

Steam as an asset: a sustainable asset management program from TLV



Dr. Uwe Minkus,
President of TLV
Europe.

Although steam is a fluid of very significant importance in our industrial plants, managers do not often give it the attention it deserves, particularly when the apparatus that uses it may be regarded in the factory as 'critical' equipment. Managing Aging Plants magazine recently met up with Dr. Uwe Minkus, President of TLV Europe, who took time to explain how the company's Steam System Optimisation Program (SSOP) is a tool which, if used correctly can lead to major improvements in safety, reliability, and profitability.

By John Butterfield and Gillian Gane

Steam in industry

A whole industrial age is linked with steam based on the invention of Watt's steam engine, and in industry today steam is still used as a powerful energy source. It has many positive physical characteristics but these must be balanced with costs and availability. The analogy between steam and industrial plants is very much like that between blood and the human body. Steam flows like blood through every corner of a plant. It travels through complex piping systems and returns as a condensate. Without steam life as we know it would not exist but, despite

its importance, there is a big contrast between the attention that many owners give to it in their industrial plants when considering that steam using apparatus is classed as being very critical equipment. Says Dr. Minkus, "If you walk through a refinery you will often see steam leaking out of rusty pipes everywhere and you will hear noises that sound like bullet shots, making the pipe-work system shake like crazy. The two worst sounds to assault your ears will be a very loud hissing noise, indicating leakages and the more alarming banging sound of water ham-

mer. The older the plant the worse the situation is. With the continued need for increased competitiveness, the integrity and efficiency of steam-using equipment is often critical to productivity and the same goes for steam distribution systems. Based on our steam knowhow TLV wants to support the industry and at the same time to give value to our customers' challenges."

About TLV

TLV is a family owned company based in Japan. It was founded more than seventy years ago, dedicated right



from the start with a long-term strategy of being a premium steam equipment supplier to all industries. "From day one TLV looked to improve upon the many products that were available in the general market, which were being supplied to the industry. One result of this campaign was the design of the inventive, patented Free-Float-Steam-Trap – a much more energy efficient solution, which was brilliant in its simplicity. TLV always seeks the best, innovative solution for a particular application and the number of patents that the company now holds has grown to 1400," explains Dr. Minkus.

Services

There is no doubt that TLV has improved inspection services relating to steam systems.

Dr. Minkus: "In many applications looked at the failure rate of steam traps was enormously high: more than 30% of the traps were not working correctly. Either they were leaking or, even worse, blocked resulting in no condensate being discharged and water collecting in the systems. This residual water could

create water hammer with catastrophic consequences for all valves and pipes in the system. Water hammer can create pressure peaks of over 120 bars whereas most systems are only designed for 10 bars. In the best cases this will mean only more leakages and wear upon and in the sealings but in severe cases the pipes or valves can rupture and the resulting escape of steam can cause injury to people."

"With TLV's sophisticated inspection service tool, the TRAPMAN, all failures can be detected easily, independent of the surveyors' knowhow, says Dr. Minkus. The TRAPMAN consists of instrumentation and software, with a database of over 3.000 models, which has been certified by Lloyd's, and can quantify all leakages and other errors. Over a period of many years TLV's steam specialists have further supported industry through various types of consultancy relating to steam, not only for piping, valves and steam traps, but also for different kinds of applications such as heat exchanger, turbines and flares. In many cases it becomes obvious that the existing valves and steam traps

reduce performance and increase failure risk of the applications. Nevertheless, despite all the contributions that TLV has made to industry in the form of unique solutions, made through its powerful inspection services and consultancy teams, steam is still an issue in daily operations. Dr. Minkus elaborates: "From time to time a customer may not be able to make full use of the services offered by us for one reason or another: perhaps shared responsibilities for the steam within a plant, between the process maintenance departments for example, or limited resources in manpower and steam knowhow. To overcome this situation we have developed a comprehensive management program combining all the elements and taking over the management of the optimization process. SSOP – Steam System Optimisation Program, is a tool whose goals are to improve safety, reliability, and profitability. The key features of this program are, first and foremost, to identify and visualize any problems and, secondly, to optimise the system in a timely manner."

The SSOP program

Dr. Minkus explains that the SSOP program is a three-phase concept that typically runs for a period of five years. He says that its use can lead to tremendous results in many plants by incorporating it into different plant phases that include comprehensive inspection, the analysis of steam use in applications, steam production, and solution provision.

