HMI/SCADA APPLICATIONS

PROJECT OVERVIEW

Design and development of HMI/SCADA applications

Custody transfer metering skids, systems and solutions for oil, gas, petrol and chemical products

Design, engineering, configuration, commissioning and start up of complete instrumentation & control solutions in standard fieldbus technologies (Foundation Fieldbus, HART, Profibus)

Tank Management Systems (TMS) and Tank Inventory Systems (TIS)

WIG SOLUTIONS ARE RUNNING

HMI/SCADA for your applications

Completed complex HMI projects

Solutions in ArchestrA System Platform and InTouch software development environment. Commissioning, training, servicing and support after start-up

SRBIJAGAS, Underground Gas Storage, Banatski Dvor (Serbia)

Wonderware System platform 3.0

» around 6000 tags (1500 I/O signals)
» over 250 screens and popup windows (100 full size InTouch screens)
» three different operating modes in plant
» extensive reporting and trend analysis (60 predefined and custom trends, 9 custom reports with 80 report pages)

Hellenic Petroleum, Tank Management System for OKTA Refinery (FYR Macedonia)

Wonderware System platform 3.1

» around 3500 tags (900 I/O signals)
» around 100 screens and popup windows (25 full size InTouch screens)
» extensive reporting and trend analysis (15 different reports, 50 predefined and custom trends)
» two operating languages (English and Macedonian)

Pancevo Refinery, Truck and Rail Loading/Unloading of LPG (Serbia)

Wonderware System platform 4.0

» around 3000 tags (1300 I/O signals)
» over 250 screens and popup windows (30 full size InTouch screens)
» close to 600 object scripts

NIS Gazprom Neft, Automatic System for Control of Transport and Production of Oil and Gas (Serbia)

Wonderware System platform 3.1
» 7 Different locations, each with its own application (all later integrated into larger System Platform)
» around 3000 tags (1000 I/O signals, with additional 3000 system parameters referenced)
» over 150 screens and popup windows (50 full size InTouch screens)
» detailed trend and batch analysis (70 predefined and custom trends, 7 custom SQL databases with batch tables)

SRBIJAGAS, Calibration System of Industrial Flow Meters (Serbia)

Wonderware System platform 2012
» around 3000 tags (1500 I/O signals)
» over 140 screens and popup windows (50 full size InTouch screens)
» close to 500 object scripts

Krohne Oil&Gas, LDS for NIS Gazprom Crude Oil Pipelines (Serbia)

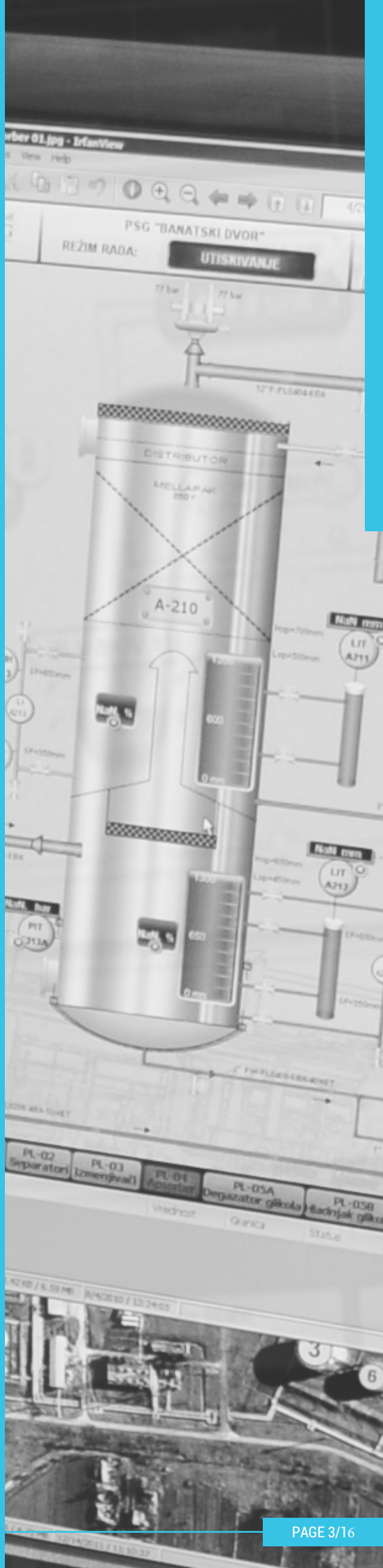
Wonderware System Platform 2012
» over 1500 I/O signals (7000 tags in total, with additional 3000 system defined attributes referenced)
» over 200 screens and popup windows
» two operating languages implemented (more available for implementation)
» fully integrated into larger customer's system (System Platform with over 50000 I/O tags and 40 stations)

Krohne Oil&Gas, Second Phase of LDS for KOC Pipeline Network Project (Kuwait)

Upgrade of InTouch 10.1 HMI application (17 new pipelines)
» over 20000 new InTouch tags (close to 50000 in total)
» close to 250 new InTouch screens (around 500 in total)

Krohne Oil&Gas, LDS for Pony Express Crude Oil Pipeline (USA)

InTouch 2014 runtime, with Archestra 2014 graphics and objects
» over 11000 InTouch tags (7000 I/O signals, with 12000 system defined attributes referenced)
» over 300 InTouch screens



Underground Gas Storage, Banatski Dvor (Serbia)

CLIENT: SRBIJAGAS (Serbia) and HEAT (Austria)
YEAR: 2006-2010
LOCATION: Banatski Dvor (Serbia)

Introduction

WIG was contracted to design and implement a complete DCS for Underground Gas Storage „Banatski Dvor". Project was done in two phases, first being only injection part of storage process, and second phase included complete plant functionality, with both plant regimes (injection and production of gas). HMI was also in a scope of work for this project (for both project phases).

