Technical Information
Tankvision Professional NXA85
Tank Gauging

Advanced tank gauging and inventory management system

Application

Tankvision Professional is specifically designed for operators of bulk storage facilities, marketing terminals, refineries and pipelines. It is designed to handle all the data acquisition, supervisory control and monitoring required in a single fully integrated solution.

Tankvision Professional integrates all major types of tank measurement instruments into one system.

All measured and calculated tank parameters are accessible to your tank farm and terminal operators as well as to connected host systems.
Multi-user operation is provided by the inbuilt Web Server offering the opportunity to access data at any connected location (local/remote) e.g. for administrative and accounting purposes.

Your benefits

- Approved for custody transfer applications according to NMi, PTB and GOST (in preparation)
- Built-in web server for limited tank farm operations
- Operates under Microsoft Windows and Windows Server
- Stand-alone or redundant system architecture
- Intuitive User Friendly Graphical User Interface (GUI)
- Supports most types of Tank Gauge: Float/Transmitter, Servo, Radar, Hydrostatic, etc.
- Provides interfaces to most Legacy Host Systems
- Real-time & Historical Trending
- Scheduling of Gauge Commands, Reports and Backups
- 3rd party protocols (e.g. Enraf, Saab) and drivers available for virtually any Device
- Capable of handling 400 tanks (more on request)
- Calculations for most used API/ASTM, JIS, GBT, IP Tables
- OPC Data Access Server and Modbus connectivity

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People for Process Automation

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Function and system design

Application

Tankvision Professional is a scalable tank gauging and inventory management system for all kind of bulk storage facilities. Applications range from small authorized distributors through to the largest storage terminals and refineries.

It is designed to handle all the data acquisition, supervisory control and monitoring required for an easy and save management of the entire facility in a single fully integrated solution.

Its connectivity to both old legacy and new modern instrumentation facilitates the upgrade of existing installed base in convenient stages.

The system is available as a single standalone operator station or as a client-server system. The system is designed to run on standard PCs with Windows 10 operating systems and Windows server 2016 platforms. (Please contact Endress+Hauser for the latest supported Windows versions.)

Tankvision Professional can be applied in a redundant architecture (hot standby).

Gauges

The system enables seamless integration of all major types of tank level, temperature and density/mass measurement gauges.

Tank gauges are connected via Tankvision Multi Scan, Tank Scanner, other 3rd party field communication and acquisition units or directly to according communication cards fitted into the Tankvision Professional workstation PC.

Display

Parameters such as level, temperature, pressure, density, mass, flow rate, gross and standard volumes are calculated continuously and displayed. Up to 400 tanks are supported[1]. Tankvision Professional offers numerous visualizations of tank inventory data, e.g. a complete overview of connected tanks in a graphical or grid view, real time or historical trending and some more specialized views. Most of these screens can be customized to user requirements.

In addition, Tankvision Professional offers HMI functionality to create screens according to user requirements including valves, pipes, pumps and motors.

Connections

The data can be distributed using OPC, Web based technologies and Modbus (TCP or RTU).

Approvals

PTB is available[2]
NMi[2]
GOST (in preparation)[2]

Inventory Calculations

Tankvision Professional offers most used inventory calculations according international standards like API, ASTM, GBT, IP and JIS.

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1) 200 in fully redundant mode, more on request
2) Restrictions apply, more information on request

System Overview

Stand alone

The following general architecture represents the common architecture for small depots, terminals and even small refineries. It consists of a single standalone operator work station, including a single PC using Microsoft Windows Operating System and running Tankvision Professional. The PC can be fitted with multiple serial ports and each port can be configured to act as a host or slave.

A field interface is used to collect data from external devices such as level and temperature gauges. A host interface is used to provide data to a higher level system either via OPC, Modbus or Web interface generally for inventory management, stock control or process.

Tankvision Professional is provided with a web server. This allows the distribution of data to any desktop computer with a browser like Internet Explorer. The browser user interface includes most of the features available in Tankvision Professional. A number of screens are interactive and allow functions like sending gauge commands.
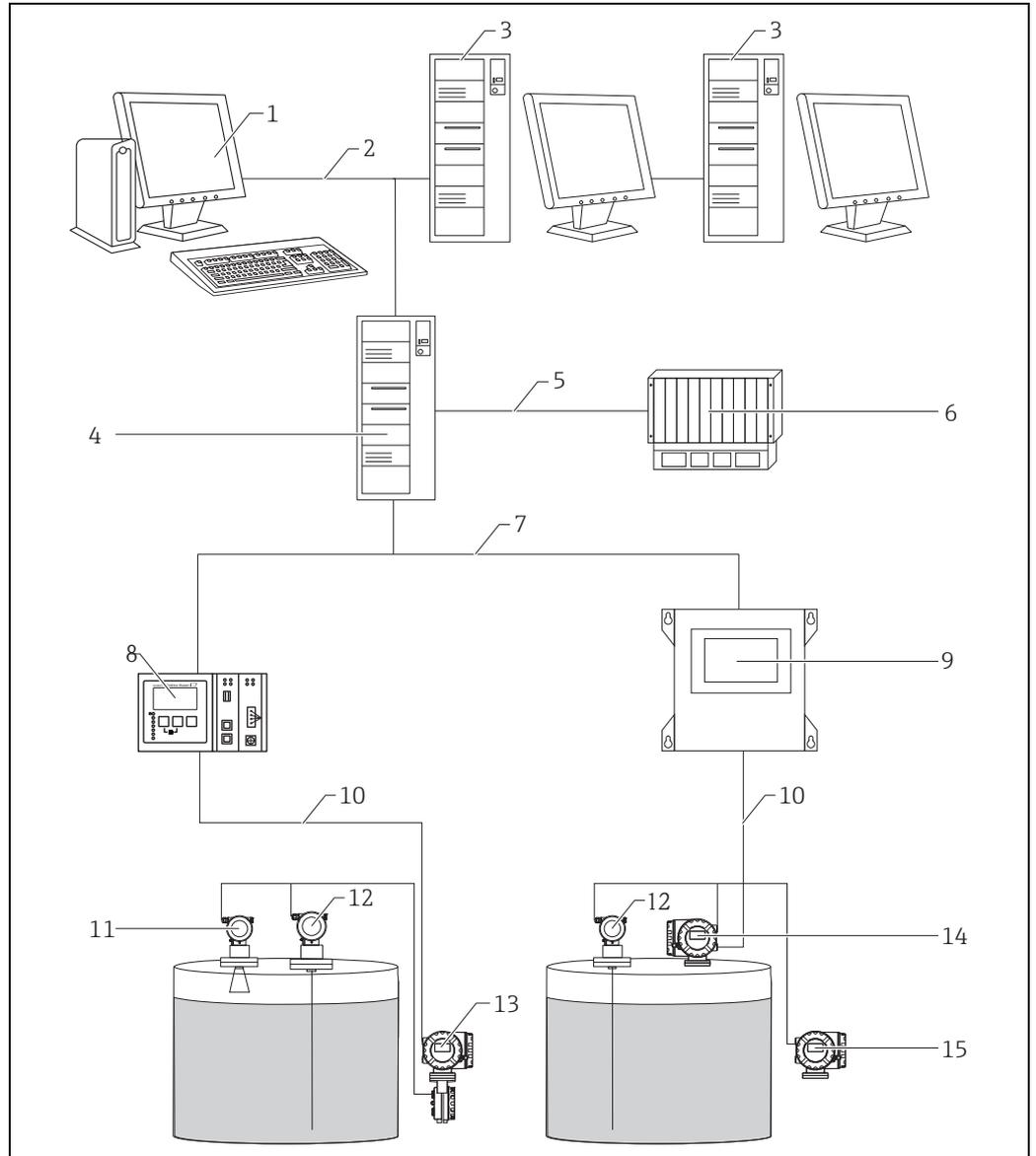

