KLINGER
The Netherlands

STEAM SURVEYS

Safe, efficient and ready for the future.

Whitepaper

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INTRODUCTION

Is working with steam a thing of the past? Absolutely not. A substantial share of the natural gas extracted in the Netherlands is still used to generate steam for industrial applications. Innovations and upgrades to steam systems are commonplace these days — and that requires specialists who monitor steam systems from a qualitative perspective and who share their knowledge. KLINGER's Survey programmes for both complete installations and steam traps are unique in this area. This whitepaper tells you more about how safe steam systems will keep you ahead of the pack in a cost-effective way.

WHY DOES GOOD STEAM PRODUCTION MATTER?

Steam is one of the most important energy carriers in the industrial sector. Nearly all products we use in our daily lives will have used steam at some point in their manufacturing process. Steam is mainly used to generate energy at power plants, to generate heat, in reactors and for other purposes in the petrochemical sector, for example, as well as to drive machinery.

Even though steam has been used for centuries, our knowledge about steam in production facilities is not as extensive as it should be. Both the layout of installations and the appendages used, such as steam traps, are aspects that are often overlooked. Not only during the construction of industrial installations, but during their maintenance too, users often opt for the cheapest solution, without realising the problems this may bring about in the longer term. For those reasons, flawless and sustainable steam production is of the utmost importance for the continuity of industrial enterprises.

WHAT ARE THE RISKS OF NEGLECTED STEAM SYSTEMS?

The quality and correct application of steam traps is often overlooked. As we mentioned earlier, this often comes down to cost, but in some cases, a lack of knowledge and insight is the reason. Unsuitable steam traps will lead to problems in the short or longer term, such as the inability to vent systems properly. This will cause the condensate to acidify more and more, which will result in it ravaging the pipework from the inside out in the form of corrosion and erosion. Another risk of selecting the wrong steam trap is the inability to properly discharge the condensate. Among other things, this may lead to water hammer and other incidents, occasionally with disastrous consequences.

Aside from risks surrounding steam traps, other elements of the steam and condensate system require attention too, including the boiler, steam and condensate distribution and the applications (“consumers”). For example, when a steam system is not functioning optimally, more gas will be needed to produce steam, and production losses may occur. Some of these possible problems are quantifiable as part of monitoring systems, but when a steam trap gets blocked and stops discharging, this is not immediately visible and other safety issues may arise due to condensate no longer being captured from the steam.

In terms of physics, these potential problems all arise from the fact that saturated steam no longer cools down, but condensates inside the pipework instead. When the temperature is measured, it is not always clear what exactly is moving through the pipework: steam, condensate or a mix of the two? If the temperature is acceptable, operators may think that everything is running just fine — even though condensate is being deposited inside the pipework right there and then, with all the implications that entails.

The seed of future problems is often sown as soon as the construction phase of a new factory starts. Building needs to happen as cheaply and quickly as possible, which often results in the installation of components that prove to be unsuitable for their role in the process. The outages, leaks or costly repairs to the steam system that result from these decisions often cause the TCO to rise so quickly that it would have been better to invest in quality products right from the start.

CAN YOU RECOGNISE THE RISKS SURROUNDING STEAM SYSTEMS?

Both literally and figuratively speaking, industrial processes never stand still. Production methods change and innovations take place. New steam applications and hot water systems are developed and production demand changes, with an increasing amount of peaks and troughs.

Knowledge remains limited among many process operators. They are not always sure how exactly to get a process up and running again after a shutdown, and problems soon follow. In other cases, they simply don’t realise the risks posed by the sheer amount of energy running through their systems. It can occasionally be a challenge to increase that awareness, because when a steam system has been running fairly well for a number of years, it’s difficult to accept suggestions for improvement.

That said, everyone involved in the steam process stands to gain from a system that functions properly: from process technologists to safety specialists, and from maintenance staff to operators. The focus always has to remain on safety. In many cases, everything is perfectly under control as far as the steam boiler itself is concerned, as the measurements from that are quantifiable. However, as soon as the steam leaves the building, it often finds itself in no man’s land.

One interesting example of how things can sometimes go wrong is the “plume”: condensate that is drained via an infiltration drain is still hot. This results in a steam plume that everyone can easily see. The management assumes that this plume equates to energy losses — and consequently, extra costs — and decides to take the steam trap out of service by shutting it off. The plume vanishes as a result, but the shut-off steam trap has disastrous consequences for the rest of the steam system.

» “Plumes” are often associated with energy losses, and consequently, with extra costs. A plume can easily be made to disappear by shutting off the section in question, but doing so has disastrous consequences for the rest of the steam system.

WHAT IS A STEAM SURVEY?

