

Technical Description

705020En, Ed.1, Rev C

June 2007

Rosemount TankMaster™

Tank Inventory Management Software



ROSEMOUNT®
Tank Gauging

www.rosemount-tg.com


EMERSON™
Process Management

TankMaster

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TankMaster tank inventory management – the leading tank gauging software

TankMaster is the powerful Human Machine Interface (HMI) for tank inventory management. It provides inventory and custody transfer functions, configuration, and service and set up for Rosemount's tank gauging system. All calculations are based on current API and ISO standards.

TankMaster can communicate with Microsoft® programs and OPC compatible systems like Intellution's iFIX® and Wonderware's InTouch®. By sharing data with users on all levels of the enterprise through modern network connectivity, operators and plant management are better equipped to make timely decisions.

TankMaster is developed for the Rosemount Tank Gauging system. This ensures a reliable leading edge system with full technical and global support.

Applications

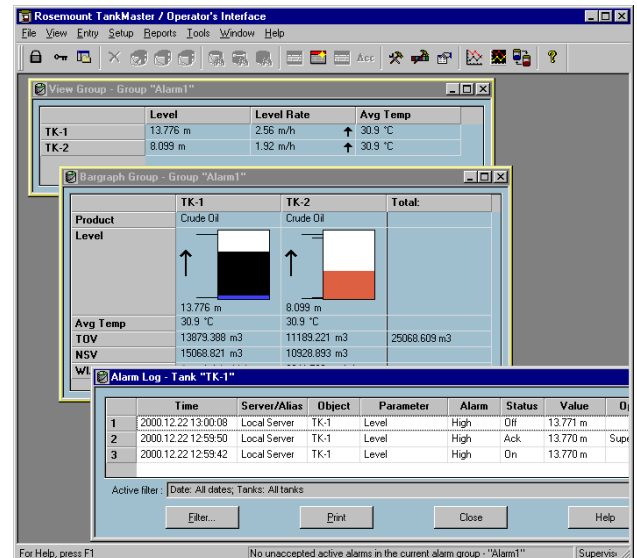
TankMaster is a versatile software package suitable for all tank inventory management needs at:

- Refineries
- Independent tank terminals
- Marketing terminals
- Pipeline terminals
- Petrochemical industry
- Liquefied gas terminals
- Aviation fuel depots

TankMaster collects inventory management data from entire storage tank site. Data from all major vendors is presented in a familiar and easily accessible Windows environment. As a part of the TankRadar Rex system TankMaster measures the entire storage tank site.

Features

- Real time tank gauging data.
- Real time inventory calculations based on API and ISO standards.
- Hybrid tank gauging.
- API calculator.
- Full network capabilities.
- User-friendly navigation.
- Interactive configuration and installation.
- Batch report for internal and external transfers.
- Historical data sampling.
- Automatic reports.
- Reliable alarm handling.
- Internet access of tank data.
- Customized views.
- Integration with other tank gauging systems
- Worldwide service and support.



TankMaster

Functions overview

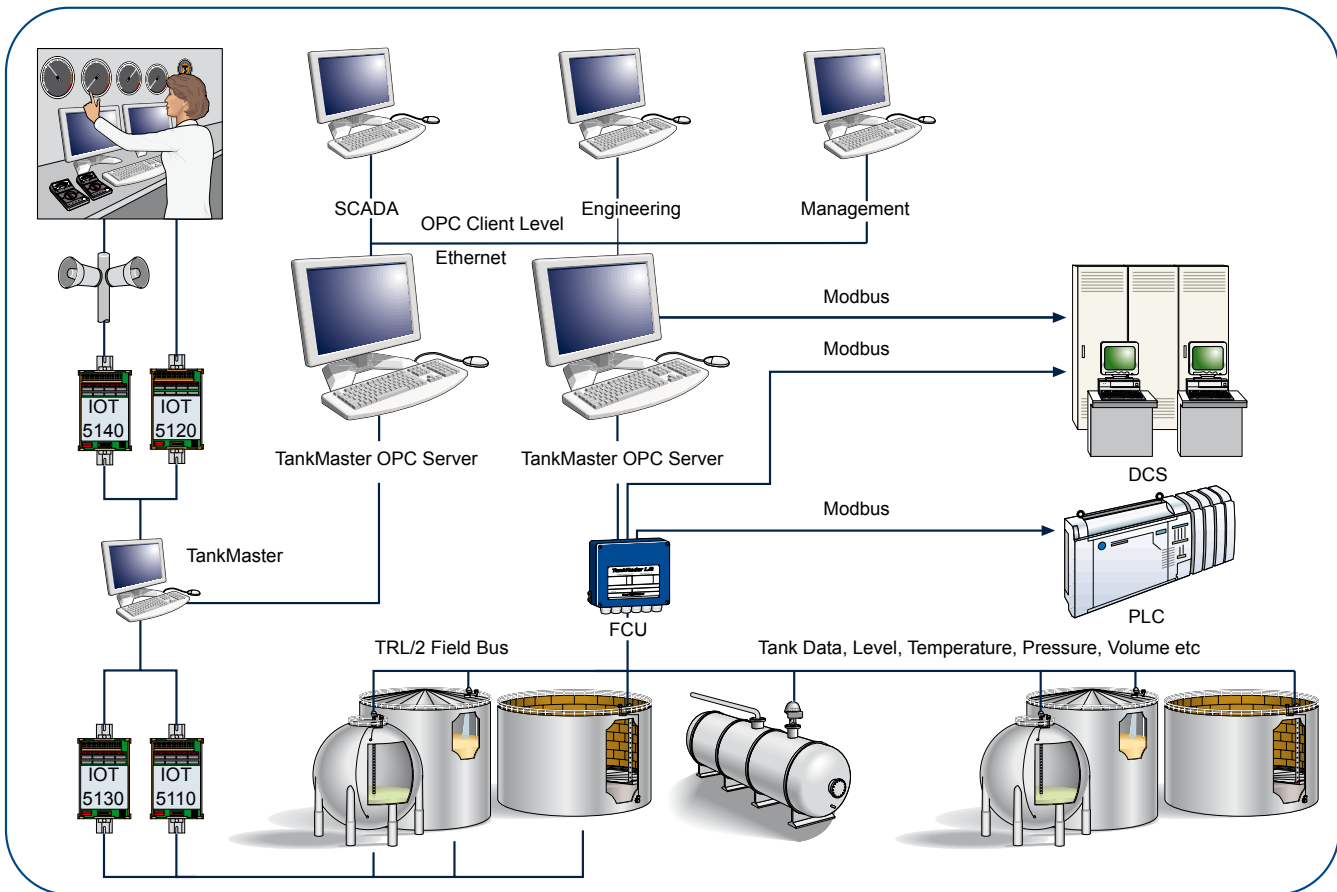
The TankMaster tank inventory management system provides tools for:

- Tank inventory
- Configuration
- Service
- Set up

These reliable and easy-to-use tools make it easy for operators to have full control and overview of the current tank farm status, and for engineers to configure and service tanks. Using these first-rate tools, the user has access to:

- Real time tank gauging data.
- Real time inventory calculations based on API and ISO.
- Hybrid tank gauging.

- Batch reports for internal and external transfers.
- Historical data sampling.
- Automatic reports.
- Reliable alarm handling.
- User manager.
- Customized views.
- Custody transfer batch handling.
- Open system which can utilize other vendor's products.
- Internet and WAP capabilities through TankMaster.net.
- Alarm panels, horns, valve monitoring, etc. using TankMaster I/O terminals (IOT).