NXA85_System-overview_Stand-alone
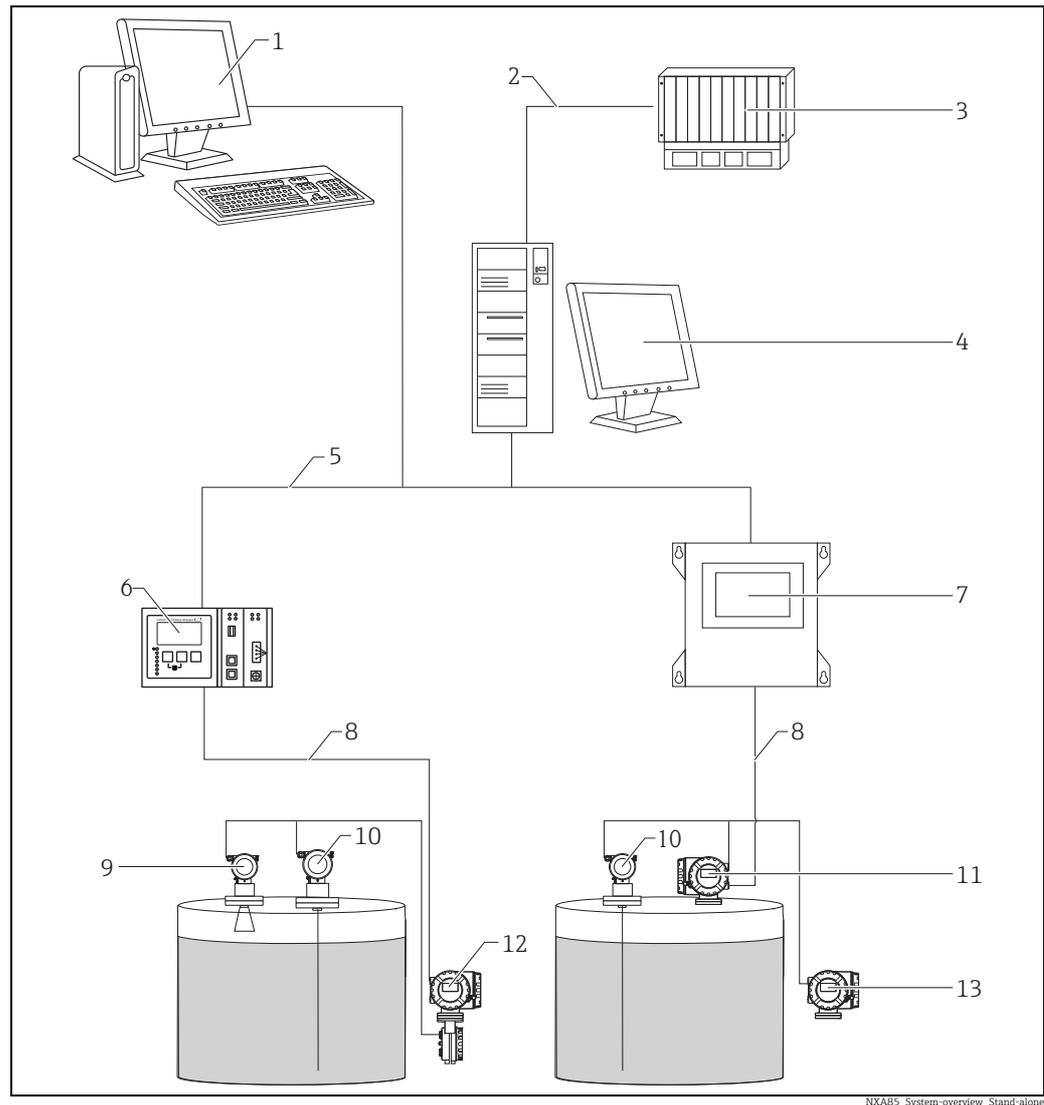
1   Tankvision Browser Visualization
2   Serial or Ethernet
3   DCS / PLC (Distributed control system / Programmable logic controller)
4   Tankvision Professional NXA85 Workstation
5   Ethernet
6   Tankvision Tank Scanner NXA820
7   Tankvision Multi Scan NXA83
8   Fieldbus protocol (Modbus, Sakura V1, Whessoe WM550)
9   Micropilot
10 Prothermo
11 Proservo
12 Tank Side Monitor
13 Promonitor

The system can be designed in redundant mode.