A Steam Survey is a KLINGER service that focuses on the full range of risks and opportunities in steam installations. It is a unique method in which KLINGER, in close cooperation with its business partner Armstrong International, performs so-called steam installation audits (a “pre-audit”). Our specialists highlight any problems and potential risks as part of these audits, but they mainly identify new opportunities to make steam systems safer, more efficient and more sustainable.

Parallel to the Steam Survey and the on-site implementation of solution, KLINGER also focuses on educating the technical support staff. In some situations, employees are fully updated on the basic principles of steam: what are the concepts, what is condensate, how does the whole pipework system operate, what is the role of steam traps and what are the differences between the various elements? Based on this fundamental knowledge, our KLINGER specialists and your staff can work together much more effectively to find potential problems in your steam process and come up with on-site solution to prevent any outages.

WHAT IS A STEAM TRAPS SURVEY?

The Steam Traps Survey programme involves regular monitoring of steam traps within steam installations. Our KLINGER professionals will check the functioning, sizing and durability of your steam traps. Of course, the quality of the steam system upstream to any steam traps and the condensate system downstream from the traps will also be considered.

» MANY FACTORIES ARE OPTIMISED TO THE GREATEST DEGREE AS PRODUCTION FACILITIES, BUT THEIR STEAM INSTALLATIONS HAVE NOT EVOLVED ALONGSIDE. «

WHAT MAKES A STEAM SURVEY SO IMPORTANT?

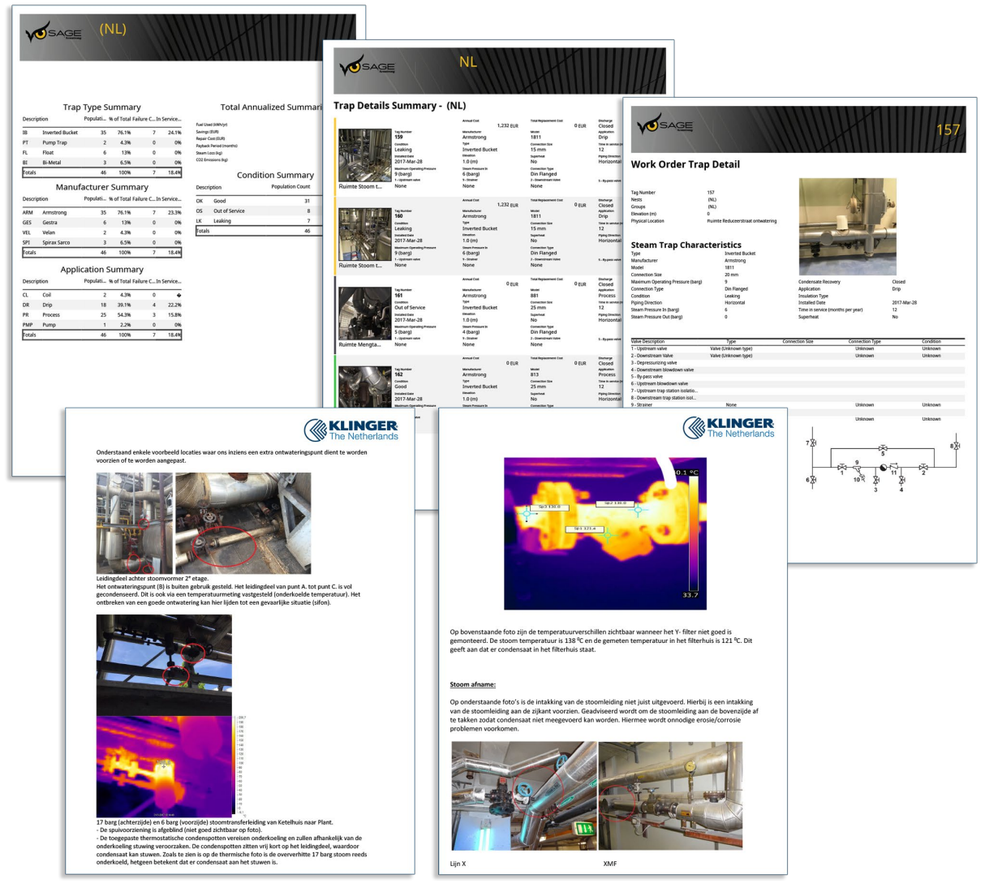
Lots of factories were built decades ago for one specific purpose. They have fulfilled that purpose perfectly well, but the pressure to produce more and more has also risen as the years have passed. The basic elements of their steam systems have been gradually improved to be able to cope with new production capacity levels, but often, the connections back to the utilities have not been taken into consideration: how do steam and condensate relate to these new adaptations? To put it concisely: many factories are optimised to the greatest degree as production facilities, but their steam installations have not evolved alongside. This often leads to a chain reaction of problems: outages, leaks, damaged pipework and too many unnecessary delays in the production process.

