Level, Pressure, and Density

Instrumentation for the Refining Industry

Application Examples and Products

Looking Forward VEGA

Instrumentation for Modern Refining

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

1	**Tank Farm in the Refinery**	Level Measurement
2	**Distillation Column**	Level and Pressure Measurement
3	**Reboiler**	Level Measurement
4	**Propane Bullet**	Level and Interface Measurement
5	**Desalter**	Interface Measurement
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7	**Steam Drum**	Level Measurement
8	**Sour Water Stripper**	Level and Interface Measurement
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10	**Sump**	Level Measurement
11	**Sulphur Pit**	Level Measurement
12	**Flare Knockout Drum**	Level and Interface Measurement

Modern Refining

Accurate and Reliable Instrumentation

VEGA's comprehensive offering of products and services for the measurement of level, pressure, and density is setting the standard in the refining industry. With advanced electronics and technology, VEGA products are equipped to handle the increased demands of modern refining methods used to process both light and heavy crude. VEGA's diverse product offering delivers overfill protection and redundant systems for the most challenging applications, even with extreme temperature and pressure. These advanced products enable greater efficiency and accuracy within the refinery.

Instrument Overview

Continuous Level Measurement

Instrument Type		Measuring Range	Process Fitting	Process Temperature	Process Pressure
VEGAPULS 64 Non-contact radar sensor for continuous level measurment of liquids		up to 98 ft (30 m)	Threads from G¾, ¾ NPT Flanges from DN 50, 2"	-320 … +392°F (-196 … +200°C)	-14.5 … +3622,320 psi (-1 … +25 bar)
VEGAFLEX 81 Guided wave radar sensor for continuous level measurement of liquids		up to 246 ft (75 m)	Threads from G¾, ¾ NPT Flanges from DN 25, 1"	-40 … +392°F (-40 … +200°C)	-14.5 … +580 psi (-1 … +40 bar)
VEGAFLEX 86 Guided wave radar sensor for liquid and interface measurement in high temperatures/pressures		up to 246 ft (75 m)	Threads from G¾, ¾ NPT Flanges from DN 25, 1"	-320 … +842°F (-196 … +450°C)	-14.5 … +5,800 psi (-1 … +400 bar)
FiberTrac 31 Radiometric sensor for continuous level measurement		up to 23 ft (7 m)	Mounts external to the vessel	-4 … +122°F (-20 … +50°C)	Mounts external to the vessel
VEGAMAG 82 Combination measuring system — magnetic level indicator paired with bridle and guided wave radar		up to 50 ft (15 m)	Threads from G½, ½ NPT Flanges from DN 25, 1"	-320 … +842°F (-196 … +450°C)	-14.5 … +5,800 psi (-1 … +400 bar)

Signal Processing

Instrument Type		Hysteresis	Input	Output	Operating Voltage
VEGAMET 861 Robust controller and display instrument for level sensors		adjustable	1x 4 … 20 mA/HART sensor input 2x digital input	1/3x 0/4 … 20 mA current output 4/6x operating relay 1x fail safe relay (instead of an operating relay)	24 ... 65 V DC 100 ... 230 V AC, 50/60Hz

Point Level Detection

Instrument Type		Measuring Range	Process Fitting	Process Temperature	Process Pressure
VEGASWING 63 Vibrating level switch with tube extension for liquids		up to 20 ft (6 m)	Threads from G¾, ¾ NPT Flanges from DN 25, 1"	-58 … +482°F (-50 … +250°C)	-14.5 … +928 psi (-1 … +64 bar)
VEGASWING 66 Vibrating level switch for liquids in high temperatures/pressures		up to 10 ft (3 m)	Threads from G1, 1 NPT Flanges from DN 40, 1½"	-321 … +842°F (-196 … +450°C)	-14.5 … +2,320 psi (-1 … +160 bar)

Pressure Measurement

Instrument Type		Deviation	Process Fitting	Process Temperature	Measuring Range
VEGABAR 82 Pressure transmitter with CERTEC® measuring cell		0.05 … 0.2%	Threads from G½, ½ NPT Flanges from DN 15, 1" Hygienic fittings	-40 … +302°F (-40 … +150°C)	-14.5 … +1,450 psi (-1 … +100 bar)
VEGABAR 83 Pressure transmitter with METEC® measuring cell		0.075 … 0.2%	Threads from G½, ½ NPT Flanges from DN 25, 1" Hygienic fittings	-40 … +392°F (-40 … +200°C)	-14.5 … +14,500 psi (-1 … +1,000 bar)