Server Client architecture

If multiple operator work stations are required, a client server architecture is normally provided.
A central server is used to collect data, and make that available to a number of client operator stations via an Ethernet network. The server will run on a Windows Server platform, SQL Server and the client/server version of Tankvision Professional.
The Client Operator Stations are based on a standard PC's, running a windows operating system. Each Client Operator station has the full functionality of the Tankvision Professional software and operates just like the Standalone version.

NXA85_System-overview_Server-client

1   Tankvision Browser Visualization
2   Ethernet
3   Tankvision Professional NXA85 Workstation
4   Tankvision Professional NXA85 Server
5   Serial/Ethernet
6   DCS / PLC (Distributed control system / Programmable logic controller)
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15   Promonitor

The system can be designed in redundant mode.

Requirements Hardware / PC

Recommended PC Specifications

The amount of web clients or clients (server-client system architecture) is limited depending on the PC specifications:
- With an SQL Express installation and a Windows 64 bit Version only 2 Web or 2 application clients are supported (included in the delivery package).
- With an SQL full installation and a Windows 64 bit Version on a Server System with 16 cores up to 16 Web or application clients are supported (not included in the delivery package).

In general up to 150 Tanks on a web client are supported when in combination with a 64 bit Windows Server System with 16 cores.

Recommended System Requirements

General Requirements

Tank Gauging computers typically receive data using serial communications devices; therefore it is usually simpler to use a computer equipped with serial ports. Where a large number of serial channels need to be terminated at the PC serial communications channels can be conveniently provided via Ethernet to Serial device servers.

Expansion Slots and Ports

The use of radio alarm annunciation and alarm relays require the installation of relay adapter cards. It is therefore important to ensure your PC case can accommodate these. In addition to the keyboard and mouse being connected to USB ports, tank gauging software is licensed using a USB dongle. Radio alarm annunciation requires a second sound card which may be provided using a USB module and SMS messaging also requires a USB input. It is important therefore to consider how many ports are required.

Standalone System/Client System

A system in this configuration needs a decent display adaptor and reasonable amounts of RAM and Hard Disk Space. An internal PC speaker is recommended from the point of view of tidiness and of preventing operator interference.

The choice of monitor will largely be affected by the number of tanks to be displayed and considerations about how the system will be used. A single 24" widescreen monitor is normally sufficient for a site with up to 20 tanks. Larger monitors allow more tanks to fit on the screen and multiple monitors can be used provided the computers graphics hardware supports it.

Property	Requirement
CPU	Multi-core processor (e.g. Intel Core i7 or equivalent)
Memory	16 GB RAM
Hard Drive	500+ GB
Optical Drive	CD/DVD
USB Ports	Minimum 4
Graphics	DirectX 10 device with WDDM 1.0 or higher driver
Serial Ports	See general requirements – not required for 'Client only' system
Operating System	Windows 10
Audio	Any Windows compatible sound device and speakers
Monitor	1,920 x 1,080 pixel display
Network	Ethernet connection

A simple RAID configuration that mirrors the hard disk to a separate device is a suggested enhancement as it will provide the system with some resilience should the disk fail. Solid state drives offer little in the way of benefit to these systems, as power consumption and faster boot times are of marginal benefit to tank gauging users.

Server System

Where you have a server computer connected to multiple client stations, the emphasis needs to be on the communications provided by the machine, not on providing a user interface for the operators. Such machines are typically sited in a back room away from the operators so don't require speakers or large monitors. Rack mounted servers work in these situations, but you need to be careful in selecting them, because 1U and 2U servers are not normally equipped with serial ports and have very limited expansion options.

RAID can improve performance of server computers particularly when used in a RAID 0+1 configuration. RAID 5 offers limited performance gains for SQL Server and tank gauging applications, though does present some extra protection against hard disk failure, though RAID 0 would be the preferred option is disk space is not at a premium.

Property	Requirement
CPU	Multi-core (4, 6, or 8) processor (e.g. Intel E5 Xeon)
Memory	16 GB RAM (32+ GB RAM[1] if used as a virtual host)
Hard Drive	Dual 500+ GB minimum, RAID recommended
Optical Drive	CD/DVD
USB Ports	Minimum 4
Graphics	Basic VGA output
Serial Ports	See general requirements – not required for 'Client only' system
Operating System	Windows Server 2016
Audio	Not required unless using radio alarm messaging
Monitor	Yes
RAID Adapter	Hardware RAID controller
Network	Dual Ethernet connection

1) depends on the number of virtual machines running on the host

Virtualised Tank Gauging Systems

For tank gauging systems being deployed in a virtualized environment (supported virtualized environments include Microsoft Hyper-V and VMWare ESXI), the following specification is recommended for each virtual server deployed on the host machine (based on above server recommended specifications):

Virtual Server System

Property	Requirement
Operating System	Windows Server 2016
Memory	> 16 GB RAM
Hard Drive	> 150 GB HDD Disk
Processor	> 4 Cores
Ethernet USB Server	Such as Digi USBAnywhere – to provide a location for the Tank Gauging USB Licensing Dongle. Only needed if using Microsoft Hyper-V or VMWare Virtual Environment.
Serial to Ethernet Converter(s)	Such as Moxa NPort series – to provide serial communications to the virtual machine. Please note: if the field interface device selected supports Ethernet connectivity this is not required.

Virtual Client System

It is possible to implement virtual servers and either virtual or physical clients. For a virtualised client system, the following is recommended:

Property	Requirement
Operating System	Windows 10
Memory	8 GB RAM
Hard Drive	50 GB HDD Disk
Processor	4 Cores

If using a virtual environment, a Windows based PC with network access to the remote environment will be required for operator access.