First (temporary) HMI application was developed on Wonderware InTouch 10.0. The second (final) phase included overhaul and design of a completely new HMI application. This new application was developed on Wonderware System Platform 3.0 software environment. Application was implemented on two system servers, one engineering, and three operator stations. History and trending was done in Wonderware Historian, and reports were designed and implemented in HMI Reports software (now called Dream Reports, by Ocean Data Systems).

Scope of work & Implementation

HMI application was developed in Wonderware System Platform 3.0 software environment. HMI was designed to offer complete control and supervision over all of DSC. The plant/storage was designed to operate in three modes: gas injection, production (extraction) of gas, and passive plant mode. Each work mode has its own specific functions and a different set of operational and system parameters (alarms, alarm limits, set points, automatic/manual controls, user access to objects, etc.). All options increase complexity of plant control and supervision, offering, at the same time, immense capabilities to HMI user, as well as level of fine control (both automatic and manual modes) rarely seen in such applications.

HMI is divided into several sections (screens or groups of screens). Some sections are based on specific parts of plant and process, and other screens/sections show general data or offer some specific functionality. The former group includes all of the well screens, well line collectors, separator part of process, absorber part, heat and gas exchange, drainage, pump stations, compressor stations, and other. The latter group includes general overview screens, alarms and alarm limits overview, ESD system overview, diagnostics of computer network and electrical cabinets, trends, reporting, documentation (all available within HMI), and some other screens and subsections.

Scope of work includes:

- around 6000 tags (1500 I/O signals),
- over 250 screens and popup windows (100 full size InTouch screens),
- three different work modes in plant,
- extensive reporting and trend analysis (60 predefined and custom trends, 9 custom reports with 80 report pages).

Reporting and trend analysis were given special consideration for the operation of this Underground Storage. Reports were designed in HMI Reports software (by Ocean Data Systems). Reports show plant operation and data summary on daily and monthly basis. Reports include a great amount of data, such as: exact value at some given time, average value, min and max values, and value differences within a time period. Graphs and trends are also available in some types of reports. Reports are designed in word and pdf file formats.

HMI uses Reports Screen and Reports Menu to access/view finished reports and to connect with interface of HMI Reports software. Although all types of reports have predefined time slots and time periods (for report execution/calculation and generation), user has a possibility to change that if required. Reports can also be generated on event, like push of a button in HMI. This HMI application offers a lot of "additional" options and content to user. Some of that content is included in regular operations, and some options are available through specific menus and functions. For example, user can click on any instrument display and open detailed popup window for that transmitter. That window includes information on measured value, temperature of integrated electronic board, review of all alarms and alarm limits, and can additionally open manufacturer's pdf document with model's specifications. Valves, pumps, positioners and similar equipment also have a lot of command options, and options to choose operating mode (local or remote, and then remote automatic or remote manual).

HMI also offers a lot of actual photos of equipment, ranging from field instruments and valves, to absorbers, separators, heat exchangers, tanks and many others. Since most of the process screens are visually reminiscent of PIDs, some of those photos are "hidden" from regular view. User can click on, so called, specific separator tank, and open an actual photo of the particular tank and its close surrounding. Most of the active (clickable) elements in HMI are also animated. User can hover over certain elements on screen (with mouse pointer), and if active, some type of animation would appear on those elements. HMI also has extensive documentation available to user, without leaving runtime operations. This documentation includes: system architecture, signal lists, equipment lists, equipment specifications, operator manual and some other documents.


PSG "BANATSKI DVOR"
REŽIM RADA:
STANDBY
4.8.2010
СРБИЈАГАС
A-210
E-340

Tank Management System for OKTA Refinery (FYR Macedonia)

CLIENT: OKTA Refinery
YEAR: 2010-2011
LOCATION: OKTA Refinery (near Skopje, FYR Macedonia)

Introduction

WIG was contracted by OKTA Refinery (under Hellenic Petroleum) to develop and implement an advanced tank management system for almost 50 reservoirs used for storage of oil and petroleum products. HMI was also in a scope of work for this project.

HMI application was developed on Wonderware System Platform 3.1 software environment, and it was implemented on one system server, three operator stations, and one engineering/operator station. History and trending was done in Wonderware Historian, and reports were designed and implemented in HMI Reports software (now called Dream Reports, by Ocean Data Systems).

Scope of work & Implementation

Tank Management in mostly supervision, but some parameters cound be changed (manually inputed), and there are 75 on/off valves that could be remotely controlled.

Each tank shows:

» level of main fluid (millimeters and percentage of max value, with alarm indications and alarm limits in four ranges),
» interface level water (with alarm indication and alarm limit),
» temperature in several points (up to 6 points depending on max height of tank, with alarm indications and alarm limits for each one),
» average temperature of main fluid,
» actual volume of fluid (in cubic meters, calculated and compliant with all necessary tank volume standards),
» standard volume of fluid (standard cubic meters),
» density of fluid (kilograms per cubic meters),
» mass of fluid (metric tons),
» pressure value in tank (available only if tank is pressurized),
» connecting valves, with states (opened, closed) and commands for each valve,
» ambient temperature display and input (ambient temperature features in some volume calculations standards),
» tank specifications (popup screen with text lines, shows value on 17 different parameters).

All in all, around 50 references on average per tank (I/O signals, user defined attributes, and system parameters).