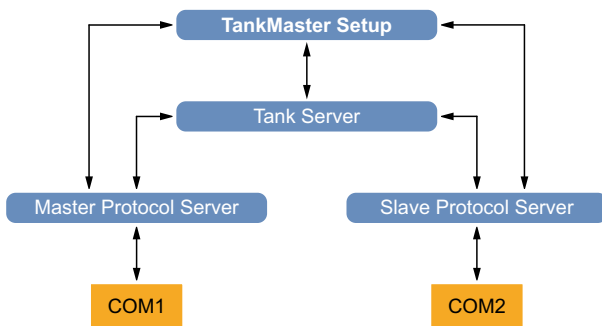


TankMaster system overview.

TankMaster Software Package

There are five major software modules in the TankMaster software package:

- WinOpi
- WinSetup
- Tank Server
- Master Protocol Servers
- Slave Protocol Server



WinOpi is the operator's interface to the Rosemount Tank Gauging system. It communicates with the Tank Server and the different protocol servers to let the user monitor measured tank data. Through communication with the TankServer, the user-friendly WinOpi program also provides alarm handling, batch reports, automatic report handling, historical data sampling as well as inventory calculations like volume, observed density, and other parameters.

The easy to use WinSetup program is a graphical user interface for installation, configuration, and service of tank gauging devices.

The Tank Server communicates with devices via the Master protocol server and handles configuration data for all the installed tanks and devices. Tank and device names, configuration data like antenna type, number of connected temperature sensors and analog inputs and many other parameters are stored by the Tank Server. The Tank Server collects measured data from connected devices and

provides these data to the WinOpi/WinSetup user interface.

The Master Protocol Server transfers configuration data and measured data between the Tank Server and connected devices in a Rosemount Tank Gauging system. The Master Protocol Server is able to communicate with various types of devices such as Radar Tank Gauges (RTGs), Field Communication Units (FCUs) and Data Acquisition Units (DAUs) to collect measured data like for example level, temperature and pressure.

The Slave Protocol Server connects the TankMaster system to a host computer (DCS system). The Slave Protocol Server exchanges tank data between the Tank Server and the host computer.

Installing a Tank Level Gauging System

Setting up a Tank Level Gauging system is based on two main activities:

- Tank installation.
- Device installation.

Tank installation

Tank installation includes specifying tank type, specifying which transmitter to associate to the tank and which source signals to use as input for various tank parameters.

Device installation

Device installation includes tasks like configuration of field bus communication, specifying tank height and other geometrical parameters, specifying type of antenna to be used, configuration of temperature sensors, relays, pressure sensors and other external devices.

Wizards

In order to facilitate the installation process, TankMaster WinSetup guides you through the installation procedure by using so called "wizards". When you have started a wizard, WinSetup automatically walks through a step-by-step procedure which lets you focus on the important issues rather than trying to remember what to do next. The Online Help provides information for each step in case you need further assistance.

TankMaster

TankMaster calculations

TankMaster is a software product used at refineries, independent tank terminals, marketing terminals, pipeline terminals, liquefied gas terminals, and aviation fuel depots for tank gauging monitoring and inventory calculation.

The inventory calculations are mainly based on volumes. The main calculation is to find a volume correction factor (VCF). The VCF is then used to calculate a volume based on a reference temperature.

The inventory calculation can be divided into four parts.

1. Calculation of observed volumes.
2. Calculation of observed density
3. Calculation of reference density and Volume Correction Factor according to the selected volume correction table
4. Net volumes with help of VCF.

Total Observed Volume (TOV) is calculated from strapping tables. It is the total volume at the observed temperature of the product.

Gross Observed Volume (GOV) is obtained by subtracting the Free Water Volume (FWV) from the TOV. The FWV is calculated from the Free Water Level entered by the operator or measured automatically by using a water interface sensor.

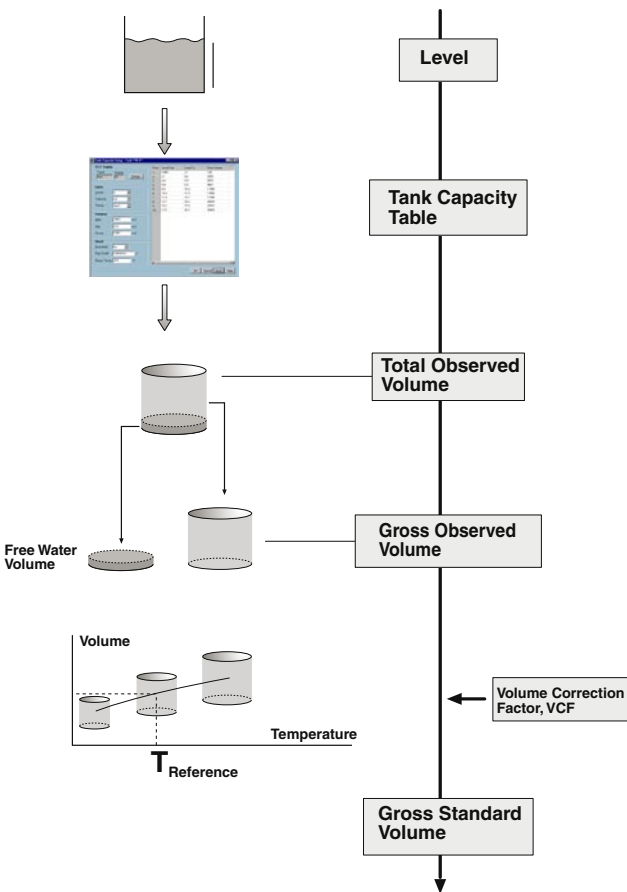
Gross Standard Volume (GSV) is the GOV corrected to the reference temperature 15 °C (60 °F). The correction is made using the Volume Correction Factor according to API Standard 2540.

Net Standard Volume (NSV) is calculated as the Gross Standard Volume minus the dissolved sediment and water. For liquid gas tanks the liquid equivalent volume of the gas above the product surface is added. The WinOpi also includes a Leak Alarm based on changes of the NSV.

If a pressure transducer is installed in the tank and properly connected and configured, the density of the product can be calculated. This value is presented as the Observed Density.

The Reference Density is the density of the product at the standard reference temperature 15°C (60°F). It can either be manually entered, or automatically calculated from the Average Temperature and the Observed Density if it is available. The Reference Density is calculated using a VCF according to API Tables 5A, 5B, 53A, or 53B. The Observed Density can also be calculated based on the manually entered Reference Density.