Further Information   For further information, please consult your local Endress+Hauser representative for the latest PC specifications.

Operator Interface and functions

Operator Interface

Tankvision Professional takes advantage of the intuitive nature of Windows based Graphical User Interfaces (GUI's) and multi-tasking, allowing multiple Windows to be opened simultaneously and allowing the use of other third party applications such as Microsoft Office suite to be run simultaneously.

Displays are loaded very quickly, can be scaled, minimised, maximised and moved around so that the operator can set the desktop as required.

Main Page

The first Graphical user Interface is the Main Page.

This page provides an overview of all tanks in a set of sizable graphical Windows.

The Main Page is the centre console from which all other functions can be quickly and easily accessed. Navigation through the different screens is simplified through the use of Toolbars, menus and short-cut links.

From the Main Page the user can send gauge commands through a context sensitive pop-up menu.

Tanks can be filtered on the Home Page using the Grouping features available.
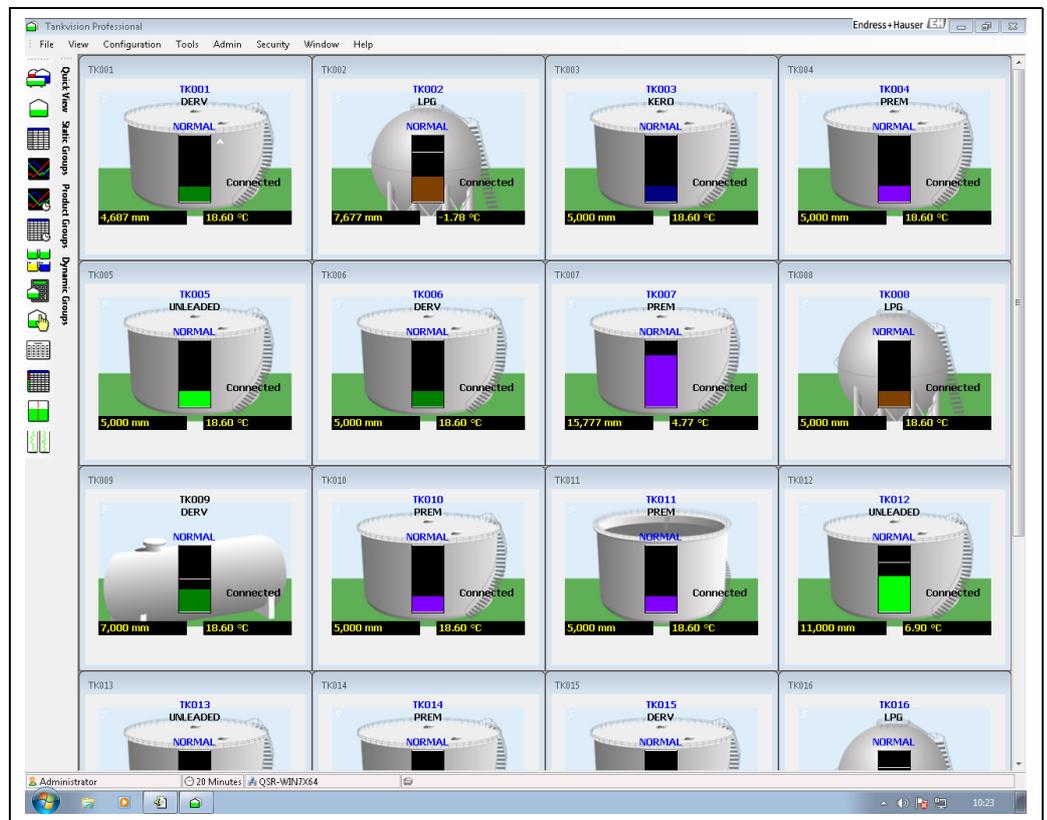
Main_Page

Grouping

The system has a range of different grouping strategies, some are user defined and others are automatic.

User defined groups are configured by the user.

Each group has a name, and the user defines which tanks will be displayed within that group.

User Defined groups are available for use in the Home Page and Grid View.

The Automatic groups are changing dynamically according to fixed criteria.

For example, the 'Moving group' contains all tanks that are defined by the system to be moving.
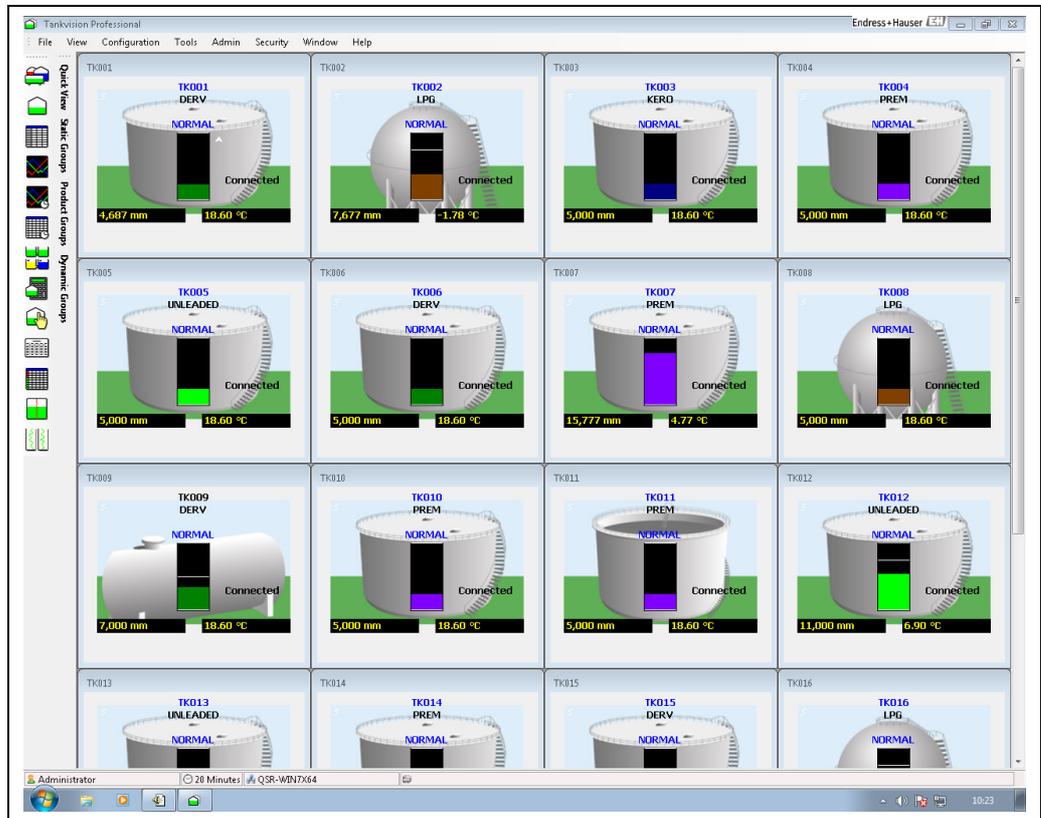
Main_Page

