INDUSTRIAL AUTOMATION
Interactive Graphical SCADA System

CUSTOMER CASE

IGSS at Odense Municipal District

Heating Company

Denmark

Odense Municipal District Heating Company (OMDH)

More than 80,000 private residences and numerous industrial plants, commercial gardening facilities and schools get their district heating from OMDH, which through 1,547 km of pipeline ensures that nobody needs to freeze in the 3rd largest city in Denmark, Odense.

District heating comes from Fynsværket (the Funen Plant) which is a combined power and heating plant. Producing electricity requires large volumes of steam which must be cooled down after use. Instead of wasting the energy in the steam by cooling it down in the nearby bay, it is recycled into the district heating pipeline where its heat supplies radiators, hot-water tanks, etc. to consumers. Afterwards the cooled water is pumped back to the Funen Plant where it is reheated to steam for electricity production and once again recycled to district heating customers. The primary energy source for the Funen Plant is coal, but oil, natural gas and waste combustion is also used.

The Funen Plant supplies 95% of the total heating consumption in the area. The remaining 5% comes from the 20 peak load stations which are also operated by OMDH.

For further information, visit the okf.dk.

7T Chosen as Supplier of Monitoring and Optimization Software

OMDH is among the leading plants in the world in terms of utilizing new technology for supervision, control and optimization of a district heating network. OMDH chose IGSS from 7T as their SCADA system, which replaced their former system, TRISAC. The overall requirement was that OMDH would be able to provide the same functionality as in the old system to ensure continuity and to make the transition as easy as possible for plant operators. And of course, IGSS had to be able to communicate with existing PLC equipment from ABB. In close co-operation with 7T, OMDH's requirements were met and this resulted in new and improved features being incorporated in the IGSS package.

CUSTOMER CASE

Since 1987, OMDH has used another software package from 7T, TERMIS, for optimizing the operation of the district heating network. OMDH was one of the very first users of TERMIS and has contributed significantly to improved product functionality with their rigorous requirements.

Supervision and Control with IGSS

In the daily operation of the district heating network, IGSS is used for monitoring and regulating the many heating and pumping stations. The operators can thus start and stop pumps, regulate set points, start up the boilers at the heating stations, etc. This can be done from the Funen Plant itself, from the administrative HQ in the heart of the city of Odense, or from anywhere else via a portable PC which is connected as a remote operator station.

Using miscellaneous overview diagrams and customized reports, the operators can quickly gain an overview of the operational status and react, if required. Of course, the alarm list is also indispensable in daily operations and OMDH has taken advantage of the smart object note functionality in IGSS. It allows operators to key in important information on individual process components, for instance if a pump has been temporarily been taken out of service. This vital information will then appear in the alarm list to inform colleagues and other operators of this condition.

As a matter of curiosity, the many commercial gardening facilities within the supply area of OMDH require very accurate monitoring and regulation. If the weather suddenly changes from bright sunshine to rain, substantial heating must be supplied to the gardeners quickly. The graph below clearly illustrates the difference between an urban area (the two curves with little fluctuation) and the areas with the many gardening facilities (the curves with significant fluctuation).

The many gardening facilities on Funen require careful heat regulation.

Planning and Implementing IGSS at OMDH

After choosing IGSS as their SCADA system, OMDH began planning the implementation. Many considerations and practical aspects went into the network architecture shown in the diagram below. Here are a few of the decisions that were made along the way. The first step was for 7T to develop a driver allowing IGSS to communicate with the PLC equipment from ABB. Next, OMDH had to find a solution for server redundancy. The remote PLCs in the heating and pumping stations were connected via modem to the servers. This in part influenced OMDH to choose the IGSS advanced A/B switch solution. The switch has several functions, but in relation to the PLCs the switch, and thus the modem connections, can be directed either towards IGSS Server 1 or IGSS Server 2. The alternative was to dualize the optical fibre cabling to the PLCs, which would have meant unacceptable costs.

The A/B switch solution has another vital role. When OMDH modifies the IGSS configuration - which is typically done every day - they can make changes on one server while all the operator stations are still online with the second server. When the modified configuration is ready for download, the A/B switch moves the operator stations to the server where the configuration was updated. OMDH has thus obtained what corresponds to online configuration.