A Steam Survey creates a seamless overview of all risks through a pre-audit or thermal audit followed by a Steam Traps Survey. One of the outcomes may be that certain elements of your steam system need to be modified. This may involve the sizing of your pipework, your pipe routing or the way in which systems and consumers are added or removed. When too much capacity is demanded from a steam system that is not designed for that purpose, this may lead to various problems in terms of capacity, safety or excessive wear and tear. By carrying out a thorough survey of pressure and temperature, systems can be prepared for a more efficient and safer future.

The opposite might happen too: when a production facility is downgraded and elements of the process are moved to a new location, this has a significant impact on substance flows through a steam installation. When these flows drop to just a tenth of the speed the installation was built for, problems are inevitable. A Steam Survey or thermal audit identifies these obstacles in a simple way and at an early stage.

Another thing that’s good to know is that a Steam Traps Survey involves more than just looking at the condition of your steam traps. They constitute just a small part of the overall systems in which huge amounts of energy and thermodynamics converge. In fact, the quality and functioning of steam traps is the very last thing that’s looked at as part of a Steam Traps Survey.

First of all, we need to know where a steam trap needs to be installed, what its function is and what happens upstream and downstream from this point in the process.



HOW DOES A STEAM SURVEY DELIVER RESULTS FOR YOU?

KLINGER and its partner, Armstrong International, often find themselves discussing energy management and savings with their customers. Larger organisations in particular need to demonstrate to the relevant authorities every four years exactly what their efforts have achieved, as part of the Multi-annual Energy Efficiency Agreements, among other things.

Of course, the energy awareness of large and smaller enterprises only reaches as far as their willingness to invest, but with a plan resulting from a Steam Survey, businesses can take a serious look at increasing their sustainability, reducing their CO2 footprint and boosting the safety of their steam installations. Doing so delivers measurable results that lead to an improved image, including from a PR perspective.

WHAT DOES THE SAGE SOFTWARE SYSTEM ADD?

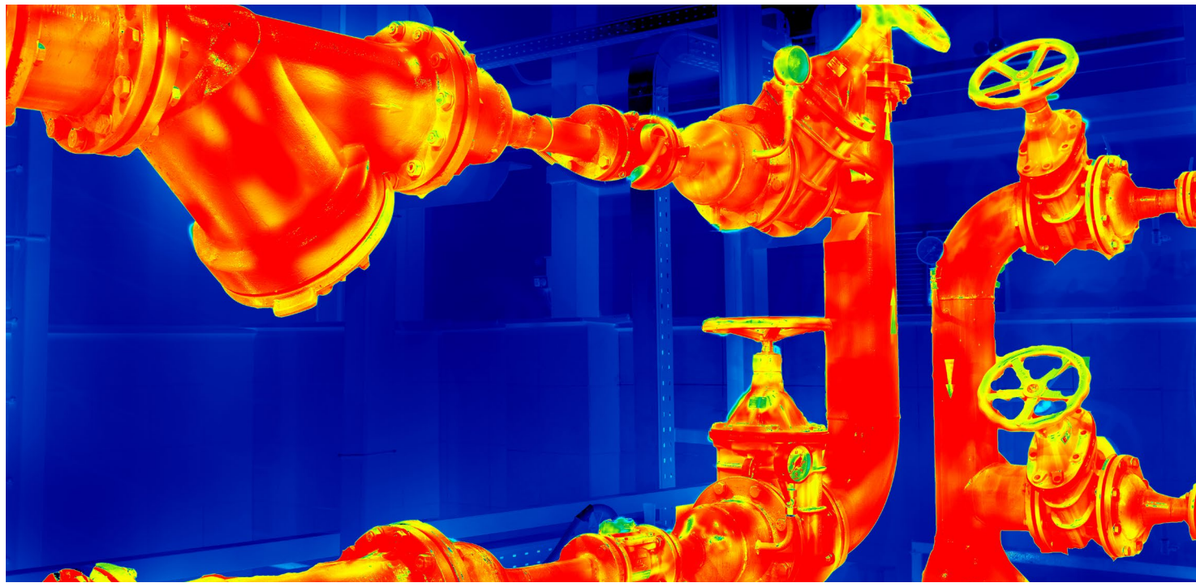
KLINGER works together closely with Armstrong International, an international family business that has developed a comprehensive service package including audits that have led to in-depth studies into the engineering of steam systems.

For many years now, Armstrong International has been building a database known as SAGE, which is in a unique pioneering position when it comes to knowledge of steam systems. The SAGE database includes nearly 7,000 variants of steam traps from all kinds of manufacturers, in all their different types and sizes. This has resulted in an unprecedented amount of information about the countless configurations of every single steam trap; sizes, different interior finishes and various extra options are all recorded in SAGE.