Density Measurement

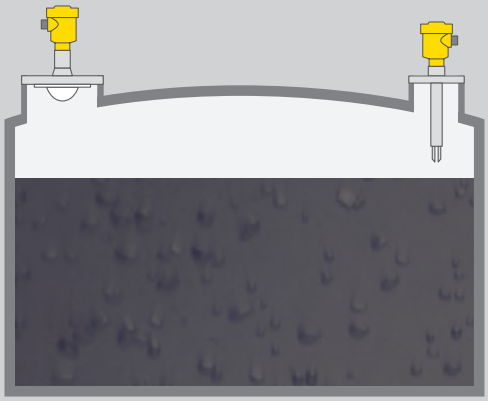
Instrument Type		Measuring Range	Process Fitting	Process Temperature	Process Pressure
MiniTrac 31 Radiometric density and point level measurement		up to 40" (1 m) of process material	Mounts external to the vessel	-40 … +140°F (-40 … +60°C)	Mounts external to the vessel

Application: Tank Farm in the Refinery

Reliable
Redundant measurement ensures a high degree of safety

Cost-effective
Self-monitoring reduces maintenance costs

Convenient
Easy installation and setup



Level Monitoring of Fixed-Roof Storage Tanks

Level measurement of bulk liquids storage tanks in a refinery is necessary for inventory management and overflow protection. An instrument that can adapt to meet existing process connections to continuously monitor the liquid level in the storage tank is necessary. Multiple measurement devices can fit into a single process connection, reducing the cost of implementation for the system.

Level Monitoring of Floating-Roof Storage Tanks

The floating-roof style of storage tanks proves to be a difficult measurement. It is imperative to have an instrument that is accessible from the platform at the top of the storage vessel and is able to track the level of the roof as it rises with the stored material.

VEGAPULS 64

Pulse radar sensor for level measurement in fixed- and floating-roof storage tanks

- Small, lightweight design makes installation easy
- Simple retrofit capability utilizes existing process connections
- Exact measuring results independent of pressure, temperature, gas, or steam

VEGASWING 63

Vibrating level switch for overfill protection in fixed-roof storage tanks

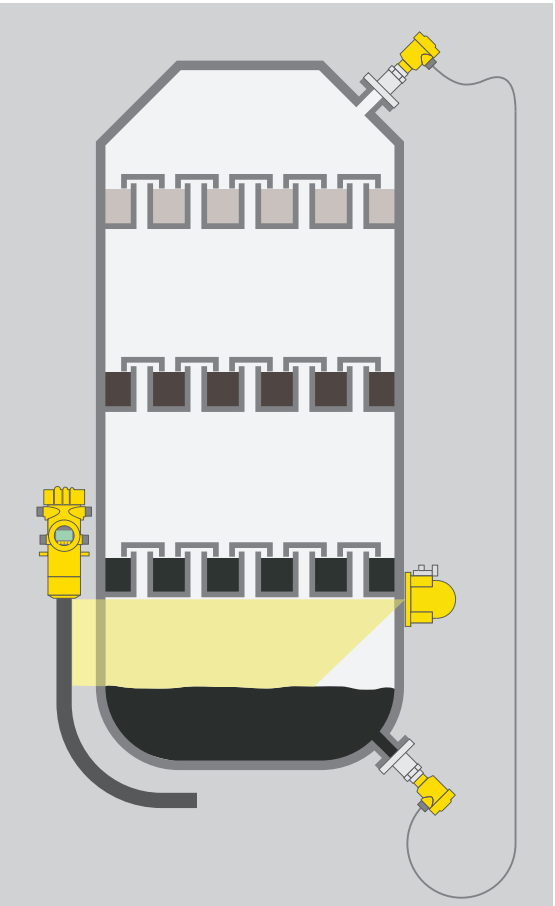
- High level switch provides redundancy
- Varying insertion lengths meet specific application requirements
- By simply pushing a button, you can meet the legal requirements of the periodic test in seconds
- Unaffected by media properties ensures reliable measurement

Application: Distillation Column

Reliable
Precise measurement results even in extreme environments

Cost-effective
Single source/detector combination

Convenient
Overfill protection increases plant safety



Measurement of Distillation Column Bottoms

The heavy, highly viscous process material and extreme temperature in the bottom range of the distillation unit can cause operational difficulties for most traditional instrumentation. Thick insulation and the contours of the column bottom create measurement and mounting challenges. For reliable level control of residual feeds in such conditions, a non-contact technology is necessary.