The operator stations are located in two different buildings at the Funen Plant and at the administrative HQ in Odense City. The two locations are connected via a radio connection between two transmitters. The IGSS servers are located at the Funen Plant so the administrative HQ receives data through the remote connection. The transmission speed has proven to be a critical factor here, as it takes longer for the operator stations at the HQ to present data in the form of graphs as an example. Besides the permanent operator stations, portable PCs can also be connected from any location.

During daily operation, it is highly practical for the operator to be able to view multiple screens simultaneously - for example a pumping station diagram on one screen and an associated graph on another screen. OMDH uses the IGSS multi-screen solution where the operators have three screens at their disposal for every operator station.

OMDH also relies on the IGSS reporting system very intensively. The size of the configuration per se puts heavy requirements on the storage of data. OMDH has therefore chosen to implement an SQL solution instead of utilizing IGSS' built-in standard database in Microsoft Access format. The SQL solution results in a more effective management of the great volumes of data. There are literally hundreds of reports which need to be produced and that is the reason OMDH has dedicated one workstation solely for generating its reports.

Designing the IGSS Configuration

The IGSS configuration at OMDH is large. It contains about 6,000 objects corresponding to approximately 12,000 I/O points. This puts heavy demands on a structure, which must be robust, and on being able to devise a solid naming convention for objects in the configuration that can easily be modified and expanded to meet future needs. This ensures consistency and overview when the time comes to make changes.

The main visualization in the configuration is a map of the OMDH supply area extending in a radius around the city of Odense. The many pumping and heating stations have been drawn on the map and the operator simply clicks the

corresponding symbol to gain access. By hovering the cursor just over the symbol, the operator can see the full name of the station. All pumping and heating stations are associated with a 3-letter prefix which is used in every object name, for example

- KOP Korup Pumping Station
- KOV Korup Heating Station

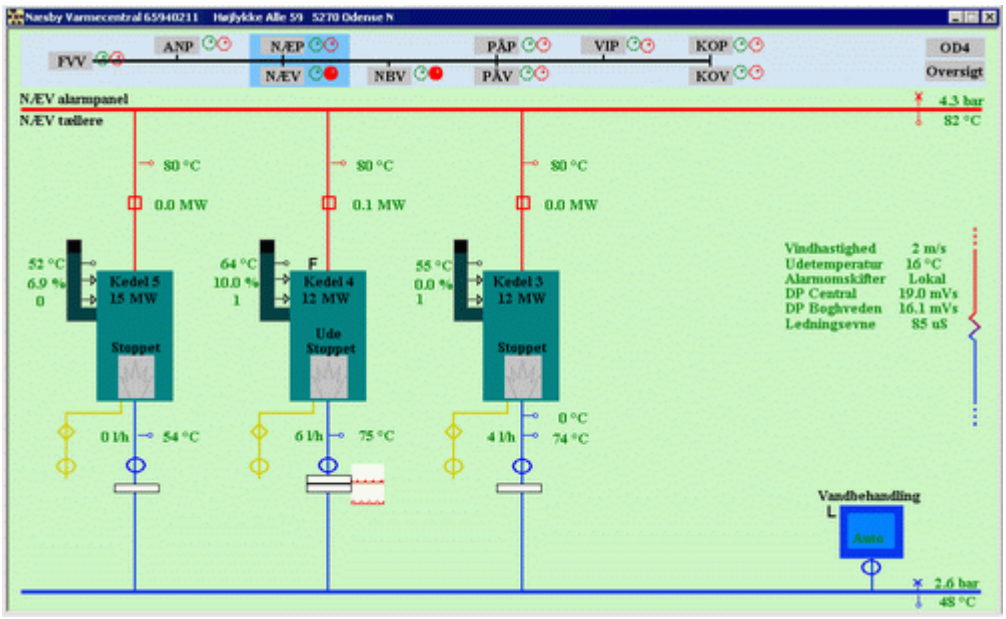
Overview map of the supply area of OMDH. The operator simply clicks on the symbol of the relevant pumping or heating station to gain access.