Single Tank

The Single Tank Detail display provides a detailed overview of all data for a single tank.
The data includes all live and calculated values, alarm levels, flow rates and other configuration parameters.
In addition the Single Tank Detail screen provides quick access to the Density Profile and Temperature profile displays.
The user can print a report of the single tank detail data.
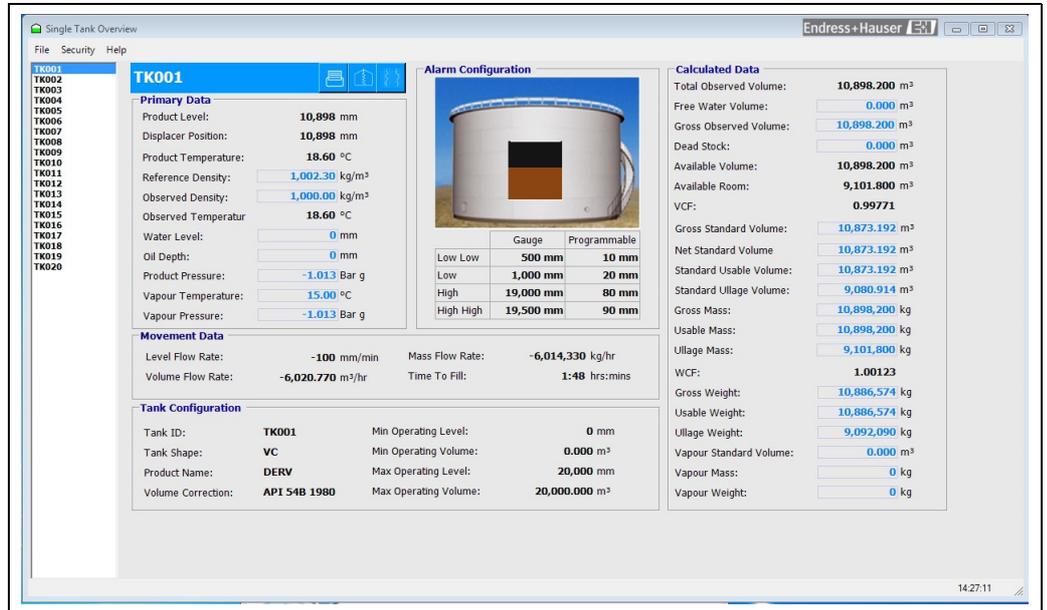
Single_Tank

Grid View

The Grid View display is a tabular list of tank data similar to a spreadsheet.
The system comes with several pre-defined views and provides tools to the user to configure their own customised views.
Gauge commands can be sent from Grid View using the pop-up menu.
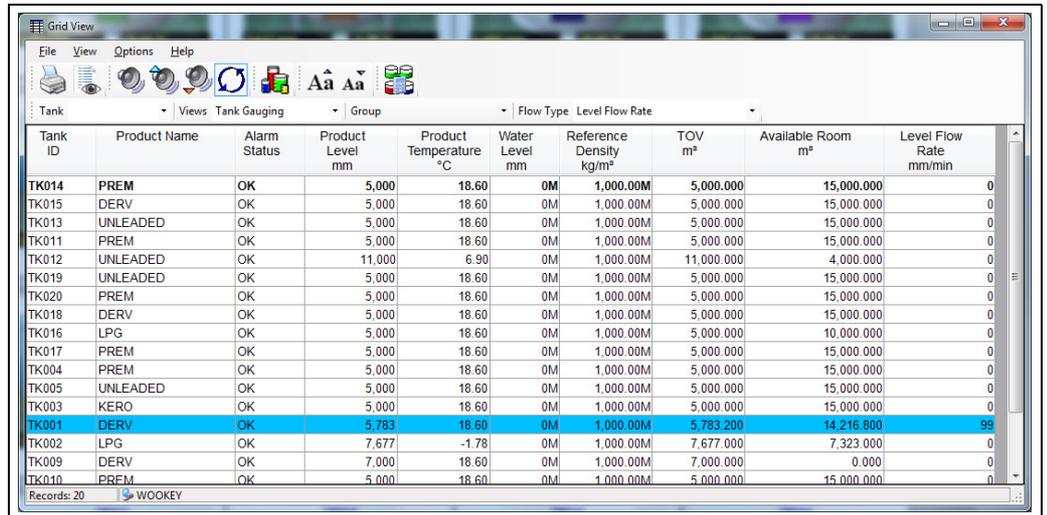
Grid_View