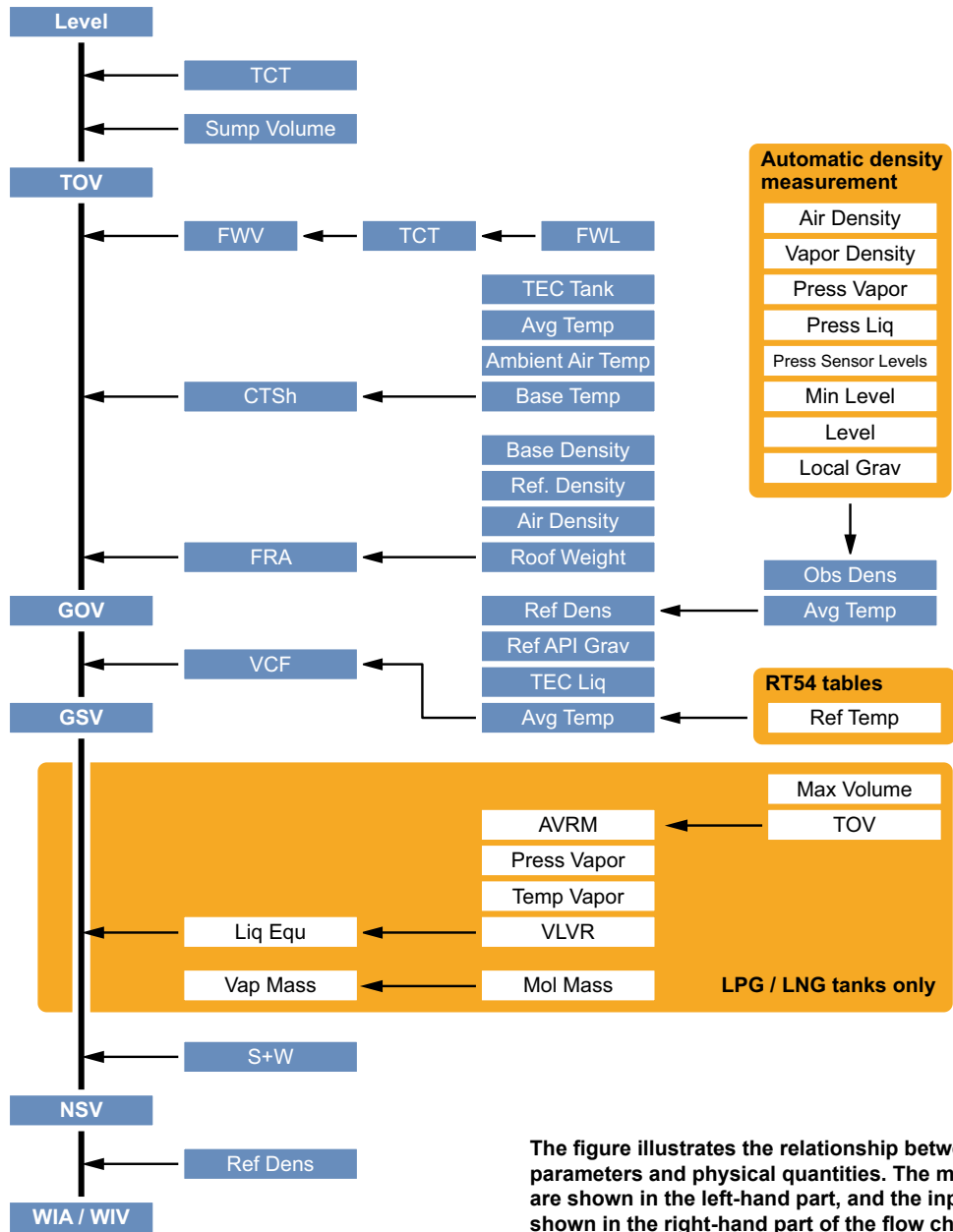
Weight calculations are performed using the calculated volumes and either the manually entered density or the observed density. The Weight In Air (WIA) is calculated as the Net Standard Volume multiplied by the Weight Conversion Factor.



TankMaster calculates inventory parameters based on input data available for the current tank. The figure shows an example of how TankMaster converts measured product level to a standardized volume.

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The figure illustrates the relationship between tank parameters and physical quantities. The main parameters are shown in the left-hand part, and the input parameters are shown in the right-hand part of the flow chart.

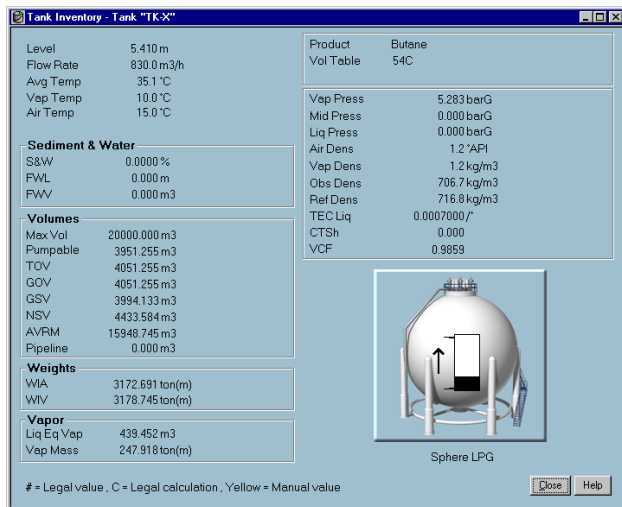
TOV	Total Observed Volume	CTSh	Correction for tank shell temperature
GOV	Gross Observed Volume	TEC	Tank shell Expansion Coefficient
GSV	Gross Standard Volume	FRA	Floating Roof Adjustment
NSV	Net Standard Volume	VCF	Volume Correction Factor
WIA / WIV	Weight In Air / Weight In Vacuum	S+W	Sediment and Water
TCT	Tank Capacity Table	AVRM	Available Room
FWL / FWV	Free Water Level / Free Water Volume	VLVR	Vapor Liquid Volume Ratio

TankMaster

Tank inventory

Tank gauging data

Collecting all tank gauging data such as level, temperature, water interface and pressure from radar gauges in the Rex TankRadar system, TankMaster automatically calculates volume and mass for inventory and custody transfer tanks. This will maximize the plant effectiveness, increase productivity and reduce costs. The operator will be able to respond faster to changing tank farm conditions.



TankMaster quickly and accurately calculates inventory data, allowing full control over the tank farm. Real time inventory calculations include gross and net volumes as well as mass calculations, according to current API tables (6, 54, 24, A-D), ISO and other major standards. Tank capacity tables (5000 strapping points) for cylindrical and spherical tanks are also supported. Liquid and mass calculations of vapor in LPG are made according to ISO 4267. TankMaster also allows the Net Standard Volume to be calculated at a user specified reference temperature.

Secondary units

Measured and calculated inventory tank parameters are displayed in the engineering units specified by the user.

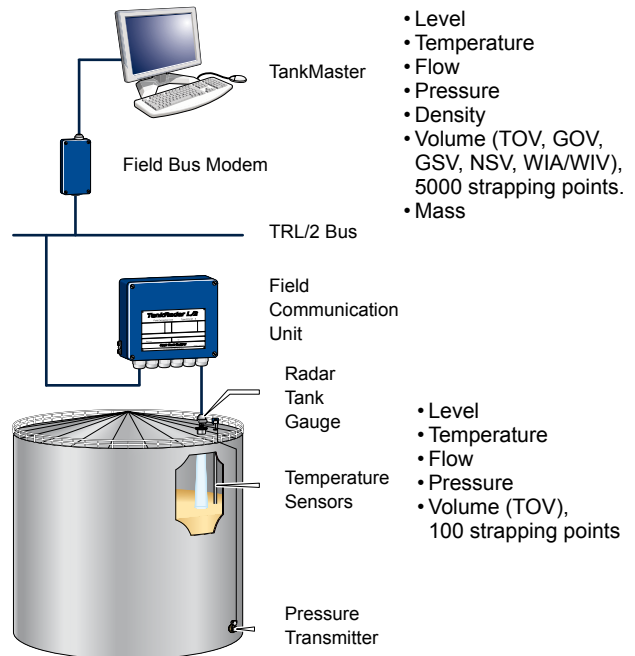
TankMaster also displays measured and calculated values in secondary units. For example, the results can be shown in both bbl and °F and m³ and °C at the same time.

Hybrid tank gauging

With a high accuracy hybrid tank gauging system the need for manual density sampling is eliminated. With tank gauging data such as level, pressure and temperature you get automatic density measurements and mass calculations from the TankMaster system. The density measurements are made in real time just like the level measurement.

Density measurement with pressure transmitters

When the RTG is connected with a pressure transmitter near the bottom of the tank, the density of the product can be calculated and presented on-line. The accuracy of the density calculation largely depends on the accuracy of the pressure transmitter. TankRadar Rex can interface to any pressure transmitter with a standard output of 4-20 mA or HART. The 4-20 mA signal is converted from analog to digital form in the RTG.



By complementing the level measurement with temperature and pressure measurement, the density of the product in the tank can be continuously calculated and provided on-line.

