Thermal power station put to the test:

Plant inspection with the Siempelkamp Prüf- und Gutachter-Gesellschaft in Chemnitz

According to the local press, the Siempelkamp Prüf- und Gutachter-Gesellschaft (SPG) in Saxony "took a critical look at the city's furnace" in spring 2013: the Dresden-based Siempelkamp subsidiary inspected the entire pressurized plant in unit C of the Chemnitz thermal power station. Where otherwise hot fires of more than 1,000°C are blazing to provide the citizens of the city with heat and power, the inside and outside of pipes and turbines had to report for a check-up.

by Dr. Peter Seliger

The eins energie thermal power station at Chemnitz, Germany, provides heat and power to a large part of the city's citizens on 365 days a year (photo: eins energie in Saxony)

Scaffolded for inspection: the boiler house
(photo: Andreas Seidel, Chemnitz)

Cutting works at the exhaust system
(photo: Andreas Seidel, Chemnitz)

The inspection taking place from the middle of May to the middle of June 2013 included the entire pressurized plant, i.e., the boiler and the pipe components of power plant unit C. According to the proverb: you must finish what you start, inspecting unit C means you also have to look at unit B and unit A: during the summer, the inspection of unit B was next, followed by the one of unit A in 2014.

Inspections usually take place between spring (March) and late fall (October). Following the slogan "one man's meat is another man's poison," during the winter, the power plant generates heat provided to the population, while during the inspection phase in the summer months, the inspection personnel sweats – since then too, the temperatures within the power plant are considerable.

Inside the steam boiler in unit C, which is almost 60 m high, SPG employees inspected the condition of pipes and other components. Two weeks earlier, the fire in the boiler was extinguished for it to cool down so the scaffold could be threaded in through the opening of only about 1 m and then to be set up. In addition, pipes and claddings had to be sandblasted and ground to ensure the material testers' access to the blank metal.

"Using magnetic-particle and ultrasonic testing devices we determine if cracks have developed," Dr. Peter Seliger, head of plant inspection at SPG, explained. The hardness of the material, the wall thickness and diameter are also measured. Furthermore, the SPG team takes samples to check the condition of the material's microstructure to determine changes caused by exposure to stress, and deriving from this the remaining useful time of the pipe components.

Dresden goes Chemnitz: special knowledge trumps

The connection between Chemnitz and Dresden is based on a long-standing tradition: employees of the SPG predecessor Kraftwerksanlagenbau Dresden had already been involved in the construction

View into the burner of a boiler
(photo: Andreas Seidel, Chemnitz)

Siempelkamp's plant inspectors from Dresden in the power station

of the thermal power station in the 1980s. Today, the customer benefits from the development of the SPG, which evolved in the 1990s from a research institution into a service provider for testing and expert services recognized on the energy and power plant market. "At the time, it showed that in the area of lifetime monitoring of conventional power plants, there is an opportunity to retain customers permanently that started to reduce or outsource own capacities due to the liberalization of the energy market," Dr. Peter Seliger explained.

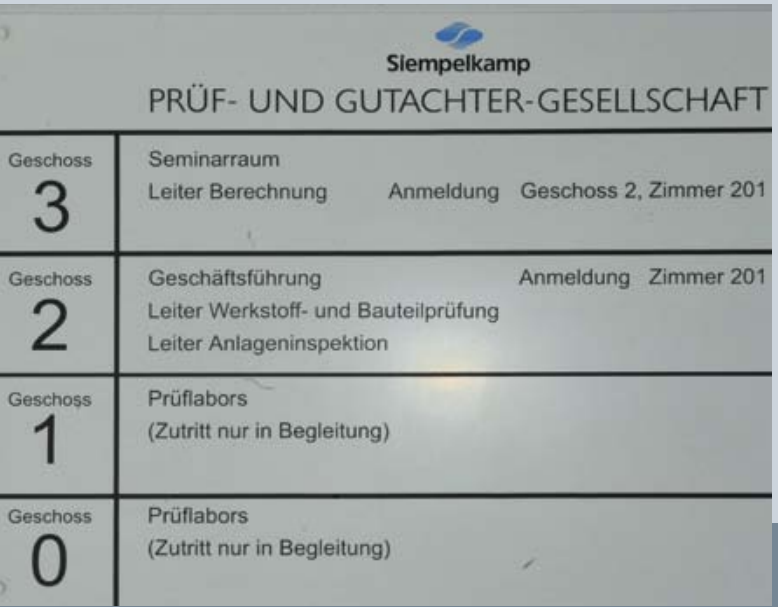
Since then, the SPG has established itself on the market as a specialist for the lifetime monitoring of power plants exposed to extreme stress. By founding an accredited inspection body of type A according to DIN EN ISO/IEC 17020 in 1999, and creating an independent department "plant inspection" in 2000, the objective was to respond more powerfully and specifically to the needs of the end customer. These end customers are the operators whose power plants are exposed to extreme thermal stress on the plant as well as chemical/petrochemical industry.

"During the past years, we successfully enhanced our assignment profile increasing the efficiency and quality of processing major testing and inspection programs in a more professional manner. Here, it proved to be a major advantage that due to the close connection of both other specialist departments 'material and component testing' and 'strength calculation' within SPG, we are provided with the competence to process the issues of our customers in a complex manner," according to the expert for inspection services Dr. Peter Seliger.