This HMI has an option to change display language. All texts on screen can be shown in different languages. This is custom made feature, not a preexisting option built in configuration software. All texts have been made as string type tags. Not only display texts, but descriptions, legends and explanations, alarm messages and even tooltips are dynamic objects. Everything can be switched with a single click of a button. English and Macedonian languages have been implemented.

History and trends are available via Wonderware Historian.

Scope of work includes:

» around 3500 tags (900 I/O signals),
» around 100 screens and popup windows (25 full size InTouch screens),
» extensive reporting and trend analysis (15 different reports, 50 predefined and custom trends),
» two operating languages (English and Macedonian).

Reporting and trend analysis were given special consideration in this Tank Management System. Reports were designed in HMI Reports software (by Ocean Data Systems). There are three types of reports with 15 different individual reports in total. Reports show a great amount of data, such as: exact value at some given time, average value, min and max values, and value differences within some time period. Graphs and trends are also available on some types of reports. Reports themselves are designed in word and pdf file formats.

HMI uses Reports Screen and Reports Menu to access/view finished reports, and to connect with interface of HMI Reports software. Although all types of reports have predefined time slots and time periods (for execution/calculation and generation of report), it is possible for user to change that if necessary. Reports can also be generated on event, like push of a button in HMI.

HMI history and reports analysis lead to increase of proficiency and productivity of Tank Management division of OKTA Refinery. Within two months from start-up of new system, data gathered and analyzed offered greater insight of the whole work and technological process. Customer was able to change and improve on their work process according to that data.

SOLUTIONS ARE RUNNING

Truck and Rail Loading/Unloading of Liquid Petroleum Gas for Pančevo Refinery (Serbia)

CLIENT: Pančevo Refinery (for NIS Gazprom, Serbia)
YEAR: 2011
LOCATION: Pancevo Refinery (Pancevo, Serbia)

Introduction

WIG was contracted by Pančevo Refinery (under NIS Gazprom) to develop and implement an advanced Truck and Rail Loading/Unloading system for liquid petroleum gas. HMI was also in a scope of work for this project.

HMI application was developed on Wonderware System Platform 4.0 software environment and it was implemented on a system server, and one operator station. History and trending was done in Wonderware Historian. HMI reads signals form three different sources (OPC Servers) and also send commands (writes) back to each of them.

Scope of work & Implementation

This HMI application was developed in Wonderware System Platform 4.0 software environment. HMI was developed to show all relevant data regarding system supervision and alarms, but HMI is also used to control this system with manual commands to field equipment (valves, compressors, PLCs, and flow-computers). Wonderware application communicates with three different OPC Servers: SMAR, HIMA, and Mess- und Fördertechnik. Most of the automation is programmed into PLCs and flow-computers but user was left with an option to switch system control to remote manual commands at any time. Although user and database accounts for batch tracking are part of a different system, HMI is used to monitor technological process, and if necessary, to remotely control a lot of equipment used in this process.

HMI monitors 11 metering skids (each with several field instruments), 11 flow-computers (in detail), almost a hundred on/off valves, and several pumps, compressors, and electrical cabinets. ESD system with valves and shutdown buttons is also part of the HMI.

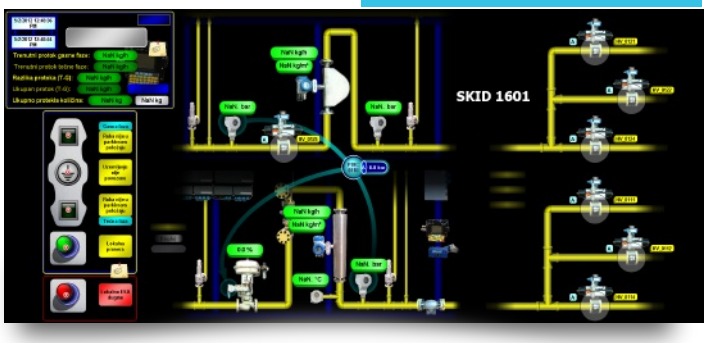
Scope of work includes:

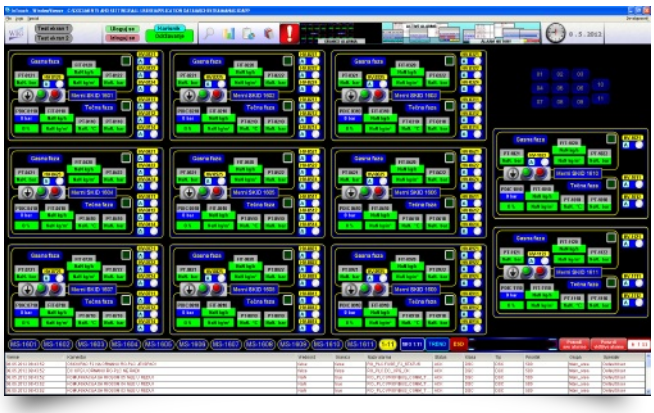
- around 3000 tags (1300 I/O signals),
- over 1500 system defined attributes/tags were also referenced,
- over 250 screens and popup windows (30 full size InTouch screens),
- close to 600 object scripts,
- more than 20 predefined and custom trends,
- close to 50 unique ArchestrA graphical objects, which combined make another 100 larger objects and screens.

HMI also includes several general and overview screens, such as alarm and alarm limits overview, computer network and cabinet diagnostics screen, complete ESD overview, overview of all flow-computers, and overview of all metering skids. Many of these screens are quite extensive and show a lot of data in one place. Overview screen of all metering skids has more than 2000 references alone. This offers great monitoring capabilities to user, because operator can easily switch between general (overall) screens, and detailed screens for single metering skids. General screens offer almost all of data from single screens, just in a more compact space.