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The gauge calculates (or receives inputs for) the following data:

- Gross Observed Volume using the tank strapping table (100 strapping points).
- Mass (if pressure sensor connected)
- Observed density (if pressure sensor connected)
- Level (corrected for thermal tank wall expansion)
- Temperature
- Oil/Water interface level.

Data is calculated according to updated API and ISO standards. Temperature calculations include API algorithms to handle elements close to the bottom. The level value is software corrected for changes in tank reference height.

Data is presented using units from a wide selection. Both metric and USA/UK units are supported. Secondary units are available which facilitate presentation of data in two units simultaneously.

If very high accuracy net volume calculations (up to 5000 strapping points) are required, the TankMaster PC software package is used. Normally less than 100 points per tank are necessary for 1 liter accuracy. TankMaster is using quadratic interpolation for spheres and horizontal cylinders, which increases volume accuracy and reduces number of strapping points.

TankMaster

Hydrostatic tank gauging

The TankMaster Hydrostatic Tank Gauging (HTG) system is an intelligent direct mass measuring system which uses product hydrostatic pressure measurement to derive both the specific gravity and liquid level.

The TankMaster HTG system measures and calculates tank data for:

- Inventory calculations
- Mass Custody transfer
- Product movement

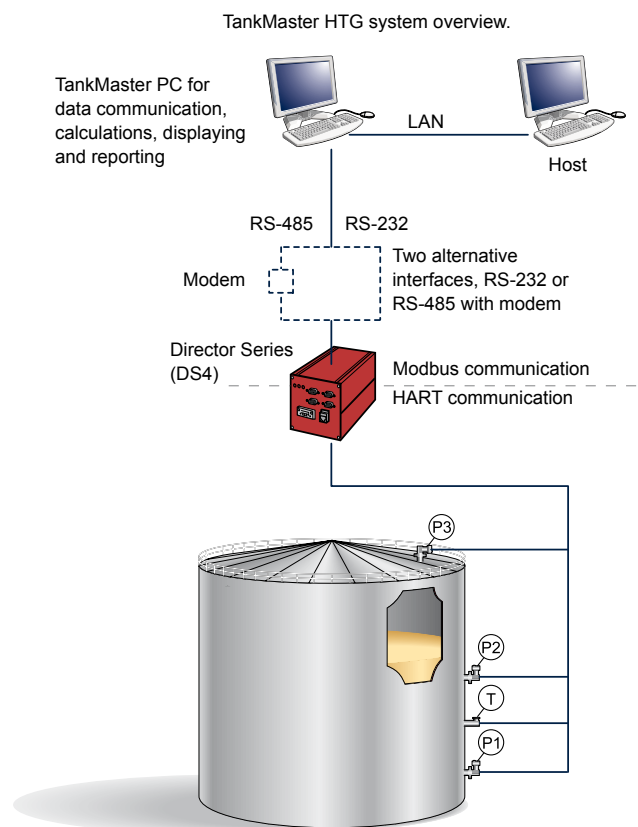
The HTG system is primarily calculating the mass of the product. These parameters are shown in the Tank Inventory windows:

- Level
- Flow rate
- Gross observed volume
- Net observed volume
- Gross standard volume
- Net standard volume
- Weight
- Mass
- Density

The pressure and temperature values from the tanks are communicated to the PC via the DS4 (a multiplexer which also converts HART to Modbus). One DS4 can collect data from 60 HART transmitters, so by using just one or many DS4s the HTG system can easily be adapted to small sites with just a few tanks as well as large sites with several hundred tanks.

A whole range of plant host computer systems, DCS or SCADA systems can be connected to the TankMaster HTG system for display of measured and calculated values. Protocols for communication with major suppliers of plant host computers have been developed and certified.

See TankMaster HTG Technical Description for more information.



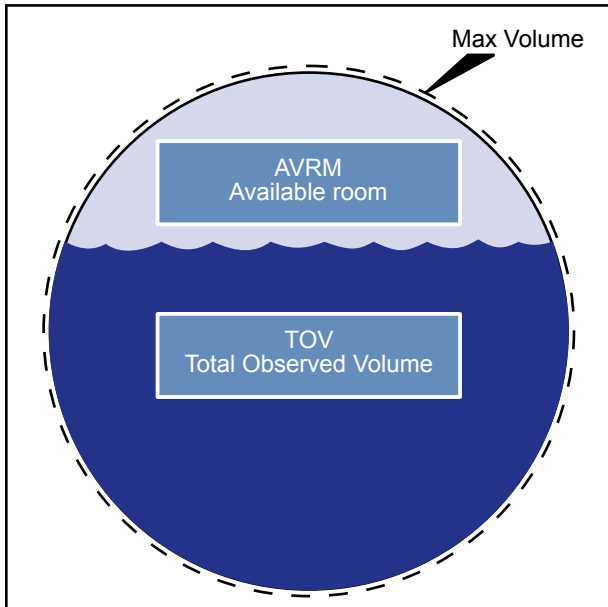
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LPG

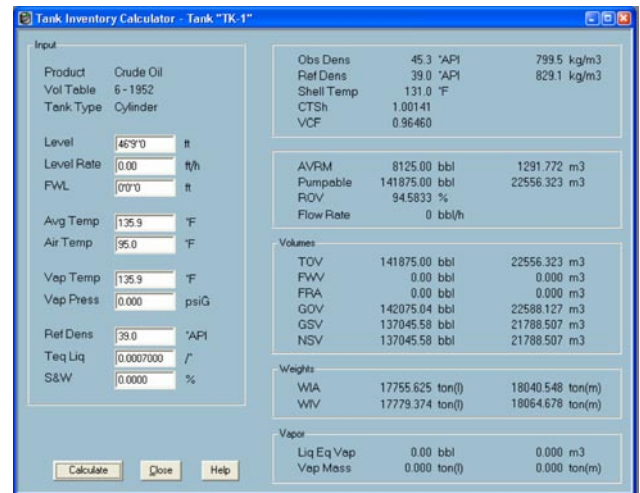
For tanks containing liquid gas a number of parameters are relevant. The mass of gas in the Available Room is calculated and the corresponding liquid equivalent volume is presented as Liq Equ in the Tank Inventory window in TankMaster. The Molecular Mass and the Vapour-Liquid-Volume Ratios are entered into the TankMaster product table.



Tank Inventory Calculator

You can easily keep your reference density updated with TankMaster's API calculator. By manually calculating your reference density by keying in temperature, observed density, and an appropriate API table, you get new accurate data. This is an easy alternative if you don't have an automatic hybrid tank gauging system.

This is a calculator function that calculates inventory values based on operator entered input values and the selected tank configuration. Input value fields are initiated with the current tank configuration and input values from devices. The operator can then change some or all input values and press the "Calculate" button to calculate inventory values.



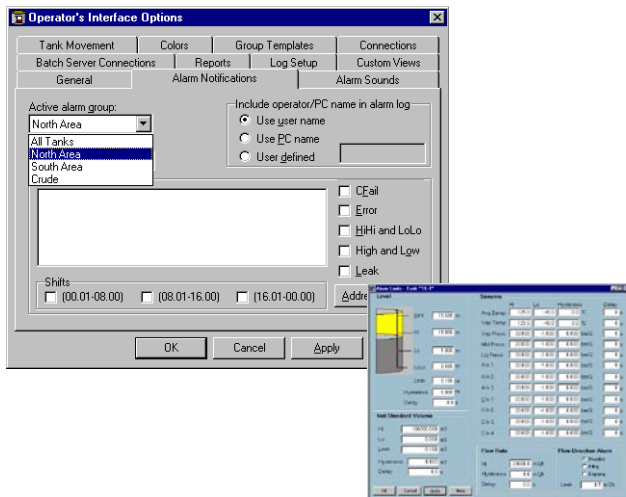
TankMaster

Inventory management

Alarm handling

TankMaster features alarm summary, alarm log and alarm event log for safe and reliable alarm handling. When an alarm occurs, a bell rings and the alarm icon starts to blink. The operator can set different sounds for each alarm type. Alarms are customized at any station in the network and a client signature is saved at every acknowledgement. It is possible to view all alarms in the system or divide the alarms per group or per tank.