When the operator clicks on a pumping or heating station, the associated process diagram appears. At the top of the diagram a navigation bar is available allowing the operator to do the following:

- See where the station is located on the transmission pipeline (marked with colour coding)
- Access the other pumping and heating stations on the pipeline
- Access the main picture for the pipeline
- Access the base picture (the supply area map)

In fact, this gives the operator access to all the main pictures in the configuration and thus avoids having to navigate through the menu system.

CUSTOMER CASE



The process diagram for a heating station. Note that the operator can view the entire transmission line at the top and thus access other stations.

Besides the above pictures, the operator can also access an operational status picture with an overview of all the heating and pumping stations in the supply area.

The OMDH configuration also exploits the IGSS custom reports module, Event Report Writer (ERW), to the full. OMDH had special reporting needs, which meant that they could not use the built-in standard reports in the IGSS package. Using ERW they are now able to satisfy their requirement of being able to combine showing process values and graphs in one and the same report. They are also able to freely choose the data source for their reports. In practice, they primarily use hour, day and month values produced by IGSS' calculation engine. Because the numerous ERW reports are used frequently by operators, report printing has been automated using the IGSS program called Job Scheduler. By applying the relevant command line parameters, IGSS can be configured to print these reports either with a fixed interval or based on an IGSS event. The illustration below shows an example of an ERW report from OMDH.

CUSTOMER CASE

Odense Kommunale Fjernvarmeforsyning										
Energi FV. - Døgnrapport										
Periodestart :	29/06/2003									
	FVSUM	OD.1	OD.2	OD.3	OD.4	OD.5	OD.6	OD.7	OD.8	OKFSUM
[kl.]	[GJ]	[GJ]	[GJ]	[GJ]	[GJ]	[GJ]	[GJ]	[GJ]	[GJ]	[GJ]
0-1	404	30	28	30	56	89	81	40	50	233
1-2	444	29	27	28	56	93	99	52	60	233
2-3	453	27	27	27	57	96	99	60	60	234
3-4	460	27	26	27	56	95	98	71	60	231
4-5	468	26	26	27	56	95	106	72	60	230
5-6	514	25	24	26	55	96	124	104	60	226
6-7	465	29	28	29	57	94	102	76	50	237
7-8	353	31	29	31	54	88	69	31	20	233
8-9	359	21	24	32	57	91	76	28	30	225
9-10	364	20	28	32	59	96	79	30	20	235
10-11	387	21	27	32	60	99	85	33	30	239
11-12	395	22	29	39	62	102	82	29	30	254
12-13	391	23	31	41	61	100	77	28	30	256
13-14	402	24	31	43	61	101	81	31	30	260
14-15	392	24	32	44	62	99	80	31	20	261
15-16	406	23	31	40	61	99	80	32	40	254
16-17	392	22	31	41	62	101	71	34	30	257
17-18	386	23	32	40	60	97	71	33	30	252
18-19	382	23	31	42	62	99	70	35	20	257
19-20	426	23	32	42	63	100	76	50	40	260
20-21	409	23	32	43	64	99	75	33	40	261
21-22	439	24	29	42	62	99	89	44	50	256
22-23	459	22	31	42	62	102	90	50	60	259
23-24	475	22	31	40	62	103	94	63	60	258
Sum for døgn	10,025	584	697	860	1,427	2,333	2,054	1,090	980	5,901

By using ERW reports, OMDH has obtained full flexibility in terms of choice of data source, report content and layout.

The future at OMDH

OMDH works continuously on optimising their IGSS installation. One of the next steps will be to implement a Thin Client solution. The operator stations not directly connected to the optical-fibre network where the servers are located - for example the stations at the administrative HQ - will be converted to Thin Clients. This will result in a faster response time for graphs and reports because resource demanding data management will take place on the same PC, the Terminal Services server, where the Thin Clients also reside. Another advantage is that all IGSS software is installed on one PC, the Terminal Services server. This means that software maintenance and upgrading only has to be undertaken at one location - namely at the server. Each of the Thin Clients will run a separate session on the Terminal Services server and be able to communicate with each other and the IGSS server.

System Integrator

7-Technologies A/S.