This HMI application has somewhat unique visual style. Many of the standard HMI elements like displays, tables and flashing alarm lights are present in their recognizable shape and form. However, metering skid screens, as well as field instruments and valves have a different visual style. Most of instruments and valves are represented with actual photos (of the instrument model) which are then inserted into regular HMI graphic. Metering skid screens especially incorporate many of these images. Metering skid themselves are designed and represented in HMI in such way to have great visual resemblance to "actual" skid in field, outside of control room. User can easily identify actual parts of metering skid by looking at HMI alone. Incorporation of actual photos inside of regular HMI graphics is done seamlessly and end result is quite pleasing to users, without sacrifice in terms of functionality or impeding in terms of visual noticeability.

SOLUTIONS ARE RUNNING





Automatic System for Control of Transport and Production of Oil and Gas (Gazprom Neft, Serbia)

CLIENT: GASPROM NEFT
YEAR: 2012
LOCATION: 7 Different locations in Vojvodina region (Serbia)

Introduction

WIG was contracted by NIS Gazprom for several different projects which were part of larger project called Automatic System for Control of Transport and Production of oil and gas (ASUTP). Projects included tank management, batch control and management, some process and measurement control and implementation of compressor station. HMI application was developed on Wonderware System Platform 3.1 and then integrated into larger NIS system (System Platform 2012). Seven different HMI applications were implemented on operator stations. History and trending was done in Wonderware Historian, and batch management systems had its own custom SQL tables and databases.

Scope of work & Implementation

HMI application was developed in Wonderware System Platform 3.1 software environment. HMI was designed to offer complete control and supervision within all requested parameters of each project.

There were 7 locations in total:

» OS Tisa Station, tank management (7 tanks), batch management (station has two receiving points and one transmitting point),
» SS1 Elemir Station, tank management (3 tanks), batch management (station has one transmitting point),
» SS1 Velebit Station, tank management (2 tanks), batch management (station has one transmitting point),
» OS Adorjan Station, tank management (4 tanks), batch management (station has one receiving point),
» OS KP Station, tank management (4 tanks), batch management (station has one receiving point and one transmitting point),
» SS1 Itebej Station, process control (separators, boilers, gas driers, flow meters, truck loading),
» SGS KG Station, compressor station (also with 4 gas measurement lines, absorber, separators, pumps etc.).

Each of these locations had HMI application offering control, supervision, trend (and SQL database) analysis. All applications were integrated into larger NIS system.

Scope of work, for all 7 locations in total, includes:

» Around 3000 tags (1000 I/O signals, with additional 3000 system parameters referenced),
» Over 150 screens and popup windows (50 full size InTouch screens),
» Detailed trend and batch analysis (70 predefined and custom trends, 7 custom SQL databases with batch tables).

All subsystems (tank management, batch management, etc.) had complex structure offering extensive management and monitoring options. For example, tank management system offered (per single tank):

» level of main fluid (millimeters and percentage of max value, with alarm indications and alarm limits in four ranges),
» interface level water (with alarm indication and alarm limit),
» temperature in several points (up to 6 points depending on max height of tank, with alarm indications and alarm limits for each),
» main fluid average temperature,
» actual volume of fluid (in cubic meters, calculated and compliant with all necessary tank volume standards),
» standard volume of fluid (standard cubic meters),
» density of fluid (kilograms per cubic meters),
» mass of fluid (metric tons),
» pressure value in tank (available only if tank is pressurized),
» connecting valves, with signal states (opened, closed) and commands for each valve,
» ambient temperature display and input (ambient temperature features in some volume calculations standards),
» local simulation of all "field signals" (around 40 new tags and additional functionality).

All in all, around 90 references on average per tank (I/O signals, user defined attributes, and system parameters), with additional functionality and control for local simulations.

SOLUTIONS ARE RUNNING

Calibration System of Industrial Flow Meters (Serbia)

CLIENT: SRBIJAGAS (Serbia)
YEAR: 2011
LOCATION: Novi Sad (Vojvodina region, Serbia)

Introduction

WIG was contracted by SRBIJAGAS to design and develop a new Calibration System of Industrial Flow Meters. HMI/SCADA application was included in a scope of work for this project.

Automation part of the system was made in SMAR System 302. The whole system was completely automated with advanced ladder logics. HMI application was developed in ArchestrA System Platform 2012. The main challenge was to calculate more than 2000 parameters every couple of seconds stored to several SQL database tables afterwards.

Scope of work & Implementation

HMI application has been developed entirely in ArchestrA System Platform 2012 software environment. Alarm and event history were stored within standard InTouch SQL database, but historical data logging was done in a custom made Microsoft SQL Database.

Data logging was made in seven separated SQL database tables. In four of them all relevant system parameters are stored for testing. Remaining three tables store the parameters for reports. Every table has approximately 500 columns. Retrieval of all parameters from some older tests and their publication in HMI is also possible.

Scope of work includes:

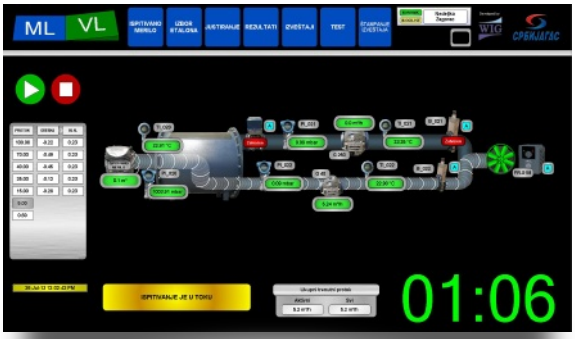
- over 1500 I/O tags,
- close to 1300 user defined attributes/tags (UDAs),
- close to 300 systems defined attributes/ tags were also referenced,
- around 50 InTouch full screens or screen size popup windows,
- around 90 popup windows could be opened from ArchestrA graphic objects,
- close to 500 scripts with more than 30000 lines of code,
- extensive reporting (4 different reports),
- structured Query Language (SQL) Database with 7 Tables.

