Company Profile
Wallstein Ingenieur GmbH

We Know How
Introduction

Who we are

We are a privately-owned company located in Recklinghausen, Germany, specialized in process and thermal technology. Since the foundation of “Wallstein Ingenieur GmbH” in 1989, our company has developed into a globally-operating corporation, including an entity in Beijing (China). Among process orientated products, “Wallstein Apparate- und Anlagenbau GmbH” and “Wallstein Service GmbH” provides high quality manufacturing of stainless steel equipment and service for industrial applications. “Wallstein Ingenieur GmbH” is focused on heat exchanger products in the field of power plants and waste incineration plants. We provide high-quality and custom heat exchanger solutions to our customers worldwide. We are proud to number companies like e.g. ALSTOM, E.ON, RWE, Vattenfall, RAFAKO, PGE, AE&E, FISIA Babcock and Nanjing Longyuan Environmental among our customers. Our core competences include engineering, manufacturing and services for heat exchangers and heat recovery systems used in the field of fossil fuels as well as renewable power generation. We are experts in developing Heat Recovery Systems (HRS) and Heat Displacement Systems (HDS) and other heat exchangers with completely corrosion-resistant designs.

Our products are designed with the highest level of technology to ensure efficiency, reliability and availability. Special materials and mixes of different materials allow us to build highly corrosion-resistant heat exchangers. Of course, our operations are proven by several international certificates. In this spirit we help our customers not only to be prepared for rapid developing market requests, but also to meet future environmental challenges, such as the reduction of carbon dioxide emissions.

All three enterprises are united under “Wallstein Holding GmbH & Co. KG”, led by the Wallstein family.

Heat exchanger design
→ Gas/gas heat exchangers
→ Steam/gas heat exchangers
→ Condensate/gas heat exchangers
→ Air preheaters
→ Shell & tube heat exchangers

Heat exchanger materials
→ Fluoropolymers (AlWaFlon®)
→ Stainless steel
→ Nickel-based alloys
→ Numerous coating and lining options
→ Finned tubes with different options

From our locations in Recklinghausen and Beijing we have a view over all the major markets of the world.
Our highly corrosion-resistant Heat Recovery System allows the extraction of a particular amount of heat from flue gas before entering the flue gas desulfurization system. The decoupled heat is either transferred into the main condensate system through an intermediate water circuit or it is used to reheat the primary air before entering the regenerative air preheater (Ljungström-principle).

The cooling procedure assures effective operation of the desulfurization unit. The water losses in the desulphurization system are reduced to a minimum. The flue gas cooler is either connected to a low pressure feed water preheater or the regenerative air preheater. By making use of the extracted heat, the amount of steam used for preheating is significantly reduced. Saving steam used for preheating leads directly to greater efficiency of the power plant. While cooling the flue gases, the acid dew point is reached. To satisfy the strict requirements for chemical resistance, high capability, high reliability and long lifetime, Wallstein developed the so-called AlWaFlon® tube material. These tubes are based on the fluoropolymer base material of our partners DuPont, Switzerland and Fluortubing, Netherland. Beside corrosion resistance, the Wallstein HRS design has very low maintenance requirements.

Wallstein products are not only beneficial for the power industry because they increase efficiency, they also contribute to the reduction of carbon dioxide emissions. For example, an 830-MW power plant is able to increase efficiency by approximately 1.4% and reduce CO₂ emissions by approximately 100,000 t annually, and save approximately 23 MW of reheating steam.
Heat Recovery System

Project:
Belchatów 13, 858 MW output, lignite coal
Customer: ALSTOM Power System GmbH
Operator: PGE S.A.

The Belchatów power plant complex is located in Poland. It is the major electrical location in Europe, being the world biggest lignite coal power station. After certain retrofits and state-of-the-art modernization, all 13 units generate electrical output of about 5,000 MW. In 2010 Wallstein provided the Heat Recovery System (HRS) for unit 13 via ALSTOM. To meet this challenge, Wallstein delivered 10 bundles for 2 lines, each line consisting of 5 bundles. Together both lines transfer 63.6 MW to the power plant’s feed water preheater circuit. This process raises the efficiency of unit 13 by 0.65 %. Due to the corrosive atmosphere, Wallstein used AlWaFlon® as the tube material.

Design Data
Flue Gas Cooler
Flue gas volumetric flow 1,557,909 Nm³/h wet
Temperature in / out 176 °C/ 125 °C
Pressure drop 4.6 mbar

Feed Water Preheater
Feed water mass flow 680,400 Kg/h
Temperature in / out 73.5 °C/ 112 °C
Heat Transfer 31,800 kW

Flue Gas Analysis
SO₂ 99,532 mg/Nm³ dry
SO₃ 40 mg/Nm³ dry
HCl 31 mg/Nm³ dry
HF 27 mg/Nm³ dry
Dust 27 mg/Nm³ dry at 6% O₂

Project:
LEDIVCE, 640 MW output, lignite coal
Customer: AE&E GmbH
Operator: CEZ Group

The Ledvice power plant, located in the Czech Republic, provides a total power output of 620 MW. Electrical generation is assured by 5 units with different outputs. The plant is designed for electric power generation and district heating. In year 2012 Wallstein installed a Heat Recovery System, which consists of flue gas coolers and a feed water preheater. During the cooling step, the flue gas drops below the acid dew point. To maintain a corrosion-free installation the heat exchanger tubes are made of a fluoropolymer based material, so-called AlWaFlon®. The heat is transferred into the feed water circuit, increasing the power plant’s thermodynamic efficiency.