Alarm Event viewer   Alarms are displayed through a pop-up window.
When a new alarm occurs the pop-up window is displayed showing the details of the alarm.
The alarm can be acknowledged through the popup or the user can view the alarm details page for
more information on the alarm.
An audible warning and optional voice message can be configured to be annunciated with each alarm.
In addition a relay contact can be in response to an alarm for drivers external sounders etc.
All alarms are logged to a relational database in chronological order.
When an alarm is acknowledged, the username of the currently logged on user and the date/time it
was acknowledged are stored with the alarm record.
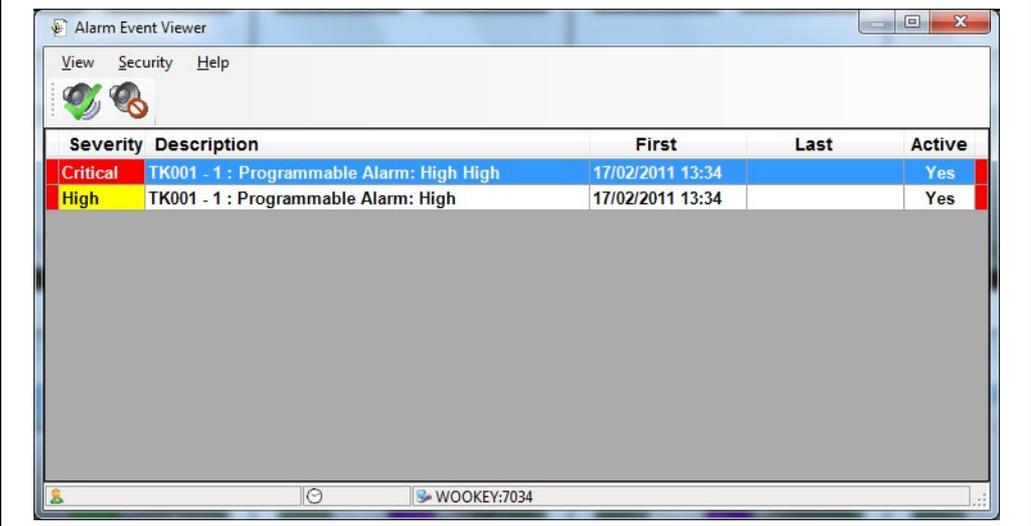
Alarm_Configuration

Alarm Configuration

Gauge and instrument alarms are normally raised at the gauge/instrument and communicated to the
system over the field bus.
Native gauge and instrument alarms are supported.
In addition the system allows the user to configure a range of programmable alarms for product level,
water level, temperature, density, flow rate, density and temperature deviation alarms, and difference
alarms when a tank has two gauges fitted.

Device Commands

All the commands supported by the native instrument are generally supported by the system.
A context sensitive pop-up menu is available from the Home Page or Grid View from which gauge commands can be selected.
This module allows the user to schedule gauge commands.
Device Commands can be sent to individual or groups of gauges and multiple schedules can be configured per day.
Typically the scheduler is used to schedule a water and or density dip at a certain time of a day.
The scheduler runs as a service.
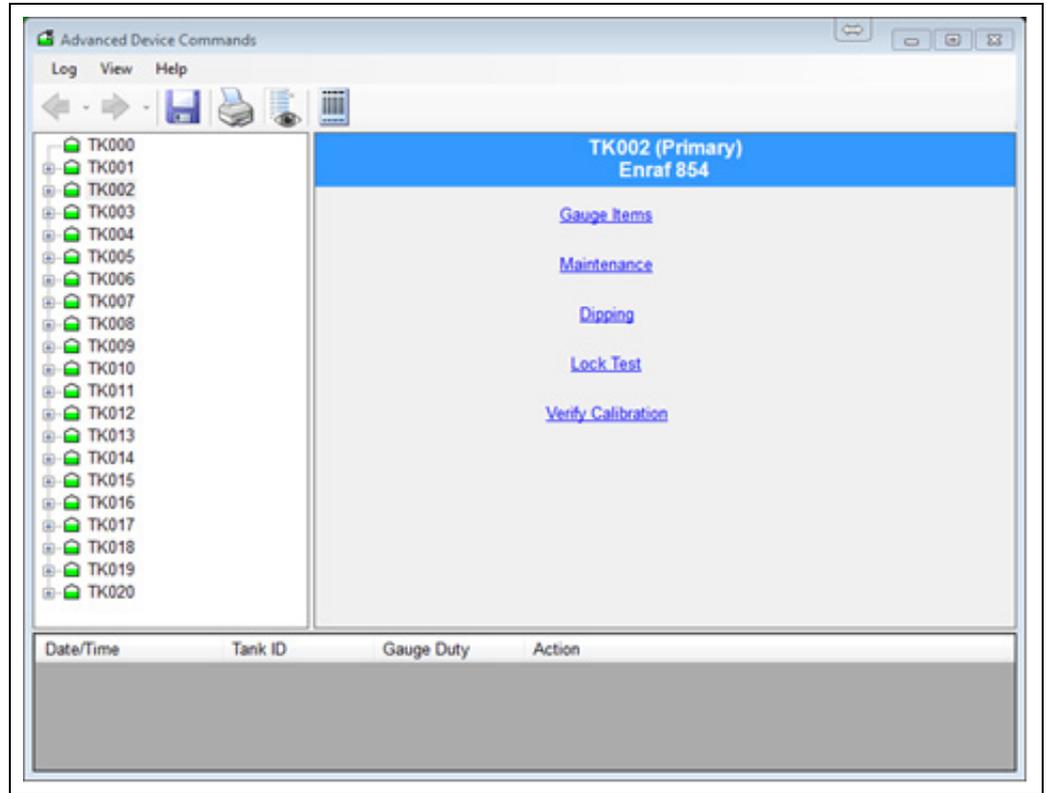
Advanced_Device_Commands

Trending

Real-time and Historical trend views are available. The Real-time view allows the user to load up to the last 24 hours of history.

The Historical trend view allows the user to view data between a start and end date.

Trend data is produce by a Trend service, which logs data to the hard drive.

Up to 6 trends can be displayed on the same graph.