Column Pressure

Monitoring head space pressure at the upper end of refinery columns is important to ensure that the process is operating under ideal pressure conditions. A pressure transmitter that can operate effectively during temperature fluctuations ensures efficiency and stability of the column's process.

FiberTrac 31

Flexible radiometric detector that measures through thick insulation and easily adapts to vessel contours

- Flexible detector adapts to vessel shape, minimizing detector quantities and cost
- Detector replacement is online, eliminating process downtime for maintenance
- Lightweight design reduces mounting hardware and structural requirements
- Easy proof test verifies operation without costly process downtime
- Can be provided with integrated air fitting

VEGABAR 83

Electronic differential pressure system for monitoring head pressure in the distillation unit

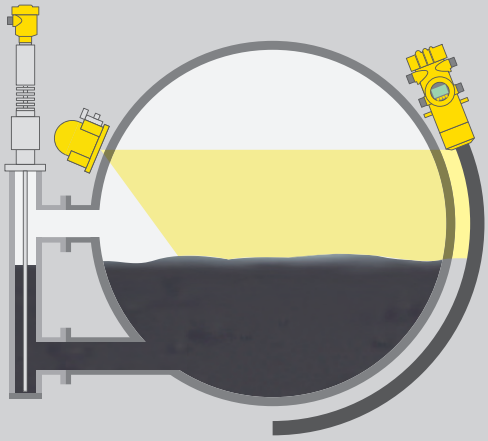
- Isolated diaphragm increases temperature resistance
- Unobtrusive sensor is unaffected by foam generation
- Tough diaphragm materials provide excellent chemical resistance

Application: Reboiler

Reliable
Safe and reliable measurement even at extreme temperatures

Cost-effective
Maintenance-free operation

Convenient
Easy installation



Level Measurement in the Reboiler

Evaporators are heat exchangers that are deployed at the bottom of distillation columns. In the evaporator, the residue is boiled up from the sump and fed back into the distillation process. Precise control of the level in the evaporator ensures efficient operation of the plant. A reliable measurement also ensures that the heating coils are always covered with liquid, to prevent any overheating incidents.

VEGAFLEX 86

Guided wave radar sensor for level measurement in the reboiler

- Reliable measurement unaffected by vapour presence and high temperatures
- Flexible mounting possibilities in the tank or in a bridle
- Robust material options are resistant to extreme process conditions

FiberTrac 31

Radiometric sensor for continuous level measurement in the reboiler

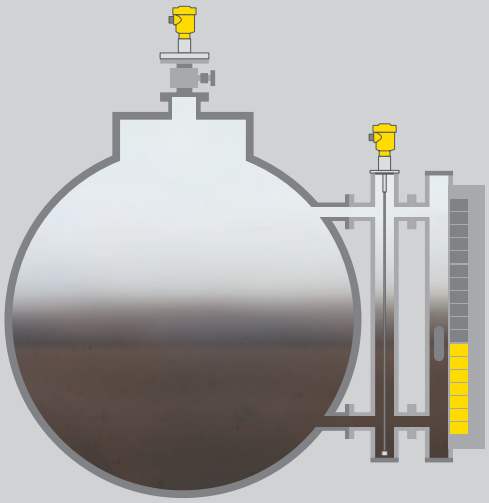
- Non-contact operation is unaffected by process temperature
- Lightweight detector eliminates need for cranes or special rigging
- Small bend radius of flexible detector mounts to vessel shape
- Cost savings, as no servicing of the measuring system is required

Application: Propane Bullet

Reliable
Redundant measurement increases plant availability and plant safety

Cost-effective
Maintenance-free operation

Convenient
Easy installation and setup



Level measurement in propane bullets

Propane, a flammable, colourless and odourless gas, is one of the many types of liquefied petroleum gases (LPG) that exist. It is produced from natural gas via a special refining process. Propane is compressed, liquefied and stored in pressure vessels so that it does not return to a gaseous state. To ensure optimal storage, reliable level measurement is required.