Tested and approved

On a scale of school grades from 1 to 5 (1 for "excellent" and 5 for "poor"), the SPG team awards the tested parts of the thermal power station, whose three units were put into operation between 1986 and 1990, a 2 – a satisfactory result for the power plant management. The evaluation implies that the plants can remain in operation in the years to come without major replacement investments. The checks also intend to enable the operator to determine and plan required long-term replacement needs.

SPG awards the tested parts of the thermal power station a 2- on level two there also is located the department plant inspection on the Siempelkamp premises at Dresden, Germany



f. r. t. l. Dr. Peter Seliger, head of plant inspection at Siempelkamp, with the head of the thermal power plant Silvia Trümper, the person responsible for service/maintenance Thomas Pöhler and chief machinist/coordinator Marco Gläser of the eins energie thermal power station (photo: Andreas Seidel, Chemnitz)

Dr. Peter Seliger, the expert for plant inspections

Inspection or total turnaround?

Four questions for Dr. Peter Seliger, head of the specialist department plant inspection of Siempelkamp Prüf- und Gutachter-Gesellschaft in Dresden.

Bulletin: Dr. Seliger, can you please describe how a power plant inspection is performed?

Dr. Peter Seliger: It is a very individual matter. The variation of the conventional power plants or the chemical or petro-chemical plants with regard to size, type, age and operating mode requires that an inspection program is specifically tailored to the operator and adjusted to the duration of an inspection. Here, due to its long-standing experience, the SPG can already be included in the preparation process and compile suggestions.

How much time and how many employees are involved?

Dr. Peter Seliger: The interval ranges from one workday to two months (see box on page 69). This requires careful assignment and personnel planning. In part, up to 20 employees are involved, whereby for very comprehensive actions – for instance, shutdowns of refineries, the so-called turnarounds – we can and will fall back on certified subcontractors. For the performance of this shutdown program, constant contact to the customer or the approved surveillance bodies such as the

Inspection activities – a job with attention to detail

Basics of the inspection activities

Basically, the requirements on the commissioning, testing and monitoring of pressure vessels, boiler plants and pipes are regulated by the legislator in directives and regulations such as the German "Betriebssicherheitsverordnung" (ordinance on industrial safety and health). Here, detailed regulations regarding testing and monitoring activities during plant shutdowns are stipulated.

Objectives

Whether inspection, plant deactivation, shutdown, turnaround or revision: The safe operation of these plants is always the primary focus. The idea of safety always exceeds other aspects such as profitability or availability.

Qualifications of the executing personnel

In addition to the legal requirements, basic prerequisite for an inspection activity in plants exposed to extreme stress is the knowledge of the processes taking place, and the components and materials used. The examination of individual plant sections during an inspection is performed by specially trained test engineers and test technicians. Their training is regulated by internationally applicable standards – e.g., the ISO 9712 "Qualification and certification of NDT personnel". The employees are subject to the obligation to furnish proof of their constant activity and advanced training in the field of non-destructive testing to be able to optimally use special test equipment required for testing. The evaluation of the determined findings of the investigation and the assessment of the component integrity and remaining service life requires a comprehensive knowledge and long-standing experience in the field of damage kinetics of the mostly heat-resistant materials used. Here again, the know-how acquired by SPG in almost 60 years in the operation of its accredited long-term test laboratory takes effect.

The conclusion

Each plant inspection is completed with a profound expertise of the plant condition, which the operator receives in the form of expert opinions or inspection reports. On this basis, the authority designated by the legislator (e.g., the regional council) is able to approve a plant restart.

Inspection box for ambulant component metallography

TÜV Süd responsible for Chemnitz is important to be able to control the inspection process and to ensure the exchange of information with regard to emerging issues.

How is the plant inspection market structured?

Dr. Peter Seliger: The area of plant inspection serves a limited and highly competitive market, which constantly changes due to the heavily subsidized development of renewable energies and phasing out nuclear energy. It is foreseeable that in the future the decentralization of the energy generation will increase even more. Minor power plant projects entail shorter inspections and minor inspection programs. Here, the SPG may have an advantage over major inspection companies. A start has already been made by the successful customer retention of minor combined heat and biomass power stations. It is necessary to build on this successful development, so we are able to further develop and assert ourselves in this area with our special experience.

Which professional forums are relevant, in order to live up to the market requirements?

Dr. Peter Seliger: With the symposium TURNAROUND, we have found a platform where the topics "Best Practices – Community – Trends" are discussed. The first issue of a classified directory for turnarounds, plant shutdowns and inspections was published at the end of January 2013. Here, the SPG is represented with its services and products in a company profile, and a praxis report.

Preparatory measures for component metallography: sanding and polishing of a pre-defined measuring point

Measurement of wall thickness by ultrasound at a pipeline (photo: Andreas Seidel, Chemnitz)

Provision of power and heat for Chemnitz viewed from the chimney of the power plant (photo: eins energie in Saxony)

Complex inspection and assessment of remaining service life of high temperature components

From the inspection to the turnaround: duration and scope

Action (example)	Duration of the inspection	Number of assigned employees
Inspection of a pressure vessel	1 day	1
Revision of a small or medium-sized thermal power station	2 to 5 days	2 to 3
Main inspection of a major power plant	2 to 3 weeks	4 to 6
Turnaround of a refinery	6 to 8 weeks	up to 20