TankMaster supervises various types of alarms. The operator can set alarm levels as well as hysteresis and delay times for Level, Average temperature, Vapor temperature, analog input signals, flow rate, flow direction, and others.



The status of the alarms can be either HiHi, High, Low, LoLo, Error, Leak Hi, Leak Lo, CFail (communication failure), or Normal. The HiHi, High, Low and LoLo alarms, the Alarm Delay Times, the Alarm Hysteresis and the Leak Alarms are set by the operator in the Alarm Limits window.

The values that the TankMaster receives from the different field devices are continuously checked against the alarm limits. If a value has passed an alarm limit, the corresponding alarm will be activated and, if so desired, delayed by a time given by the Delay Time setting.

The alarm status is shown with a flashing bright red color in for example, the Alarm Summary window, until the operator has accepted the alarm. When an alarm is accepted, the status is shown in a steady

dark red color. The alarm colors can be changed. Even if the conditions have returned to normal, the alarm status is not reset until the operator has accepted the alarm.

Batch handling

The batch report gives you full transfer supervision, when making internal and external transfers in inventory and custody transfer tanks. When e.g. a ship calls at your plant a batch report can be started which presents information about when the transfer was started, elapsed time, remaining time and estimated stop. An alarm is activated 5 minutes before, as well as after the transfer is ready. When the transfer is ready, the batch report can be printed for record keeping.

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Customized views

In TankMaster it is easy to create general and specific tank views and setup windows. TankMaster offers a number of options for customized views; it is possible to either modify the existing windows, or build completely new ones. For example, a photo of the plant gives a quick realistic view and just by clicking a specific tank, the corresponding tank data will be presented. Another example is to design a window that shows only the currently most interesting tank parameters.



Reports

TankMaster automatically generates standard reports for each shift, every twenty-four hours or at other intervals specified by the operator. Two types of standard reports can be generated, Log Reports or Mass Balance Reports, which are arranged by tanks or groups. You can adjust the parameters in the reports. All activities have a time stamp for reliable follow up.

Two standard report types are available; Log Report and Mass Balance Report.

The Log Report shows:

- product,
- level,
- average temperature,
- Net Standard Volume (NSV),
- density, and
- level status.

LogReport						
Date: 2006-02-22 10:08:30						
Tanks: All Tanks				ReportNr: 1		
Tank	Product	Level	Avg Temp	NSV	Ref Density	Status
TK-1	Crude Oil	18.809 m	22.0 °C	46626.245 m ³	1000.0 kg/m ³	HiHi
TK-2	Fuel Oil	18.103 m	22.1 °C	14332.319 m ³	1000.0 kg/m ³	
TK-3	Jet Oil	15.541 m	22.1 °C	7459.873 m ³	1000.0 kg/m ³	

The Mass Balance Report shows:

- product,
- level,
- average temperature,
- Total Observed Volume (TOV),
- Net Standard Volume (NSV),
- Weight In Air (WIA),
- density,
- level status, and
- difference in Net Standard Volume since last report.

MassBalanceReport									
Date: 2006-02-21 13:01:04									
Tanks: All Tanks								ReportNr: 1	
Name	Prod Desc	Level	AvgTemp	TOV	NSV	DenRef	WIA	LevStat	NSV Diff
TK-1	Crude Oil	18.809 m	22.0 °C	46826.667 m ³	46626.245 m ³	1000.0 kg/m ³	46574.956 ton(m)	HiHi	46626.245 m ³
TK-2	Fuel Oil	18.103 m	22.1 °C	14419.769 m ³	14332.319 m ³	1000.0 kg/m ³	14001.231 ton(m)		14332.319 m ³
TK-3	Jet Oil	15.541 m	22.1 °C	7502.310 m ³	7459.873 m ³	1000.0 kg/m ³	7429.879 ton(m)		7459.873 m ³

TankMaster

Open system solution

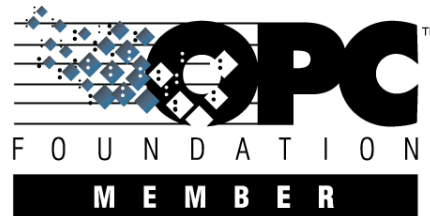
TankMaster as a part of the Rex system facilitates an Open system solution. For the end-user, this will open up several interesting features:

- TankMaster and FCU 2160/2165/2175 is an open system which can take in other vendors products
- TankMaster and FCU 2160/2165/2175 is modular and can cost effectively be fitted to the complete range of small to large systems.
- From TankMaster, alarms can be sent to a printer, SMS, or email.
- The TM IOTs provides easy, low cost solutions for alarm panels, horns, valve monitoring, indications, etc.
- Internet and WAP capabilities through TankMaster.net
- Fully OPC compliant.

OPC

OPC (OLE for Process Control) is used to bring open connectivity to industrial automation and is defined by a set of standard interfaces based on Microsoft's OLE/COM technology. Interoperability is assured through the creation and maintenance of open standards specifications. Based on fundamental standards and technology of the general computing market, the OPC Foundation adapts and creates specifications that fill industry-specific needs.

TankMaster uses OPC Data Access 2.0, an open industry standard, which eliminates the need for costly customized software integration. With the OPC server and the browser it is easy to import all custody transfer and inventory data to other OPC clients such as different DCS:s, PLC:s, Scada systems, or Microsoft Office® programs. This way, operators and plant management are better armed to make timely decisions as they work with distributed inventory and tank gauging data. For more information on the OPC Foundation, please visit the website www.opcfoundation.org.



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Connection to other systems

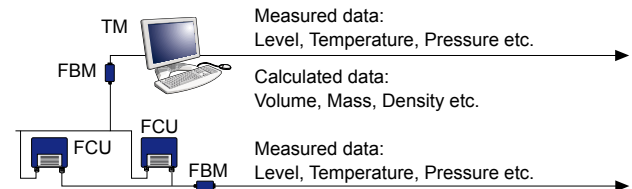
The TankRadar Rex system can be connected to all major suppliers of DCS, SCADA systems, plant host computers or terminal automation systems. The connection can be made in two ways:

- To a TankMaster PC workstation.
- Directly to a Field Communication Unit.

The advantage of connecting to a TankMaster workstation is that not only the measured values, but also the values calculated by the TankMaster can be communicated.

Examples of available protocols are given below. Certified test reports are available for most of the protocols.

If you require a protocol which is not included in the list, contact Emerson Process Management / Rosemount Tank Gauging as new protocols are developed on a regular basis.



The host computer can be connected either to a TankMaster (TM) PC or directly to the FCU.

Examples of Vendors and Interfaces

Vendor	Interface	Vendor	Interface
ABB®	Modbus, OPC	E+H®	Modbus, OPC
AEG Viewstar®	Modbus	Emerson Dantas	Modbus
Allen-Bradley®	Data Highway Plus, Modbus	ENRAF®	Enraf
Asea Master System	Modbus	Fisher®	Modbus
Bailey®	Modbus	Foxboro®	Modbus,
CSI®	Modbus	Honeywell®	Modbus, OPC
Delta V®	Modbus, OPC	Intellution FIX	Modbus, OPC
		Rosemount®	Modbus

Communication Protocols

Analog & Digital I/O	
Enraf®	GPP, GPU, 45C
FOUNDATION™ fieldbus (FF)	
GPE®	GPE
HART®	HART
L&J®	TankWay
Motherwell®	2800, 4000
Profibus®	DP
Sakura®	MDP
Texas Instruments®	Tiway
Varec®	1800, 1900
Whessoe®	WM 500, WM 550
4-20 mA	

TankMaster

Emulation

The Rosemount TankRadar system is compatible with all major tank gauging systems. It provides field and control room solutions.

