SECURE THE ASSET IN YOUR DISTRICT HEATING NETWORK

FOCUS
COMPONENTS

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Asset management has become a popular concept within district heating in recent years. It deals with securing the value of your district heating network and production plant. In other words, it is about ensuring that as a minimum you obtain the expected service life with a minimum of operational stoppages and maintenance costs. Asset management often concerns the period after systems have been put into operation.

This article will mainly address what you can do in the planning phase to secure the value of your district heating network, but also what you can do in the construction phase and operation period.

NEW DISTRICT HEATNG SYSTEMS: PLANNING

Design

The correct design, as regards the operational conditions (temperatures, pressures, variations etc.), that the system will be exposed to is decisive for the service life. Movements and stresses must be addressed, and the best solution is to use as few components as possible and avoid the use of operational compensators altogether in order to extend service life. The pipe supplier has great experience with the design of district heating (DH) systems and should be involved together with the consultant.

Choice of casing joint

History shows that system damages typically arise in casing joint systems, and the majority is due to faulty installations.

In relation to asset management, the choice of casing joint system is essential to make sure the system will have the service life you expect, and that you do not incur unforeseen repair expenses. Thus, it is vital to choose a casing joint system with a documented service life like this for the rest of the pipe system. The casing joints must also be easy to install in order to minimize the risk of faults, and it must also be possible to test the installed casing joint to ascertain whether the installation is correct or not.

History has taught us that the best choice is between the following casing joint types:

- Shrinkable cross-linked PEX casing joints, sealed with mastic
- Weld joints, fusion-welded to the outer casing of the pipe

Weld joints are considered by the market to be the best, but at the same time the most expensive joint solution.

Weld joints require more installation equipment, but they also make it possible for the energy company to make person-independent requirements as regards weld data input, where data is scanned from a QR code on the casing joint, as well as requirements to the documentation of the welding process.

A lot of development work is being done to make the tool part of weld joints more accessible to a major number of contractors, which will obviously increase the part of weld joints in future district heating networks. See below example of a press tool with an air pressure, which can be used for all dimensions in range ø 225-800 mm as well as the example of the vital weld process documentation.

CHOICE OF SURVEILLANCE SYSTEM

Establishing a well-functioning surveillance system is decisive for due information about and localization of any damage, where moisture enters the PUR insulation. In this way it is possible to repair the damage before it spreads, and make sure that the damage does not affect the expected service life of the pre-insulated pipe system. So, the surveillance system is a crucial tool in the asset management.

The surveillance system must ensure that the following faults are quickly reported:

- Weld faults
- Installation faults, casing joint installation
- Product faults
- Excavation damages
- Steel fatigue
- Any corrosion on the service pipe

The basic function of the surveillance system is to report when moisture has entered the insulation and show how the fault has developed over time.

Surveillance systems can be designed after very different principles:

- Passive system. Manual measurements of the system by a measuring technician at set intervals e.g. once or twice a year. No active surveillance of the system between these measurements. Fault location, if any, is done by the measuring technician.
- Active system based on the resistance measuring principle with information about whether there is moisture in the insulation or not. Further analyses of the insulation resistance values and galvanic voltage can be performed to establish whether the insulation is wet or dry and whether any moisture enters from the service pipe or from the outside. Fault location, if any, is done by the measuring technician.
- Active system based on the impedance principle. In addition to above possibilities, the system can locate any fault in the system.

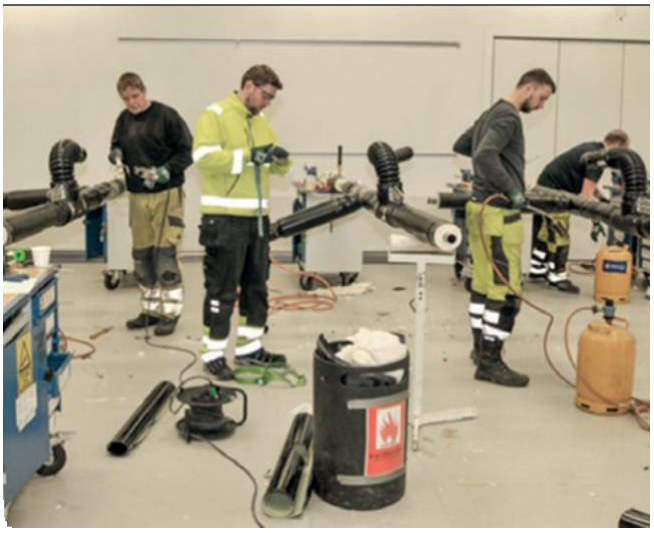
As regards asset management the recommendation obviously is to establish an active surveillance system, which makes it possible continuously to monitor and analyze the condition of the pipe system. This enables due intervention as regards any damage before it evolves and spreads in the system. In this way, the surveillance system forms the basis for obtaining at least the expected service life at a minimum of costs.

REQUIREMENTS TO CONTRACTORS

Even if the products are of the highest quality, if the installation is not carried out according to the instructions, the system will not be faultless, and repairs will be necessary. It is therefore important to make requirements to the contractor prior to the installation.