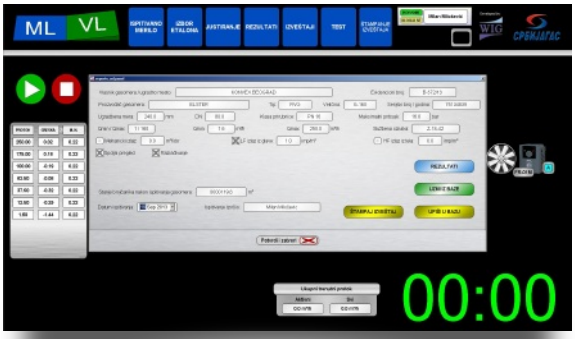
There are two separate calibration installations, for larger and smaller flow meters. On a "large" installation calibration is possible on four lines, or by combining them. Regarding the "small" one, there are two calibration lines. All installed instruments can be seen on HMI with an option to change the values manually. Choice of active installation lines is completely automated, but it is also possible to choose it manually.

One of the biggest challenges on this project was calculation. It was necessary to calculate around 2000 parameters every two seconds. At the end of flow meter testing all the parameters are rounded. Rounded values are input for advanced mathematical equations, eventually providing the result of flow meter testing in the form of flow meter error and flow meter measurement uncertainty.

Until now, a considerable number of new flow meters or operational flow meters were tested in this laboratory and the results were accepted and recognized by Serbian Accreditation Body and Directorate of Measures and Precious Metals, confirming reliability and precision of implemented calibration system.

SOLUTIONS ARE RUNNING





Leak Detection Systems for NIS Crude Oil Pipelines (Serbia)

CLIENT: GAZPROM NEFT
YEAR: 2012-2013
LOCATION: Pipelines Tisa-Novi Sad, KP-Tisa, and Adorjan-Novi Sad (Vojvodina region, Serbia)

Introduction

WIG was employed by NIS Gazprom to design and develop HMI/Scada for two separate LDS projects. These were the first LDS systems in Serbia, and project has been completed in cooperation with Krohne Oil & Gas, based on their Pipe Patrol leak detection system.

Application was developed in ArchestrA System Platform 2012. First phase (first pipeline, year 2012) has been designed as a stand-alone solution, and the latter phase (second and third pipelines, year 2013) has been made for integration into larger NIS system platform environment. Pipeline Tisa – Novi Sad was divided into segments, and there were six LDS systems in total.

HMI was designed to comply with Krohne's standard LDS functionality, but it was somewhat modified, and then heavily upgraded to allow for customer specific user functionality and interface.

Implementation

HMI application has been developed entirely in ArchestrA System Platform 2012 software environment. Historical data logging was done in Wonderware Historian, and alarm and event history were stored within standard InTouch SQL database.

Much like other LDS systems, this HMI had no need for special reporting or advanced history and trend analysis at HMI level. Nevertheless, users were provided with plethora of predefined and custom built trends, such as trends based on location, system values, profile propagation, and many comparative trends focused on specific parameters.

Scope of Work

» Close to 1500 I/O tags. Of those, at least 70% were configured as a type of analog tag (float or integer),
» Between 5500 – 6000 user defined attributes/tags (UDAs),
» Over 3000 system defined attributes/ tags were also referenced,
» Around 40 InTouch full screens or screen size popup windows,
» Around 200 popup windows could be opened from ArchestrA graphic objects (one overview screen/popup has close to 3500 references),
» More than 30 different predefined and custom trends.