The Trend view modules also provide a zoom facility and a data cursor to identify the value of data points on the trend.
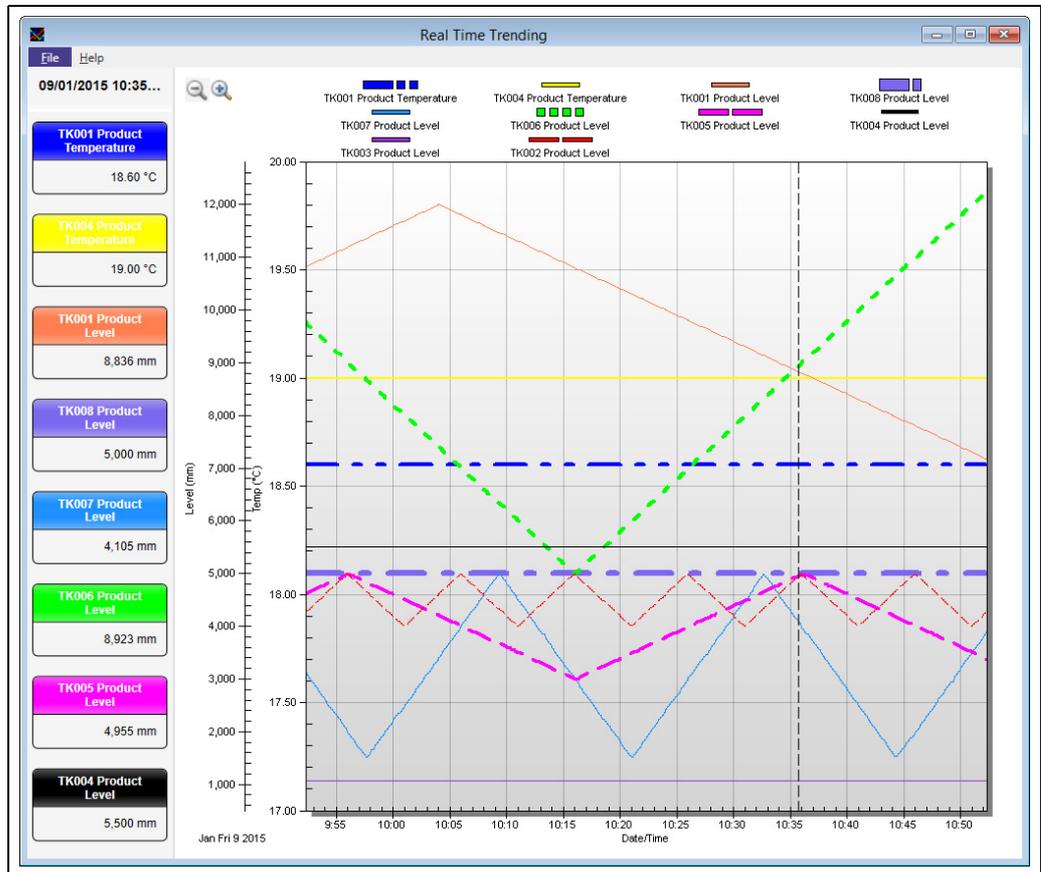
Trending

Reports

Reports can be printed on demand or scheduled. Reports are designed with Crystal Reports.
The system comes with a number of pre-formatted reports, however, reports can be customised with the use of the SAP Crystal Reports (has to be purchased separately).
Alternatively Endress+Hauser supports you with a special customized report design service that is available as additional service.

Reports

Inventory Calculator

The system provides an Inventory Calculator which can be used as follows:

- To calculate tank inventory at user specified conditions.
- To calculate the effect of a receipt or load on current tank conditions.
- The Inventory Calculator can be used as a planning tool.

Inventory_Calculator

Web Server

Tankvision Professional provides by default a secondary data access via web server. All operator screens can be viewed with the use of standard web browser[3] (recommended is the use of Microsoft Internet Explorer). Issuing gauge commands is also possible through the web interface.

The typical use case envisaged in creating the web interface was of a casual tank gauging user, needing read-only access to the system to perform limited actions. The web interface is not intended to substitute or replace the tank gauging client, but to provide a cost-effective way for occasional users of tank gauging data to benefit from the deployment of a tank gauging system. The web clients were not designed to for continuous operation (e.g. for the web page to stay open 24/7).

The hardware must be dimensioned depending on the number of clients and tanks which have to be monitored. In addition a web client should not be used for tank farm operations but only for tank farm occasional visualization. For full tank farm operation an actual client must be used.

User Management

User Management

The system has a very flexible security system that includes from providing full access with no passwords to stringent controls on every relevant feature.
Users and their privileges are entered through the User Configuration Module.
This is essentially a group of features for each user.
For each user you can determine their access rights on a feature by feature basis.
Access rights can be No Access, Read Only, Edit or Full Access as an Administrator.

Configuration

Tank Characteristics

Tank Characteristics is used to allocate a product to a tank, set the volume correction method for the tank, enter the maximum and minimum operating levels of the tank, enter the details of the floating roof if fitted, and modify the behaviour of the inventory calculation engine.
Many of the settings are critical and access should normally be limited to certain personnel.

Gauge Integration

A wide range of different vendor gauges are supported.
Gauges are configured through the Gauge Configuration Module which allows the user to define the:

- gauge type, the tank the gauge is connected with,
- the gauge physical and logical addresses,
- gauge duty if applicable, and
- the data scans that are performed.

Different manufacturer gauges are configured slightly differently in the way that they are addressed and the format of the data scans.
When a gauge type is selected, the mandatory configuration data items are labeled and enabled as required.

Endress+Hauser	Honeywell Enraf	Emerson	Motherwell	Whessoe	Varec	L&J

• Proservo
• Micropilot +
  Tank Side Monitor
• Levelflex +
  Tank Side Monitor
	• 811 Servo
	• 854 Servo
	• 873 Radar
		• TRL2 Radar
		• Rex Radar
		• Pro Radar
			• 4000 Mark/Space
			• 2800i Servo
				• 1311/2006 Float +
				  Tape WM500
				• 1311/1140
				  Servo WM500
				• 1315/2006 Float +
				  Tape WM550
				• 1315/1140/1141
				  Servo WM550
				• ITG 50/60/70
					• 1800 Mark/Space
					• 1900 Mark/Space
						• TankWay

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3) Microsoft Silverlight is required.