VEGAPULS 64

Radar sensor for level measurement with ball valve isolation

- Maintenance-free operation thanks to non-contact measuring principle
- High measuring accuracy even with low dielectric constants
- Reliable measurement independent of vapor
- Isolation valve provides the ability to remove the device without emptying the sphere and without affecting measurement reliability

VEGAFLEX 81 and VEGAMAG 82

Guided wave radar and magnetic level indicator dual measurement for reliable level measurement

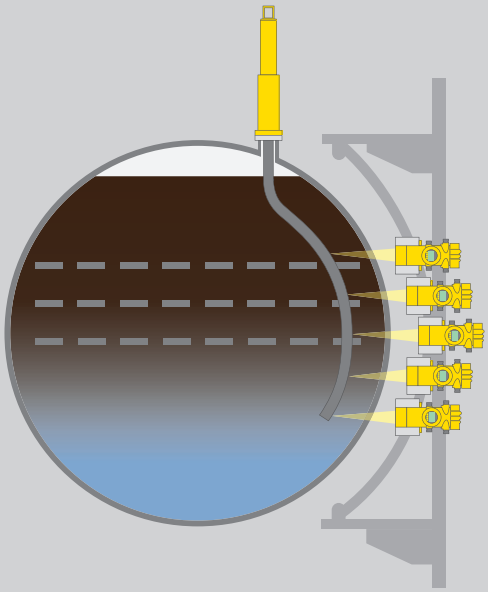
- Redundant measurement through the combination of guided radar sensor and magnetic level indicator
- Measurement is unaffected by low dielectric constant
- Equipment can be isolated from vessel for service without affecting the process

Application: Desalter

Reliable
High measuring precision, independent of process conditions

Cost-effective
Simple air and water calibration for fast commissioning time

Convenient
Mounts external to the vessel



Interface Tracking in the First Stage Desalter

Desalter efficiency is critical to any refinery process. When the crude oil mixes with the emulsifying chemicals and water, the resulting emulsion layer can make it difficult to track the interface with standard level measurement technologies. Reliable tracking of the emulsion layer and changing interfaces within the process provides a clear picture for the operators to efficiently run the desalter by eliminating electrostatic grid shortages, reducing oil under carry and preventing corrosion of downstream process equipment.

Multi-Point Density Array

Fixed density profile system for emulsion interface control

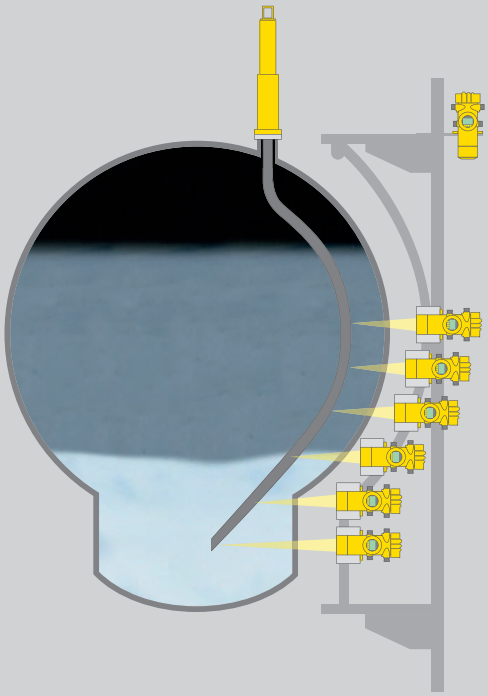
- Reliably tracks emulsion layer to keep the process stream efficient
- Adjustable measurement span accommodates changing process properties
- Remains online even when replacing a detector to eliminate downtime
- Allows operator to maintain high throughput even when switching between light to heavy feedstock
- Enables better management of chemical usage

Application: Alky Settler

Reliable
Measurement across the span of the vessel with multiple sensors

Cost-effective
Air and water calibration reduces commissioning time

Convenient
Non-invasive measurement ensures easy maintenance



Multi-Point Interface Tracking

The layers created in a separation process form interfaces that must be tracked to manage the output of the material from the unit. Reporting density on a horizontal plane enables accurate control of the process.