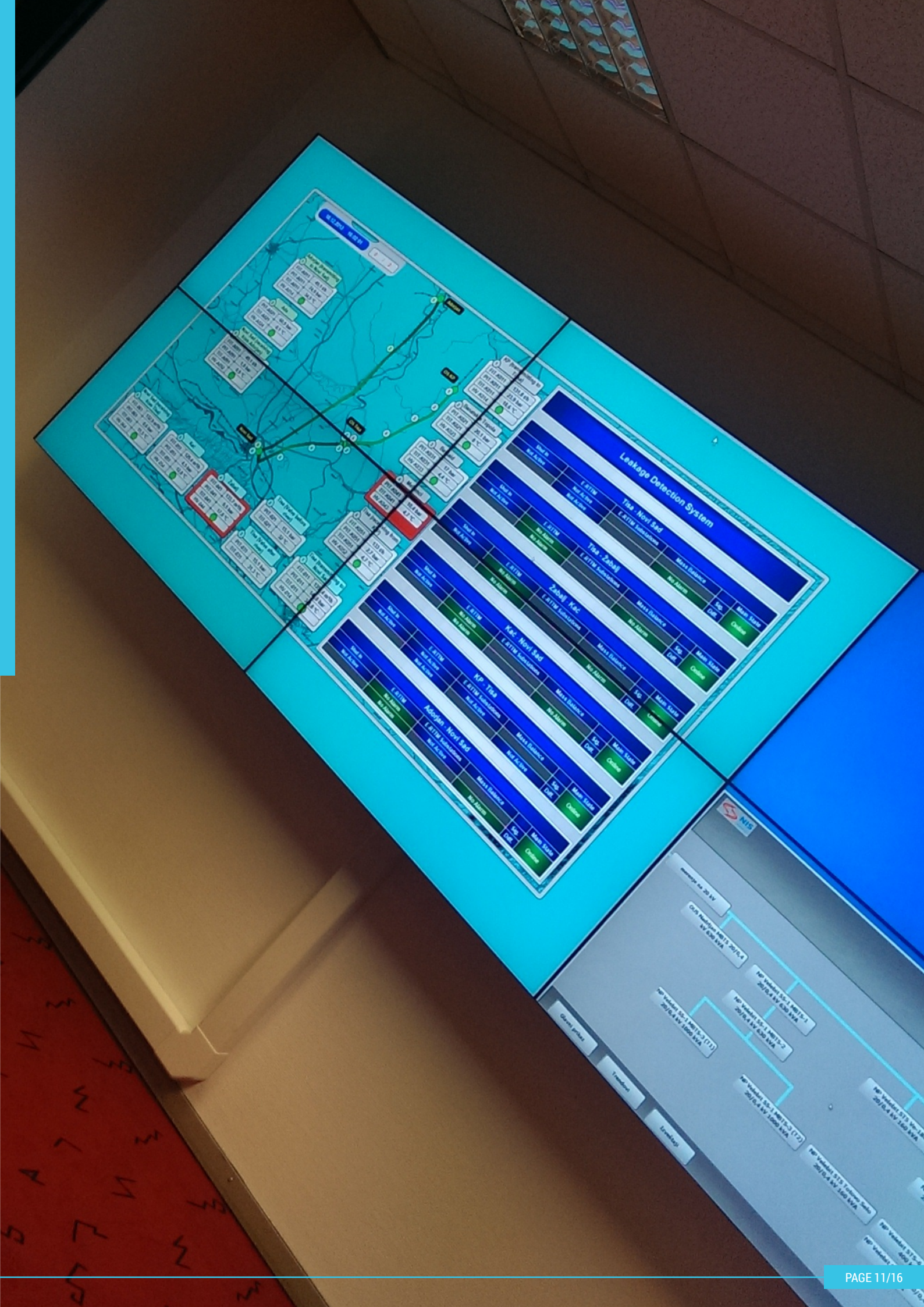
Large number of user defined tags can be attributed to some special features of this HMI. Large portion of I/O signals can be simulated locally from HMI, and all field signals (instruments, valves, etc.) have two different input sources.

HMI has a lot of options related to field signals and is highly configurable. For example, single pressure transmitter has two signals associated with it: value signal and state signal from LDS. HMI offers to user more than rudimental display of those two signals. By clicking on pressure value display, user can: adjust limit value alarms (hi-hi, hi, lo, lo-lo), inhibit/allow each of them (individually or all at once), change value source (raw, LDS, local), simulate value (if source is local), change value max and min, change alarm deadband (value and time deadbands), inhibit/allow alarm on state signal, and write/read user note on that pressure transmitter. All of that is clearly noticeable on "settings window" graphics, together with transmitter description text, input source text address, and ability to open additional legend screen for that type of window. And everything is available in two languages, English and Serbian (for end user). All in all, another 40 tags/attributes, both user and system defined, are associated with those two original tags for each transmitter.

This HMI has an option to change display language. All texts on screen can be shown in different languages. This is custom made feature, not a preexisting option built in configuration software. All texts have been made as string type tags. Not only display texts, but descriptions, legends and explanations, alarm messages and even tooltips are dynamic objects. Everything can be switched with a single click of a button. Initially, English and Serbian languages have been implemented, but it's relatively easy to additionally upgrade it other languages (functionality and structure are already in place).

Probably the most unique feature, at least from the system configuration perspective, is that this HMI has been developed and designed to function not only as stand-alone system, but more importantly, as a part of a much larger existing system.

This system encompasses almost everything regarding oil and gas extraction, refinement, transport, and storage in Serbia under the management of NIS. This includes close to 100000 I/O signals from hundreds of oil wells, almost 100 stations (extraction, pump, compressor, refinement, tank management, etc.), and dozens of oil and gas pipelines. This system is configured on Wonderware System Platform 2012, and it is controlled and observed from up to 40 operating stations on almost as much different locations. LDS was designed to be integral part of the system. HMI for LDS is entirely available from each and every station, even though in practice, it is mainly observed on only 4-5 key operator stations.


Leakage Detection System
Tisa - Novi Sad
Tisa - Zabalj
Zabalj - Kac
Kac - Novi Sad
KP - Tisa
Adoljan - Novi Sad
NIS

Second Phase of LDS for KOC Pipeline Network Project (Kuwait)

CLIENT: KOG (for Invensys, end-user Kuwait Oil Company)
YEAR: 2012-2013
LOCATION: more than 40 pipelines, Kuwait

Introduction

WIG was contracted by Krohne Oil & Gas (KOG) to develop an HMI upgrade for the second phase of Krohne's Leak Detection System (LDS) in Kuwait. Second phase consists of HMI upgrade for 17 new pipelines for oil and gas transport (first phase had 28 pipelines). HMI upgrade was developed in Wonderware InTouch 10.1, on the bases of existing HMI and development software.

In addition to new elements, some of the overall HMI was also upgraded.