One of the main benefits of using SAGE is that the energy losses resulting from a leaking or blowing steam trap can be calculated in great detail. As all interior dimensions are recorded, the amount of steam that escapes when a leak forms can be established on the basis of the pressure before and after the steam trap. This calculation shows the amount of steam lost in kilos, which makes it clear how much gas has been used in the steam boiler and how much energy and CO2 emissions this entails. In other words: what are the losses from a leaking or blowing steam trap actually costing you?

The special element added by using SAGE doesn't relate merely to the immediate maintenance of steam traps, but mainly to their broader management. Nearly all data is collected in SAGE for every steam trap in a steam installation. SAGE doesn't just record how a steam trap is functioning, but also how it is contributing to energy management and the broader quality of the steam system. In addition, SAGE records how the drain point of each steam trap is composed.

In practice, this happens by "tagging" the steam traps, electronically if required. The big benefit of this is that customers can report an issue with a specific steam trap even after several more years have passed, and that SAGE can immediately recommend whether a replacement or repair should be performed. It is even possible to present any faulty steam traps to customers directly from SAGE, including all the relevant information they need to call in an installer.



HOW DOES KLINGER HELP YOU LEARN MORE ABOUT YOUR STEAM SYSTEMS?

Together with Armstrong International, the leading partner in system solutions, KLINGER possesses the expertise and equipment to survey your steam systems. We do so with first-line, on-site advice on any issues and optimisations. The following options are available:

1. STEAM TRAPS SURVEY

KLINGER will check the functioning of the steam traps in your steam and condensate system. A specialist KLINGER/Armstrong International technician will take stock on-site, gathering the various relevant data from your steam traps. The results of this survey will be reported using the steam trap management programme SAGE. This programme provides an overview of the functioning of your steam traps, any possible losses and related comments/recommendations. An option to take out an online subscription to SAGE is also offered.

Aside from the report on the survey and functioning of your steam traps, KLINGER/Armstrong International will also create a global basic analysis of your steam and condensate system. Comments surrounding any flaws in the system will be presented to you in an additional report.

» **EXAMPLE**

A 1/2” steam trap leaks around 10 to 15 kg of steam per hour at a steam pressure of 10 bar, which results in an additional cost of around € 3,000 per year at a steam rate of around € 25 per ton. When you add the additional CO2 emissions into the mix, it soon becomes clear that there are significant savings to be achieved in this area, both financially and from an environmental perspective.

2. TRAINING AND SEMINARS

In-depth knowledge of your system is essential to be able to safely produce as optimally as possible and to detect any problems at an early stage. To achieve this, staff not only need to possess certain skills; they also need to stay up to date with the latest technological developments. KLINGER and Armstrong International offer courses and training to acquire skills and to improve knowledge. Our expert trainers are backed by years of experience with steam systems. Training can be provided on location, or at our training centres in Rotterdam, Elsloo or Herstal (B).

The Armstrong University also offers a wide range of online training courses. Our complete range of training and seminars can be viewed on this page.

3. PRE-AUDIT

The purpose of a pre-audit is to create an overall picture of your steam system. A pre-audit is suitable when you are in the exploratory phase of improving your systems, or when you are drawing up a multi-year plan.

4. THERMAL SYSTEM ASSESSMENT

A thermal system assessment delivers a detailed overview of your subsystems, any losses and their causes. A comprehensive assessment is mainly suitable for detecting recurring or hidden defects, exploring the potential for improvement and optimising your production. The assessment is followed by improvement recommendations, which we can help implement.

These studies are performed in all types of industries: the chemical/petrochemical industry, the general and food industry, pharmaceuticals, cardboard and paper manufacturing, the steel industry, general manufacturing and so on. The objectives vary greatly and are discussed in detail beforehand. Topics may include:

- Improving safety,
- Energy optimisation,
- Mapping potentially hazardous situations,
- Condensate recovery,
- Desuperheaters,
- Heat exchanger optimisation,
- Dryers,
- Tank heating,
- Water hammer studies,
- Reboiler optimisation,
- De-steaming (replacing steam with hot water systems),
- Heat pump applications,
- Creation of heat balances for production sites,
- Thermal optimisation,
- HVAC units,
- Turbine system optimisation,
- Residual heat recovery,
- Increasing production capacity,
- Steam and condensate distribution network analysis,
- Boiler room efficiency improvements,
- Alteration and newbuild support,
- Advice to engineering firms,
- Equipment sizing and selection,
- Performing multi-day measurement campaigns (pressure, temperature, water hammer, efficiency etc.).

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‘KLINGER for safety,
services and solutions’

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