Multi-Point Density Array

Fixed density profile system for emulsion interface control

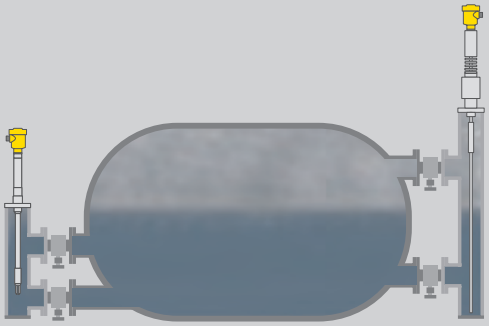
- Customizable detector system tracks multiple interfaces
- Non-contact measurement is unaffected by high process temperatures
- Online tracking increases production efficiency

Application: Steam Drum

Reliable
High measuring precision, independent of temperature and pressure

Cost-effective
Low maintenance costs

Convenient
Easy installation



Level Measurement and Point Level in the Steam Drum

High pressure steam is critical to the operation of the refinery. An accurate level measurement must be made to ensure the most efficient operation of the drum to provide reliable steam and also make certain the drum level does not fall below a minimal level which can create a very dangerous situation which could lead to major damage and possible injury to plant personnel.

VEGASWING 66

Vibrating level switch for high and low water limit

- Simple setup without product presence reduces time and cost
- Precise and reliable function through product-independent switching point
- Reliable measurement unaffected by high temperature and pressure

VEGAFLEX 86

Guided wave radar with steam compensation for a reliable drum level control

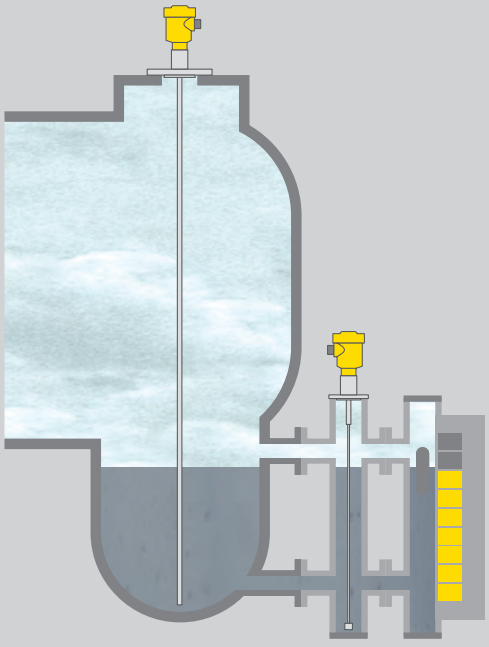
- Accurate measurement due to the automatic run-time correction, even under changing steam conditions
- Flexible mounting options easily retrofit displacer bridles or installs directly in the vessel
- Meets high safety standard up to SIL 2/3 according to IEC 61508

Application: Sour Water Stripper

Reliable
Redundant level monitoring

Cost-effective
Low maintenance costs

Convenient
Mounts to most standard tank process connections



Continuous Level Measurement

The sour water stripper or water knockout drum requires continuous, accurate level monitoring to keep sour water from entering the process vessels. Sour water is highly corrosive and over time can cause severe damage to process vessel and piping if not addressed. Any water collected in the sour water stripper is sent to sulfur removal unit to be processed.

VEGAFLEX 81

Guided wave radar sensor for continuous level measurement over the span of the knockout drum

- Continuous, online tracking maximizes operator control
- Reliable measurement ensures product quality
- Non-moving parts eliminate maintenance needs
- Dual measurement capability provides both total level and interface level

VEGAFLEX 81 and VEGAMAG 82

Guided wave radar and magnetic level indicator dual measurement for reliable interface control when air is present