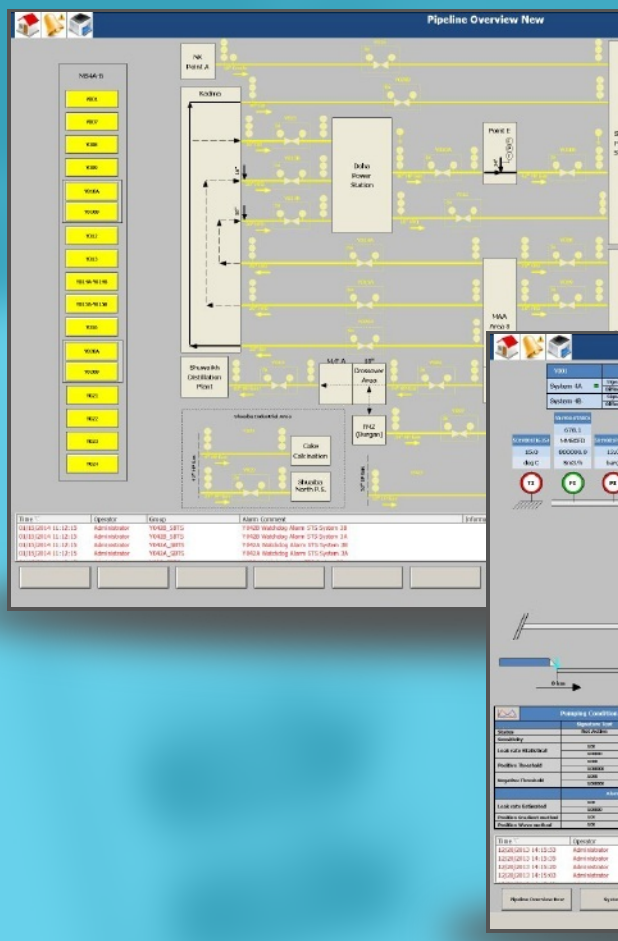
Implementation

HMI application was developed in Wonderware InTouch 10.1 software environment. HMI was developed to show all relevant data regarding LDS system and alarms, as well as most of the instrument values (flow, pressure, temperature, valve positions, etc.), complete with historical trending and pipeline efficiency. HMI design and structure were copied from the original (phase one) application, which was to be expected, considering this was an upgrade of an existing/approved system. New design and functionality was implemented in some of completely new overview and general screens, but overall, design and functionality remained the same as with "older" application.

