high and low water levels are therefore extremely important. In power plants boilers are governed by the steam pressure and the process temperature.



### VEGAFLEX 86

Level measurement with guided radar for optimization  
of steam generation in boilers

- Approved acc. to EN 12952-11 and EN 12952-9 as limiting device for high and low water in the boiler
- Automatic runtime adjustment ensures accurate measurement, even under changing vapour pressures
- High system reliability through automatic self-monitoring
- Safe for use up to SIL2/3 according to IEC 61508



### VEGASWING 66

Vibrating level switch for high and low water limitation  
in steam boilers

- Ceramic materials allow use at temperatures up to 450 °C and pressures up to 160 bar
- Density changes and changes in conductivity or saturated steam consistency do not influence the measurement
- Continuous self-monitoring as well as fast and reliable function testing via keystroke
- Safe for use up to SIL2/3 according to IEC 61508



## Separation vessel

### Reliable

Reliable measurement of the interface (separation layer)

### Cost effective

Maintenance-free operation

### User friendly

Easy setup and commissioning

### Level measurement and point level detection in a separator vessel tank for recovery of raw materials

These processes often involve the separation of water-based media from hydrocarbons. In most applications, the upper, lighter medium is electrically non-conductive. Guided radar level measurement makes use of the effect that non-conductive media allow some of the radar energy to pass through, thus enabling a measurement of the interface between the water-based lower medium and the hydrocarbons.



#### VEGAFLEX 81

Level and interface measurement with guided radar in the separation tank

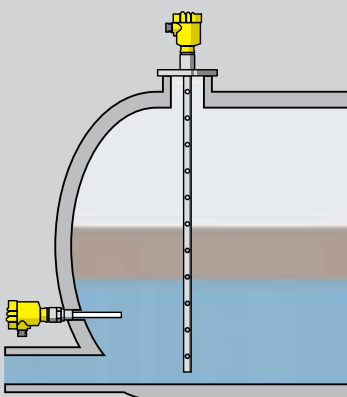
- Total level and position of the interface are reliably detected with a rod or coaxial sensor
- Separation layer thicknesses from 50 mm can be measured
- VEGAFLEX 81 measures reliably and accurately, even in emulsion phases
- Simple setup and maintenance-free operation



#### VEGACAP 63

Capacitive level switch for conductive liquids for level measurement in the separation tank

- Reliable differentiation between conductive and non-conductive media
- Reliable level measurement of the separated water quantity for disposal
- Simple mounting and calibration







## Transport containers for liquids

### **Reliable**

Accurate measurement down to the bottom of the vessel

### **Cost effective**

Sensor is quick and easy to install

### **User friendly**

Visualised display of measurements

### **Level measurement of liquids in transport containers**

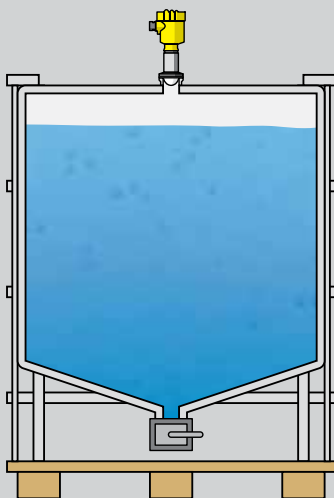
In many of the production processes in the chemical industry, small quantities of various chemicals are needed in order to improve the characteristics of certain products. The media are often provided directly to the production areas in small, transport containers. Accurate level measurement ensures a continuous supply of materials for production.



### **VEGAPULS 64**

Non-contact level measurement with radar in transport tanks

- Precise measurement even in small containers
- Sensors can be easily replaced thanks to clamp connections
- Direct display of measured vessel content on sensor display





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