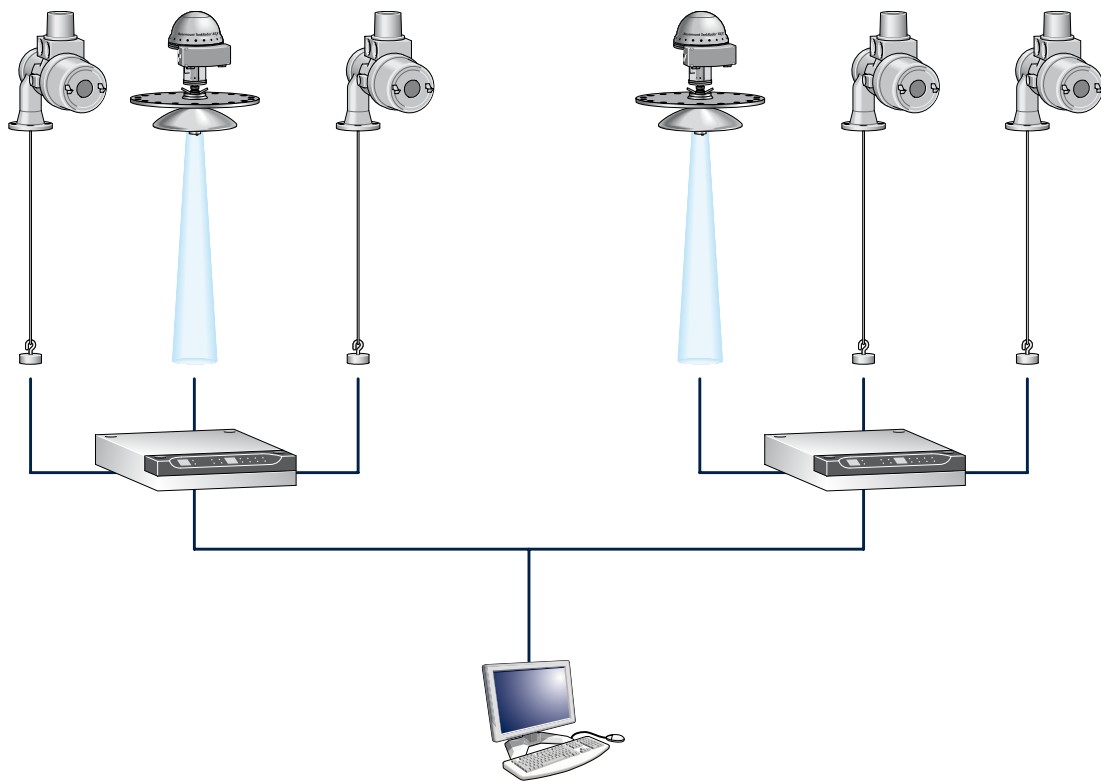
The Rex gauge is designed with an open interface, covering everything from electrical interface and communication protocol to utilization of many different power sources.

This feature makes it possible to replace old mechanical or servo gauges with modern Rex gauges, without having to replace the control system or field cabling. Simply plug-and-play.

With the FCU 2165/2175, emulation of different host systems and other control room devices is possible. Also see separate section "Field Communication Unit FCU 2165/2175"

This flexibility makes step-by-step upgrade of your tank gauging system a reality.

See section "Radar Tank Gauges" (Technical Data for the Transmitter Head) for information on communication protocols.



With the TankRadar Rex system you are no longer stuck with your old system. By replacing old servo gauges, re-calibration and expenses for spare parts and maintenance can be avoided.

Supported devices

The WinSetup program supports installation and configuration of the following device types:

- RTG 3900 Rex
- RTG Pro
- RTG 2900
- Field Communication Unit 2160
- Field Communication Unit 2165
- Independent Data Acquisition Unit (IDAU)
- Slave Data Acquisition Unit (SDAU)
- IOT 5110
- IOT 5120
- IOT 5130
- IOT 5140
- TRL PU
- ILS 2000
- Enraf® CIU
- Endress & Hauser® MDP2
- L&J® MCG 3221
- DS4
- Generic ModbusMaster Device (small size)
- Generic ModbusMaster Device (large size)
- Generic OPC Server Device (small size)
- Generic OPC Server Device (large size)

TankMaster

TankMaster I/O terminals

The I/O Terminals can be used for communication between TankMaster and field equipment, for a more versatile system. The four versions are:

- IOT 5110 for Analog Inputs
- IOT 5120 for Analog Outputs
- IOT 5130 for Digital Inputs
- IOT 5140 for Digital Outputs

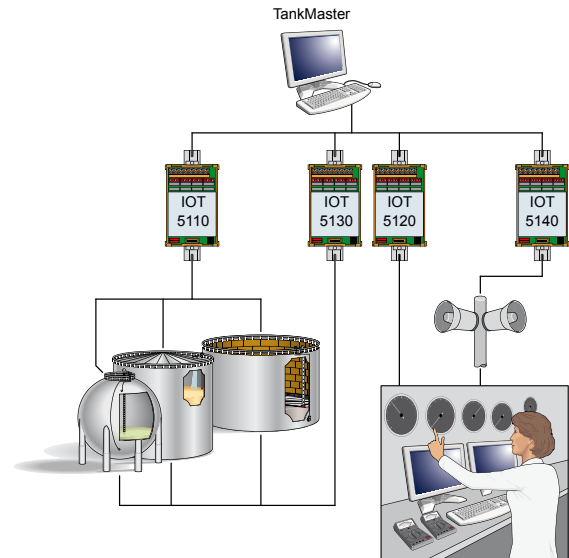
The analog inputs open up TankMaster for all 4-20 mA devices, such as pressure and temperature sensors.

The analog outputs enable mapping of values to analog indicators.

The digital inputs can for example be used to display alarms from external equipment in TankMaster.

The digital outputs can be used for alarm panels, horns, signal lamps etc.

The I/O terminals are complements to the TankMaster system, and are not designed to be used as stand-alone devices for critical operations.



Technical Data for TankMaster IOT 5110-5140

Communication type:	RS485
Communication speed:	115 kb/s
Isolation:	Opto-coupled (in I/O box)
Module size:	160x100x80 mm (6.3x3.9x3.2 in.)
Mounting method:	DIN rail 35 mm (1.4 in.) clip
Supply voltage:	24 VDC
Approved environment:	0 °C to + 55 °C (0 °F to +130 °F)

IOT 5110 Analog In; 4-20 mA, 0-10 V

Channels:	16 single ended
Input load:	50 Ω (current), 10 k Ω (voltage)
Accuracy (current and voltage):	Max ± 0.5 % of full range
Temperature drift (current and voltage):	Accuracy valid for 0 °C to + 55 °C (0 °F to +130 °F)

IOT 5120 Analog Out; 4-20 mA, 0-10 V

Channels:	16 single ended
Load impedance:	50 Ω / max 500 Ω
Load current:	< 5 mA for 0-10 VDC
Accuracy (current):	Max ± 0.5 % of full range
Accuracy (voltage):	Max ± 0.2 % of full range
Temperature drift (current and voltage):	Accuracy valid for 0 °C to + 55 °C (0 °F to +130 °F)

IOT 5130 Digital In

Channels:	16 negative common
Voltage range input:	0 to +35 VDC
Source type:	Potential free contact
Input current:	Max 0.6 mA