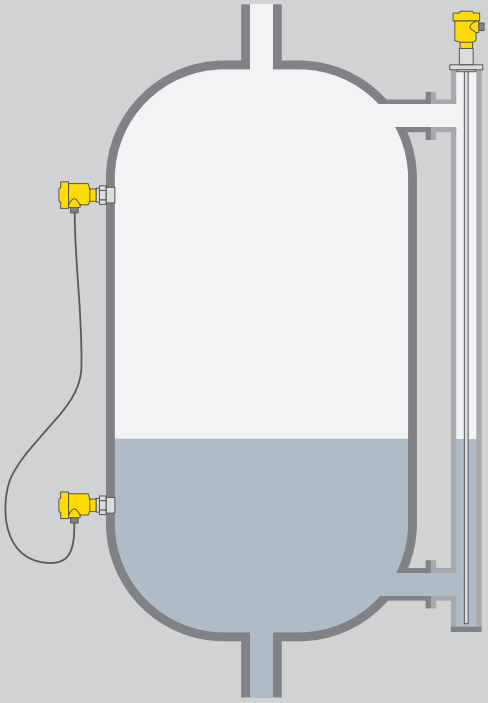
- Guided wave radar and MLI provide redundancy
- Guide wave radar is immune to the crude supply density changes offering reliable continuous level control

Application: Compressor Knockout Drum

Reliable
Differential output can provide redundant level measurement

Cost-effective
Diaphragm with high chemical resistance

Convenient
Continuous level reporting



Level Control

The vapor-liquid separation that occurs in the knockout drum protects the waste or cooling stream from process vapors and the compressor from water, which required constant level monitoring. A reliable instrument is necessary to monitor the crucial level without being influenced by the high volume of vapor created in the vessel. The reliability of an instrument ensures that there is no water carry-over to the compressor, avoiding the extremely expensive downtime that results from an upset. An alternate level measurement technology is recommended for the knockout drum in order to establish redundancy.

VEGABAR 82

Electronic differential pressure system for measurement redundancy in the drum

- No additional temperature influences because no liquid capillary connection required
- Very good reproducibility and long-term stability
- High resistance diaphragm materials
- Easy installation because no insulation for capillary needed

VEGAFLEX 81

Guided wave radar sensor for water level control in the knockout drum

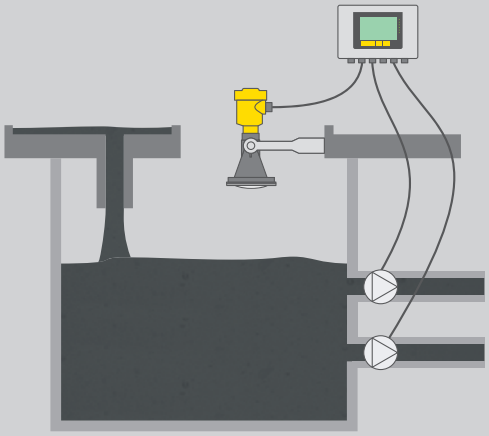
- Reliable measurement, unaffected by vapor presence
- Easy installation directly in the drum or in a bridle chamber
- Quick setup reduces installation costs
- Will not experience zero point drift or fluctuations due to specific gravity, temperature, dust, or pressure

Application: Sump

Reliable
Measurement optimizes pump usage via pump control functions

Cost-effective
Pump control ensures energy conservation and long pump service life

Convenient
Easy setup and installation



Sump Level Control

The level in the sumps around a refinery must be reliably monitored to prevent overfilling and subsequent pollution, or pump overload. Balanced pump utilization is possible thanks to a pump control rotation system integrated into the controller.

VEGAPULS 64

Non-contact radar sensor for continuous level measurement in sumps

- Very good signal focusing ensures accurate measurement, even in confined spaces
- Reliable measurement, unaffected by condensation on the antenna
- Maintenance-free operation thanks to non-contact measuring principle

VEGAMET 681

Robust controller and display instrument for level sensors

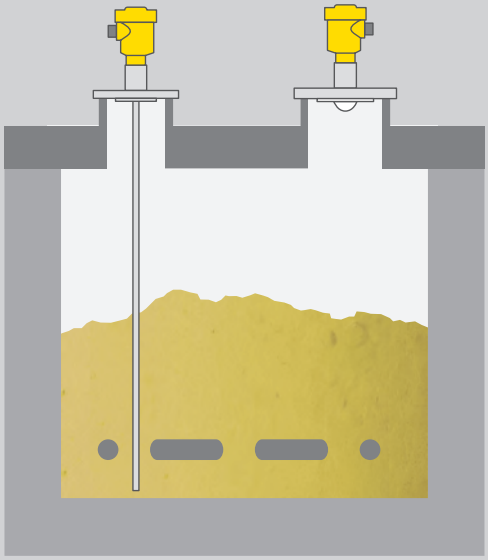
- Complex programming of control tasks is no longer necessary
- Simple and safe setup and diagnosis of measuring points via smartphone
- Easy-to-read display from a distance, even in sunlight and darkness