Inventory Calculations

Calculations

Tankvision Professional calculates tank inventory to all of the most used API/ASTM standards. The calculated data items are summarized below:

- Total Observed Volume (TOV)
- Gross Observed Volume (GOV)
- Water Volume
- Usable/Pumpable Volume
- Ullage Volume
- Gross Standard Volume
- Standard Usable Volume
- Gross Mass
- Usable Mass
- Ullage Mass
- Gross Weight
- Usable Weight
- Ullage Weight
- Vapour Gross Standard Volume
- Vapour Mass
- Dead Stock

If you want to include a parameter not mentioned here ask Endress+Hauser for availability.

Calculation Standards

- Manual VCF
- TCF
- DCF
- IP / API / ASTM D1250 1980 Table 6A
- IP / API / ASTM D1250 1980 Table 6B
- IP / API / ASTM D1250 1980 Table 6C
- IP / API / ASTM D1250 1980 Table 6D
- IP / API / ASTM D1250 1980 Table 24A
- IP / API / ASTM D1250 1980 Table 24B
- IP / API / ASTM D1250 1980 Table 24C
- IP / API / ASTM Light Hydrocarbon Liquids 1986 Table 54
- IP / API / ASTM D1250 1980 Table 54A
- IP / API / ASTM D1250 1980 Table 54B
- IP / API / ASTM D1250 1980 Table 54C
- IP / API / ASTM D1250 1980 Table 54D
- IP Petroleum Measurement Paper No.3 1988 Table 60A
- IP Petroleum Measurement Paper No.3 1988 Table 60B
- IP Petroleum Measurement Paper No.3 1988 Table 60D
- IP / API / ASTM D1250 1980 Table 6A, TREF 86 ˚F
- IP / API / ASTM D1250 1980 Table 6B, TREF 86 ˚F
- IP / API / ASTM D1250 1980 Table 6D, TREF 86 ˚F
- IP / API / ASTM D1250 1980 Table 6A, user TREF
- IP / API / ASTM D1250 1980 Table 6B, user TREF
- IP / API / ASTM D1250 1980 Table 6D, user TREF
- IP / API / ASTM D1250 1980 Table 54A, TREF 30 ˚C
- IP / API / ASTM D1250 1980 Table 54B, TREF 30 ˚C
- IP / API / ASTM D1250 1980 Table 54D, TREF 30 ˚C
- IP / API / ASTM D1250 1980 Table 54A, user TREF
- IP / API / ASTM D1250 1980 Table 54B, user TREF
- IP / API / ASTM D1250 1980 Table 54D, user TREF
- ASTM D1250 2004 Table 6A
- ASTM D1250 2004 Table 6B
- ASTM D1250 2004 Table 6C
- ASTM D1250 2004 Table 6D
- ASTM D1250 2004 Table 24A
- ASTM D1250 2004 Table 24B
- ASTM D1250 2004 Table 24C
- ASTM D1250 2004 Table 54A
- ASTM D1250 2004 Table 54B
- ASTM D1250 2004 Table 54C
- ASTM D1250 2004 Table 54D

- ASTM D1250 2004 Table 60A
- ASTM D1250 2004 Table 60B
- ASTM D1250 2004 Table 60C
- ASTM D1250 2004 Table 60D
- GPA TP-25 Table 24E
- GPA TP-27 Table 24E 2007
- GPA TP-27 Table 54E 2007
- GPA TP-27 Table 60E 2007
- ASTM D1250 1952 Table 6
- ASTM D1250 1952 Table 54
- ASTM D4311 1990 Table 1
- ASTM D4311 1990 Table 2
- ASTM D4311 1996 Table 1
- Francis (LPG mixtures)
- API Research Project 44 : TREF 15 °C (LPG mixtures)
- API Research Project 44 : TREF 20 °C (LPG mixtures)
- COSTALD (LPG / LNG mixtures)
- COSTALD - Tai t (compressed density)

If you want to include a calculation not mentioned here ask Endress+Hauser for availability.

Application packages

Movements

Tankvision Professional can be provided with a comprehensive suite of tools to monitor and facilitate automation of product movements – enabling users to monitor loading and unloading of products to and from a variety of vessels. It provides alarms and warnings of planned and unplanned events and reports. Additionally it archives data in a movement log.
The system incorporates a comprehensive product movement module for monitoring the receipt, loading or transfer of product to/from ship, pipeline, tanks, road and rail.
The user specifies the parameters of the movement e.g. the amount of product to be moved, the source/receipt tanks, the alarms and warnings required etc.
When the movement is opened the system calculates the target level, estimated time to finish, and monitors the progress of the movement providing the user with some warnings and alarms as the movement nears completion.
A comprehensive report is available as a record of the product movement.

Backup Scheduler

This module allows the user to schedule backups of the system databases.
The data that makes a system unique is contained in several different formats.
The tank databases are stored in the system SQL database, the trend data is stored in disk files, and customization data is stored in the registry.
The backup scheduler can backup from all these data sources.
Multiple backup schedules can be configured per day.
The scheduler runs as a service and does not require an interactive session to run.

Customer specific screens, viewer and designer

The custom screens can either replace or work alongside the supplied screens.
Each can contain custom graphics, text and data objects, and buttons to launch other applications or open further custom screens.
The viewer package allows the user to integrate their own screens, as an additional service provided by Endress+Hauser.

Multiple Screens

Allows launching of several instances of one screen.

Several gauges per tank

Allows assigning of various sources to one tank.

Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com → Select country → Instruments → Select device → Product page function: Configure this product
- From your Endress+Hauser Sales Center: www.endress.com/worldwide

ℹ **Product Configurator - the tool for individual product configuration**

- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Documentation

Downloads

For an overview of the technical documentation provided, visit the Downloads area of the Endress+Hauser website (www.endress.com/downloads).

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