IOT 5140 Digital Out

Channels:	8 pot free SPDT
Capacity:	Max 250 VAC, 2A

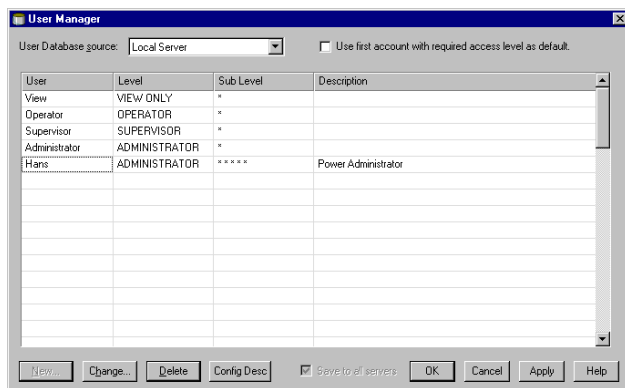
Network

The networking function makes it possible to work with TankMaster from any PC in the network. Updated real-time data are available on all TankMaster client PC:s improving the corporate communication. The operator can install tanks, handle tank gauging and inventory data and accept alarms everywhere, by simply consulting a PC nearby. Authority for alarm handling can be distributed in the network. If you have many control rooms you can decide who will be responsible for which tanks in the tank farm, giving high safety.

Security

User manager

TankMaster provides several protection levels allowing you to prevent unauthorized changes. These protection levels are categorized as User Access Levels and User Sub Access Levels. The User Access Levels are Administrator, Supervisor, Operator, and View Only where each have five User Sub Access Levels. This gives a total of 20 unique access levels.



The users can log on and log off from TankMaster without restarting the program. In the alarm log you can e.g. track who acknowledged a certain alarm. When the shift is over the operator logs out and the new operator takes over and logs in.

In order to change tank and device configuration, to install new tanks and devices, to calibrate a transmitter, to change holding register values etc. you have to be logged on to TankMaster. To perform any such action you have to be logged on at the required access level for that action.

Backup

The backup function can be used to save configuration data for devices and tanks as well as workspace settings for TankMaster.

This function lets you preserve all settings in TankMaster in an easy accessible format which facilitates a full system restore. Using the backup functionality, the following data can be stored:

- tank and device configurations
- any previously created Historical Data
- workspace configuration such as tank groups, colors, network settings etc.
- TankMaster entries in the MS Windows registry.

TankMaster

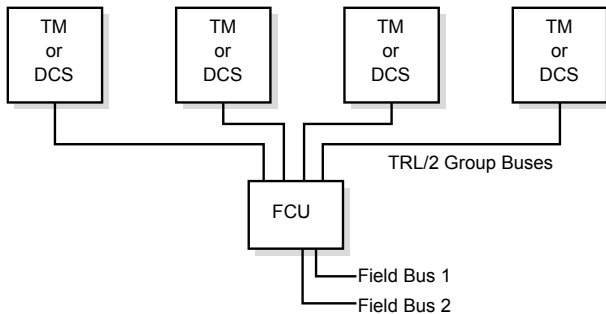
Redundancy

In order to reduce the risk of communication failure between the TankMaster/DCS system and the units connected to the TRL/2 field bus, redundancy can be made in several ways.

Several Group Buses

An FCU can connect up to four group buses with different masters, like TankMaster PC:s and DCS units, asking the FCU for data.

A system can for example have two TankMaster PC:s connected via two different group buses.



There can be up to four connections to TankMaster (TM) or DCS units on the group bus ports of the FCU.

Redundant FCU:s

Using two FCU:s provides redundancy on both FCU and host computer level. With two FCU:s connected in parallel to the field buses, one of the FCU:s will be configured as the primary FCU and will be in an active state. The other FCU will be in a back-up state. The backup FCU listens to the communication on the field bus. If the communication on the field bus ceases for a certain delay time, the backup FCU will take over and communication will be resumed.

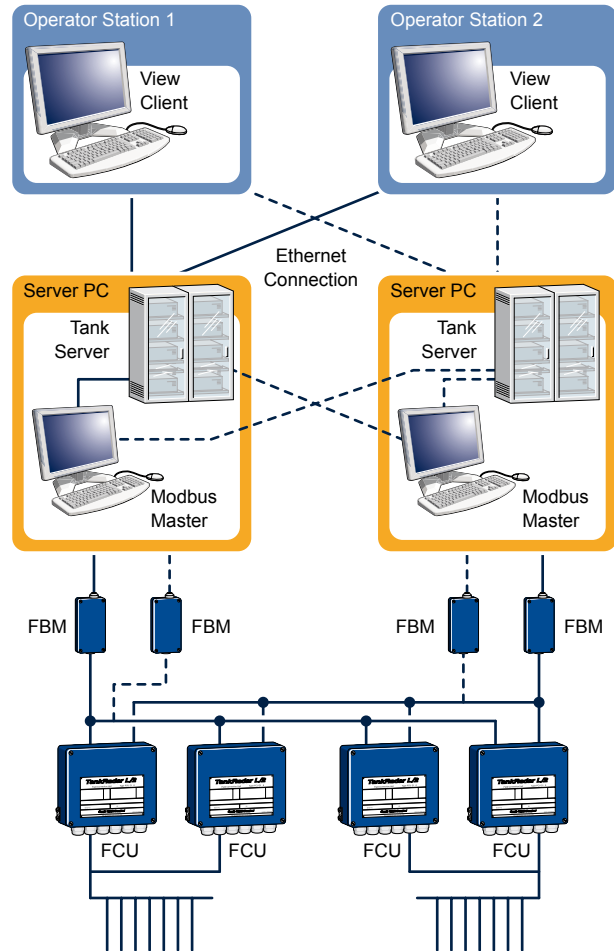
A message is sent to the TankMaster (or DCS) that the primary FCU has failed and that the backup FCU has taken over the communication.

Double FCU:s and workstations

A complete redundancy from control room to RTG:s is achieved by using double FCU:s as well as double TankMaster work stations.

Redundant FCU:s, FBM:s and workstations

With two FBM:s, safe communication between the TankMaster workstation and the FCU is achieved.



The flexible TankRadar Rex system supports several possible combinations to achieve redundancy, from control room to the different field units and RTG:s.



FCU:s connected to run in parallel provide automatic redundancy. If one unit fails the other will take over the communication.