Application: Sulphur Pit

Reliable
Unaffected by buildup or condensate

Cost-effective
Maintenance-free operation

Convenient
Easy setup and installation



Level measurement in sulphur pits

The liquid sulphur, which comes directly from the sulphur recovery plant, is stored in underground concrete pits. High temperatures are required to maintain the sulphur in its liquid form. The harsh, corrosive process and environmental conditions in sulphur pits require dependable level measurement.

Solution 1

VEGAFLEX 81

Continuous level measurement with guided wave radar in sulphur pits

- Reliable measured values even with foam
- Non-sensitive to vapour, buildup and condensation
- No moving parts and thus no need for maintenance

Solution 2

VEGAPULS 64

Non-contact level measurement with radar in sulphur pits

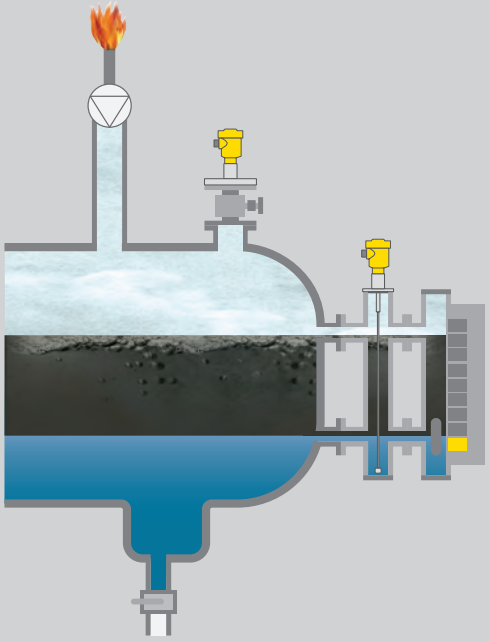
- Maintenance-free operation through non-contact measuring principle
- Wetted parts are extremely corrosion resistant
- Reliable measurement independent of vapour, buildup, and condensation
- Very good focusing allows reliable operation even in confined spaces

Application: Flare Knockout Drum

Reliable
Tracks total process level and interface level

Cost-effective
Reduced maintenance cost due to no mechanical moving parts

Convenient
Easily fit within mounting constraints



Continuous Level Measurement with Ball Valve Isolation

The flare knockout drum requires continuous, accurate level monitoring to keep liquids from reaching the flare and creating a potential fire hazard. In order to ensure safety of process by performing this critical measurement, the total process level over the span of the drum needs to be tracked and continuously reported to the operator for proper control. For measurement in the sump of the flare knockout drum, the sensor provides exact position of interface.

VEGAPULS 64

Pulse radar sensor for continuous level measurement over the span of the knockout drum

- Continuous, online tracking maximizes operator control
- Isolation valve provides the ability to remove the device without emptying
- Reliable measurement ensures product quality
- Non-moving parts eliminate maintenance needs

VEGAFLEX 81 and VEGAMAG 82

Guided wave radar sensor with bridle chamber for reliable interface measurement

- Low maintenance requirements reduce downtime and operating cost
- Flexible cable prevents plugging and results in a reliable measurement
- Bridle can be easily isolated to allow service of the VEGAFLEX without interrupting the process

plics® — Easier 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 customized, user-friendly instrument within an amazingly short time. And the best part: these instrumets are more cost-effective and advantageous in every way – and that throughout their entire life cycle.

Display and Adjustment

The display and adjustment module PLICSCOM is used for measured value indication, adjustment, and diagnosis of the sensor. Its menu structure is simple and allows for quick setup and commissioning. Status messages are displayed in plain text.

Connection

The mobile VEGACONNECT is used to connect your instrument to a PC via the USB interface. Parameterization of the instruments is carried out with the tried-and-true adjustment software PACTware and the appropriate DTM. For EDD-based adjustment we also offer graphics-driven EDDs.

Recognition of Maintenance Requirements

The integrated self-monitoring function of plics® instruments continuously reports 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.

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