For the pre-insulated system, the welding of the steel pipes and the installation of casing joints are decisive for a faultless system during the operational period. For many years, there have been very well-defined requirements to steel welds, and it is a tradition to prescribe these.

For the installation of casing joints, it ought to be a fundamental requirement that the fitters are trained to do so, but this is not always the case. In fact, they often have no training in installing these. The energy companies ought to require that casing joint fitters have attended a course at the pipe supplier's and have been certified at regular intervals to install the casing joint type in question. In addition, the energy company should require that the course gives the fitter a theoretical as well as a practical training in installing the relevant casing joints. It would be a big step for the DH trade to raise the requirement to casing joint installation to the same level as the requirement to steel welds.



As for the surveillance system, an uncertainty often exists about the acceptance criteria for the finished system. It is recommended to require that the acceptance criteria for the insulation resistance in the surveillance system follow the specifications of the supplier of the pre-insulated pipe system. The contractor must then document this on handover, and it will be a precondition for a good starting point in the asset management during the operational period.

Most faults appear by far in the first years after putting the system into operation. With an active and well-functioning surveillance system these faults will be found within the guarantee period of the supplier and contractor, and in this way the energy company ensures that there is a sponsor for repairing the damages.

NEW PIPE SYSTEMS: THE CONSTRUCTION PHASE

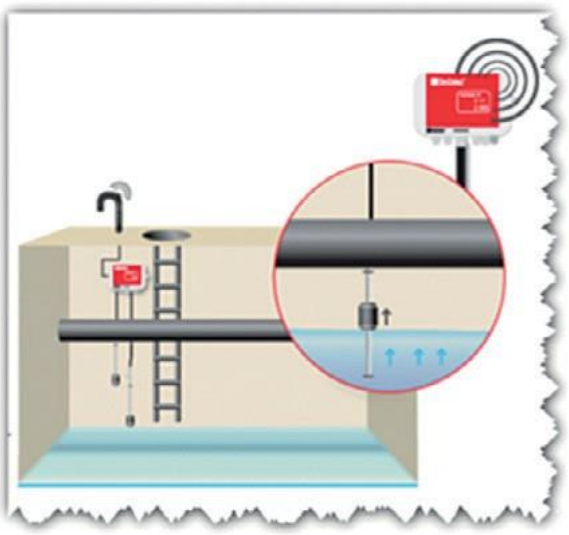
Trust is good, but control is necessary. It is decisive for the pre-insulated pipe system being installed without built-in faults after the instructions that an active inspection is performed in the construction phase. Unfortunately, this is often neglected. With an active supervision, potential faults are stopped in due time, and the basis for a faultless system for the part of the asset management belonging to the operational period will be good.

It is therefore recommended that the energy company is trained to supervise casing joint installation and surveillance systems at the pipe supplier's.

OPERATIONAL PERIOD

In established district heating networks, the active surveillance system must be monitored continuously, and you must react to the information you receive. The energy company can monitor the surveillance system, but it is also possible for the pipe supplier to offer this service.

The only physical thing you can see in the pre-insulated, buried system are the pre-insulated valves in chambers. The energy company should establish a routine for planned chamber inspections 1-2 times a year, where the valves are operated. This ensures a long service life of the pre-insulated valves. In addition, it is possible to install detectors in chambers, which sends a message if the chamber is flooded.



EXISTING SYSTEMS

In many pre-insulated pipe systems with a surveillance system that has been in operation in a few or many years, the surveillance system is often not up-to-date regarding drawing material and it is often a passive system. It is recommended to update the drawing material and make precise, as-built drawings, and then upgrade the surveillance systems to active, continuously monitored surveillance systems. This is possible for skilled measuring technicians and will certainly extend the service life of the pre-insulated pipe system instead of continuing with the “old” one, because then it is possible to repair old faults and respond quickly to new ones.

In old pre-insulated pipe systems, there is often a problem with leaky casing joints, which can be located with an updated surveillance system. It is recommended to make a renovation

plan for exchanging old leaky casing joints, because it will prevent further corrosion of steel pipes and leakages in the pipe system. There are products and techniques available to replace old straight joints, bend joints and T-joints without interrupting the operation and cutting the steel pipes. It requires a special installation technique and trained fitters.

OLD PRE-INSULATED PIPE SYSTEMS WITHOUT SURVEILLANCE SYSTEM AND PIPE SYSTEM IN CONCRETE DUCTS

In these systems, the only way to monitor the condition is to make thermographic surveillance as periodic inspections of the DH networks. If there are leaks in the steel pipes with major water loss, then it is also possible to locate the area where the leak is by analyzing data from meters in the system and at consumers’. In these systems, damages are not found until they are comprehensive e.g. moisture coming from the outside and spreading in the system or an actual rupture of the steel pipes with water loss as a result.

In old systems with surveillance wires, it will therefore be much preferable to update the system to an active surveillance system, so you can always react quickly, before the faults evolve to large and expensive damages.

DIGITALIZATION AND FUTURE DEVELOPMENT

The trend is towards the energy companies wanting more and more data from the systems. Data, from which they can make the right choices. This is also true of pre-insulated pipe systems, and we will certainly see a trend towards more ”digitized” pre-insulated pipe systems.

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