Because of the different scenarios and situations that have to be taken into account within industrial plants such as their size and age, the SSOP management program has been made to operate very flexibly, the more so since it is very important that transport and modularity meet customer expectations. "During all phases of the program the site personnel are involved. On the one hand during the analysis phase we need a lot of information about processes and current challenges whilst, on the other hand, we need to be totally transparent. All the results (in terms of reports) and all the collected data are fully accessible to customers at all times. Moreover, the training sessions for site personnel can also be integrated. In order to give our customers a basic idea of the value of SSPO, we offer customers an 'initial SSOP assessment'. This normally takes a week during which time we focus on one part of the industrial plant, highlighting all the features of the program. If the customer agrees, we can then extend the program to include the whole site."

"In Phase 1 all condensate discharge locations are identified and inspected by sophisticated measurement equipment. With all these regularly collected



Old steam traps in an industrial plant – a clear indication that although steam is a fluid of very significant importance in our industrial plants, managers do not often give it the attention it deserves, particularly when the apparatus that uses it may be regarded in the factory as 'critical' equipment.

data the basis can be created for further optimizations. A program is then initiated to manage the improvement of this system: *BPSTM – Best Practice Steam Trap Management Program*. The average result we reach regarding the failure status is below five percent. Problems caused by condensate can be solved and steam losses can be reduced considerably."

Dr. Minkus tells us that in Phase 2 the steam using equipment is the focus. Based on a detailed analysis by TLV's steam specialists in cooperation with the customer's process engineers and operators, proposals for safety, reliability and productivity improvements are worked out. Recovery and re-use of condensate and waste heat is considered too.

Phase 3 of the program is dedicated to larger installations with numerous steam producers, steam users and

complex systems with different pressure levels and changing steam loads. By simulating a complete steam system in a steam balance program, optimization can be easily calculated. Out of the energy saving consultancies for the complete steam system, various optimizations are normally proposed showing a return on investment in less than one year.

Dr. Minkus goes on to say that, after long periods of plant operation the steam and condensate system is usually in a poor condition. For example, based on a worldwide analysis mainly in refineries and chemical plants, the use of the SSOP program can bring an increase in energy efficiency by reducing leakages (changing a failure rate of between 20% and 40% to below 5% and an increased performance of applications like HX), process reliability can be increased (there is no



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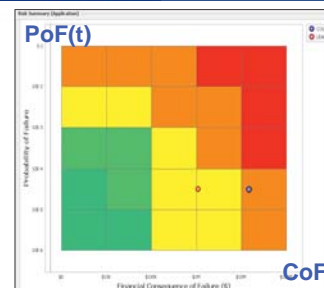


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loss of energy by blocked or leaking traps leading to equipment failure in important processes and eventual shut down), and HSE risks can be reduced (no more damage to pipes or valves due to water hammer). In more than 100 hydrocarbon and chemical plants worldwide this program is already being successfully applied and, due to its effectiveness, two energy efficiency awards have already been granted to the program.

**Based on RBI concepts of API 580/581,
World's First Risk Assessment Methodology for
Steam System Assets**

Probability of Failure : PoF(t)
Damage Mechanism, Equipment
Generic Failure Frequency, Operating
Conditions, Inspection History etc.
Time-based Probability



Risk = PoF(t) x CoF
(Quantitative Assessment)

Consequence of Failure : CoF
Production Loss, Component
Damage, Injury Cost, Steam Loss etc.

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The concept of Steam System Risk Management.

Latest developments

The latest development in the SSOP program is the integration of a risk-based approach. In the process industry more and more decisions are risk based, such as maintenance actions, inspection frequencies, and the management of change. Currently this approach is not available for steam. This risk-based solution methodology was developed in cooperation with TWI, a UK based research institute, and Dr. Brian Cane. It assists engineers in the optimisation of steam system assets. The methodology employs a formal, systematic risk management approach involving quantitative assessments of risk of failure

for steam-using applications followed by selection and scheduling risk mitigation recommendations. This methodology has been developed to be compliant with latest API guideline (API RP 581). Dr. Minkus concludes, "Over seven decades TLV has established a worldwide network with TLV associate companies and distributors. In Europe, for example, there are more than 100 people working for our customers. The SSOP program is applicable throughout the world. In Germany, UK, and France, you can contact our offices directly and we have TLV representatives or long-term partners elsewhere."



TLV's Free Float trap. With only one moving part, the sphere, an excellent performance can be achieved. Moreover says Dr. Minkus: "There is minimum leakage at all loads to the highest reliability and it is brilliant in its simplicity for all kind of applications: from pipe heating through to tracing to heavy loads in processes."