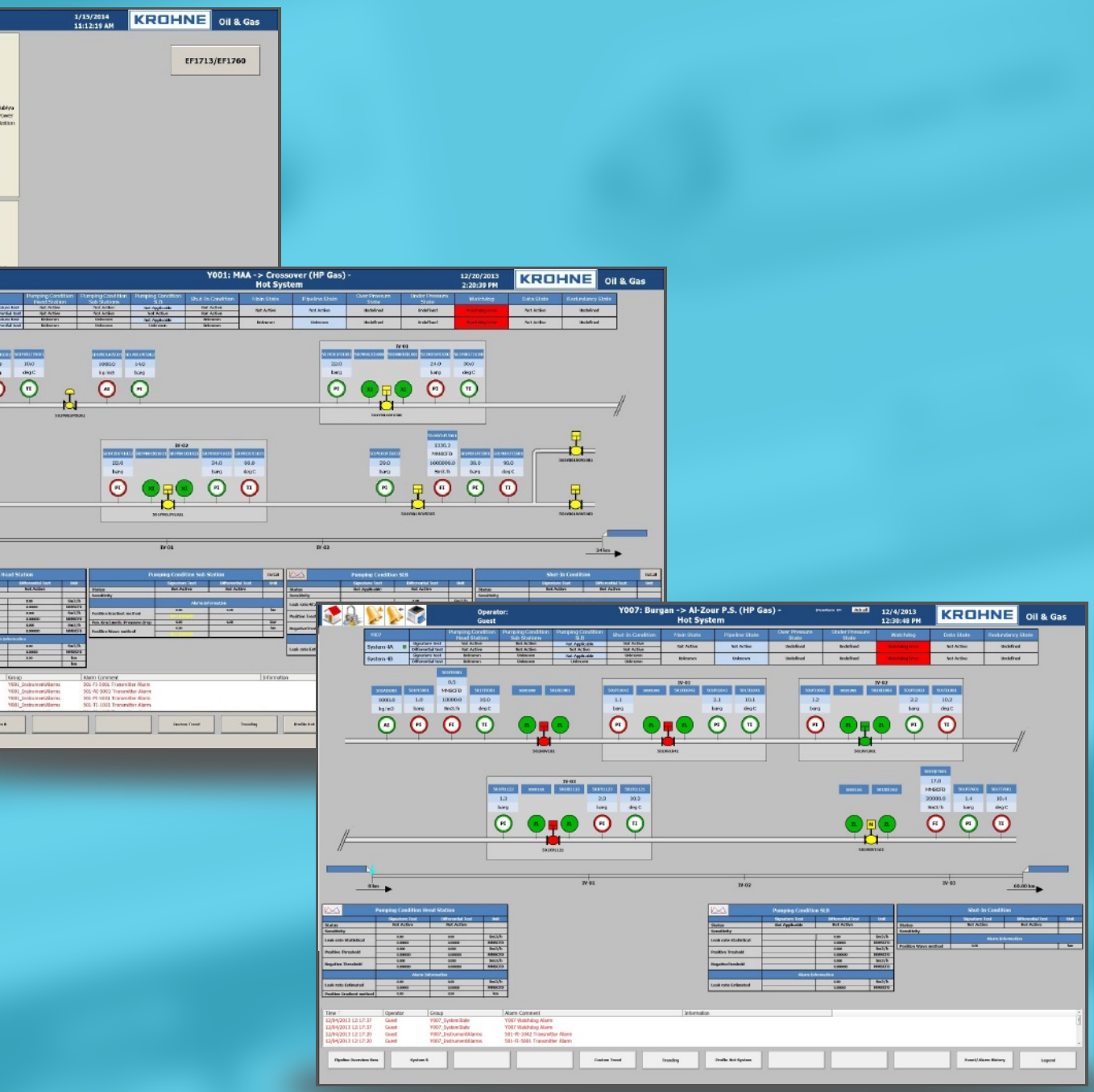
Scope of Work

» Around 20000 new tags. In total (with phase one) it amounts to close to 50000 tags.,
» Close to 250 new InTouch screens (around 500 in total),
» Over 3000 system defined attributes/ tags were also referenced,
» Around 150 new InTouch scripts and quick functions (over 450 in total).

LThis HMI was designed to work in single or dual monitor configurations. Application resolution is 5120x1600 (or 2560x1600 on single monitor), which coupled with large screen monitors (30") offers greater work area and clear visibility for all on screen displays.



SOLUTIONS ARE RUNNING


1/15/2014
11:12:19 AM
KROHNE
Oil & Gas
EF1713/EF1760
Y001: MAA -> Crossover (HP Gas) -
Hot System
12/20/2013
2:20:30 PM
KROHNE
Oil & Gas
Y007: Burgan -> Al-Zour P.S. (HP Gas) -
Hot System
Operator:
Guest
12/4/2013
12:30:48 PM
KROHNE
Oil & Gas

KOG, Leak Detection System for Pony Express Crude Oil Pipeline (USA)

CLIENT: KROHNE OIL&GAS (for Tallgrass Energy, USA)
YEAR: 2014
LOCATION: Pony Express Pipeline, USA (Wyoming, Colorado, Kansas)

Introduction

Contracted by Krohne Oil&Gas (KOG), WIG developed HMI/Scada for another Leak Detection System, this time for 700 mile long Pony Express pipeline in USA.

Application was designed for InTouch stand-alone runtime operation, with heavily featured ArchestrA graphics, and implemented on three separate (almost identical) operator stations. Pipeline was divided into 12 segments, each with its own LDS system.

HMI was designed to accommodate for Krohne's standard LDS functionality and visual style, as well as to implement customer specific style and need for some special features.

Implementation

HMI application was developed for InTouch 2014 stand-alone runtime operation. However, due to specific features requested by the customer, and the decision of the design team, HMI graphics were designed and developed almost entirely in ArchestrA environment. Most of the graphical functionality (object animations) was also developed in ArchestrA.

Operator station holds runtime environment for HMI, together with local (InTouch) history data logging, InTouch alarm and event history within local SQL database.

Application was developed in ArchestrA, and then published to be used as an InTouch stand-alone runtime application.

HMI functions as a redundant system regarding the data acquisition from remote system servers. Almost all of I/O tags are "doubled", all graphics and InTouch screens and other functionality. Even though systems were designed to be redundant, user was left with an option of following both systems based on his decision, not only one at the time based on automatic or manual switchover.

Scope of Work

» Over 11000 InTouch tags. Of those, more than 7000 I/O tags, with at least 70% of them configured as some type of analog tag (float or integer),
» close to 12000 systems defined attributes/tags were also referenced,
» over 300 InTouch screens. Of those, close to 150 full screen or large popup system screens, with average of more than 100 references per each screen,
» over 3000 tags in history, distributed on more than 100 easily accessible predefined and custom trend screens.
» over 350 ArchestrA graphical objects. Some of those, full screen size, with more than 100 references, and with more than 100 lines of scripts,
» over 200 InTouch scripts and quick functions.

Being an LDS system (leak detection), HMI doesn't have much in a way of control and regulation. It is mainly monitoring and supervision. Also, this type of system doesn't require any special reporting, or advanced history and trend analysis at HMI level.

However, this HMI features advanced profile screens, designed entirely in ArchestrA. These screens simulate pressure (or temperature) changes, usually drop of value, measured or simulated on specific points across pipeline or pipeline segment. These types of custom made screens eliminate need for third party custom trend/graph software.

Profile screens are completely custom built, and have a lot of configuration and runtime options, such as extensive color adjustment, range controls, grid transparency, data value proximity, user positioning sliders, and other. These graphs also feature, for the first time, an uninterrupted polyline which changes shape on graph to respond to runtime values and conditions. This has been available only since ArchestrA System Platform 2014 made point animation as a new feature (unavailable in older versions).

A special type of profile screen was specifically requested by customer. This profile screen is called Max Operating Head, and it shows state of pressure across entire pipeline (700 miles), but converted to "head", combination of active pressure, density, and elevation profile on more than 200 points across pipeline (X-Axis).

This screen, with its graph and table has an impressive size and complexity, but still manages to receive top value from graphic performance index and operates within 1 second sampling time. To put things in perspective, these are some of the values on this screen:

- 833 custom properties
- 17 scripts, with over 700 script lines
- 13512 line patterns
- 3709 custom property references
- 36701 solid fills
- 342 visibility animations
- 780 transparencies
- 121 location animations
- 260 push button animations
- 77 value display animations
- 30 actions scripts
- And hundreds of other graphical objects and animations

HMI for Tallgrass LDS also features extensive legend (manual) available from within HMI itself. There are several word/pdf style pages full of textual explanation and graphics or screenshot images. Some of those are represented with active elements (blinking, location positioning), and some even have simulation/testing controls and features. Legend pages are collected according to types or system groups, and the list can be accessed via legend menu.

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