Technical Description

705020En, Ed.1, Rev C

June 2007

TankMaster

TankMaster.net

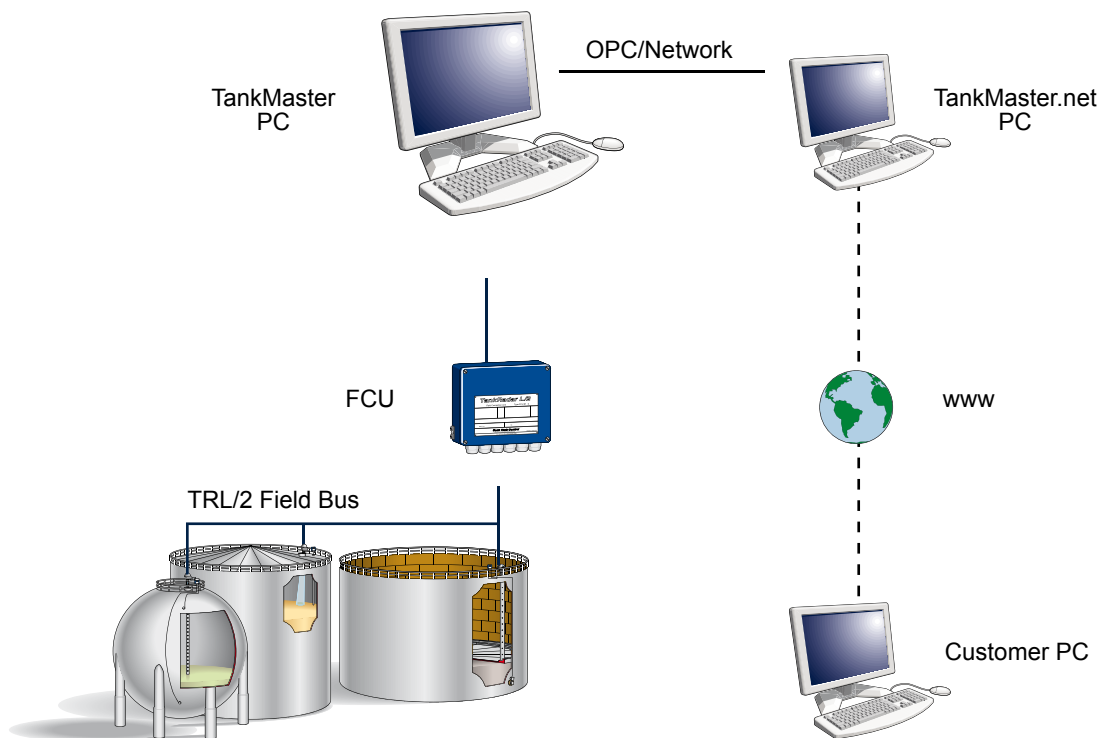
TankMaster.net is the web version of TankMaster. It monitors the tank farm inventory data on a secure web site. From there, the information is available for customers, suppliers, corporate management, and others via the Internet or the corporate intranet.

Tank content levels, volumes and temperatures are clearly viewed in all standard browsers, as are transactions and other historical events. Values, trends, utilization etc can easily be observed.

All users get unique usernames and passwords, giving access only to their own dedicated tanks.

Features

- Includes virtually all monitoring functions from TankMaster
- Fulfills industry and legal requirements such as API etc.
- Open system architecture based on OPC/OLE industry standard.
- Inventory control available 24 hours a day, at any location.
- Shared information: Suppliers, customers and transporters get automatic real-time inventory overview via Internet or intranet
- User-friendly navigation.
- Interactive configuration and installation.



TankMaster

Product information

Requirements for TankMaster

Operating System: English version of Windows XP Professional Edition (SP 2) is recommended for WinOpi, WinSetup, and TankMaster servers

Required TankMaster network server PC hardware

Processor: 2 GHz double processor or corresponding single processor
RAM memory: 2048 MB (1024 MB for systems up to 20 tanks)
Disk drive: 40 GB
Graphics card: 1152*864 pixels, 65536 colors (16 bit)

Required TankMaster standalone server or client PC hardware

Processor: 1 GHz double processor or corresponding single processor
RAM memory: 1024 MB (512 MB for systems up to 20 tanks)
Disk drive: 40 GB
Graphics card: 1152*864 pixels, 65536 colors (16 bit)

Requirements for TankMaster.net

Operating System: English version of Windows XP Professional Edition (SP 2), Windows 2000 server and Windows 2003 Server, with IIS, are recommended for TankMaster.net servers

Required TankMaster.net server PC hardware

Processor: 1.8 GHz (single processor) or better
RAM memory: 256 MB (1024 MB recommended)
Disk drive: 20 GB
Graphics card: 1152*864 pixels, 65536 colors (16 bit)
Bandwidth to each TankMaster PC: 20 kbps for each connected tank
Internet Bandwidth: 64 kbps (256 kbps recommended)

Required TankMaster.net client PC hardware and software

Processor: 1.3 GHz (single processor) or better
RAM memory: 256 MB
Disk drive: 20 GB
Graphics card: 1152*864 pixels, 65536 colors (16 bit)
Network Connection: LAN or internet
Internet Bandwidth: 64 kbps (256 kbps recommended)

Required TankMaster.net client Palm or phone hardware

Network Connection: WAP 2.0, Internet Connectivity

Available technical documentation for TankMaster:

- Technical Description
- Technical Description HTG
- WinSetup User's Guide
- WinOpi User's Guide

The Technical Description explains various aspects of the TankMaster software.

The Technical Description HTG explains various aspects of the TankMaster HTG system.

The TankMaster WinSetup User's Guide describes how to start-up the tank gauging system using the WinSetup software on a personal computer.

The TankMaster WinOpi User's Guide describes the inventory and display functions included in the TankMaster WinOpi software.

Ordering information

TankMaster™ Software

For upgrade of your TankMaster system please contact your sales representative (software key number is required).

Pos	Item	Code	Description	Note
1	License	DM	TankMaster Demo	No hardware key included
		WS	TankMaster WinSetup	Configuration only. No hardware key included
		05	TankMaster WinOpi, with TankServer for up to 5 tanks ⁽¹⁾⁽²⁾	One hardware key included
		20	TankMaster WinOpi, with TankServer for up to 20 tanks ⁽¹⁾⁽²⁾	One hardware key included
		50	TankMaster WinOpi, with TankServer for up to 50 tanks ⁽¹⁾⁽²⁾	One hardware key included
		MX	TankMaster WinOpi Max ⁽¹⁾	Unlimited number of tanks. One hardware key included
2	Host Communication	0	None	
		C	Host Communication ⁽³⁾	
		S	Host Communication ⁽³⁾ + Office Link ⁽⁴⁾	
3	Network	0	None	
		N	Network enabled ⁽⁵⁾	Used for TM WinOpi Clients in the network
4	Custody Transfer	0	None	
		C	Custody transfer functions ⁽⁶⁾	
5	Extended Batch Handling	0	None	
		B	Custody transfer batch handling system	
6	HTG	0	None	
		P	TankMaster Hydrostatic Tank Gauging Functions	
7	Customization	0	None	
		C	Customized Views	
8	Redundancy	00	None	
		R0	Redundancy	

(1) Configuration, view and alarm handling. Volume calculations according to API and others. Includes WinSetup.

(2) To view unlimited number of tanks if Pos 3 "Network" code N.

(3) For connection between TM and SCADA / DCS via Modbus (RS232). Includes OPC Server and Slave Protocol. Requires WinOpi.

(4) For connection between TM and Microsoft® Office via OPC Server. Client/Site Server License.

(5) Enables viewing of all installed tanks in the network from any TankMaster PC, independent of WinOpi type.

(6) Custody Transfer windows. Includes Hardware key, Custody Transfer seal and Metrological seal for Custody Transfer approvals.

Model Code Example

TM - 20 S N C 0 P C R0

TankMaster

TankMaster.net Software

Item	Version/Code	Description
TankMaster.net	RTM39EL	TankMaster.net ⁽¹⁾ , Single License (one user).
	RTM39EM	TankMaster.net ⁽¹⁾ , Limited License (up to 3 users).
	RTM39ES	TankMaster.net ⁽¹⁾ , Site License (unlimited number of users).

(1) Tank data availability through Internet / Intranet. Requires TankMaster WinOpi and at least Windows 2000 with MS Office™ 2000.

TankMaster I/O Terminals

Item	Model/Code	Description	Note
I/O Terminals	IOM 5110 AI	I/O Terminals, Analog In, 16 channels ⁽¹⁾	Connected to TankMaster PC
	IOM 5120 AO	I/O Terminals, Analog Out, 16 channels ⁽¹⁾	Connected to TankMaster PC
	IOM 5130 DI	I/O Terminals, Digital In, 16 channels ⁽¹⁾	Connected to TankMaster PC
	IOM 5140 DO	I/O Terminals, Digital Out, 8 channels ⁽¹⁾	Connected to TankMaster PC

- (1) • Protective hose included.
- Power supply required (24 VDC) - not included.
 - TankMaster Customized views option is recommended.

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