Design Data
Flue Gas Cooler
Flue gas volumetric flow 2,003,004 Nm³/h wet
Temperature in / out 170 °C/ 120 °C
Pressure drop 5 mbar

Feed Water Preheater
Feed water mass flow 663,298 Kg/h
Temperature in / out 55 °C/ 106 °C
Heat Transfer 39,400 kW

Flue Gas Analysis
SO₂ 5,500 mg/Nm³ dry at 6% O₂
SO₃ 80 mg/Nm³ dry at 6% O₂
HCl 11 mg/Nm³ dry
HF 11 mg/Nm³ dry
Dust 53 mg/Nm³ dry
The Heat Displacement System allows the extraction of a particular amount of heat from the flue gas upstream of the flue gas desulfurization unit. In contrast to the Heat Recovery System, the heat is transferred to the clean gas side downstream of the flue gas desulfurization unit to increase the clean gas temperature. A closed water circuit is also used here. The cooling process assures effective operation of the desulfurization unit, which is characterized by lower water loss. Furthermore, clean gas reheating ensures that the temperature reaches an adequate level before entering the stack. This reheating process improves the exhaust of the gases to the atmosphere and allows a reduction of aerosols. In addition, the higher temperatures reduce the risk of corrosion in flue gas ducts and the stack.

The cooling as well as the reheating process of the gas is done by two separately-designed heat exchangers. Both heat exchangers are connected to the same water circuit, so that permanent heat exchange is ensured. Due to the use of two independent heat exchanger units, the system ensures leakage free heat transfer between raw and clean gas. During cooling of the flue gases, the acid dew point is reached. To satisfy the strict requirements concerning chemical resistance, high capability, high reliability and long lifetime, Wallstein developed the so-called AlWaFlon® tube material. These tubes are based on the fluoropolymer base material of our partner DuPont, Switzerland.

Beside the corrosion resistance, the Wallstein HDS design has very low maintenance requirements. Wallstein products are not only beneficial for the power industry because they increase efficiency, they also contribute to the reduction of carbon dioxide emissions. Other advantages are the reduce of CO\textsubscript{2} emissions and the increase of efficiency by saving primary energy and additional the corrosion protection of stacks, ducts etc. by reheating the air.
Heat Displacement System

**Project:**
Siekierki, 620 MW output, hard coal
**Customer:** RAFAKO S.A.
**Operator:** Vattenfall Europe Generation AG & Co. KG

The Siekierki power plant in Poland is a co-generation power plant with an electrical power output of approximately 600 MW, using fuels like hard coal, oil, waste and biomass. In addition to power, heat is generated in order to provide district heating to a huge number of households. The Heat Displacement System was designed by the Wallstein Group and has been in commercial operation since 2011.

During the cooling process, the dew point of the flue gas is reached thus condensing corrosive components. To avoid any corrosion attack, Wallstein used fluoropolymer material type AlWaFlon® for the heat exchanger tubes. After the first stage, the temperatures reach a suitable level to use stainless steel as the tube material.

**Design Data**

### Flue Gas Cooler
- **Flue gas volume flow:** 2,034,711 kg/h
- **Temperature in / out:** 134.6 / 97 °C
- **Pressure drop:** 3.9 mbar

### Clean Gas Reheater
- **Clean gas volume flow:** 2,082,670 Nm³/h wet
- **Temperature in / out:** 48.3 °C/ 85 °C
- **Pressure drop:** 6 mbar

**Heat Transfer**
23,000 kW

**Flue Gas Analysis**
- SO₂: 2,150 mg/Nm³ dry at 6% O₂
- SO₃: 20 mg/Nm³ dry at 6% O₂
- HCl: 425 mg/Nm³ wet
- HF: 47 mg/Nm³ wet
- Dust: 47 mg/Nm³

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**Project:**
Belchatów 8/10/11/12, lignite coal
**Customer:** RAFAKO S.A.
**Operator:** PGE S.A.

Between 1981 and 1988, the entire Belchatów power plant complex was built. Together with the new construction of unit 13, a modernization process covering all units was started. For units 8, 10, 11 and 12, the Wallstein Group will engineer, manufacture and install the Heat Displacement System. The last unit will be put into operation in 2016.

The clear commitment to more efficiency and lower environmental pollution at Belchatów Power Station is supported by various technology providers. Wallstein is proud to supply the Heat Displacement System for 4 units, each consisting of 5 bundles for the flue gas cooler and 5 bundles for the clean gas reheater. For both heat exchanger types, AlWaFlon® is used as tube material.

**Design Data**

### Flue Gas Cooler
- **Raw gas mass flow:** 2,534,378 kg/h
- **Temperature in / out:** 160 °C/ 149 °C
- **Pressure drop:** 2.3 mbar

### Clean Gas Reheater
- **Clean gas mass flow:** 2,688,252 kg/h
- **Temperature in / out:** 68 °C/ 78 °C
- **Pressure drop:** 5.5 mbar

**Heat Transfer**
8,900 kW

**Flue Gas Analysis**
- SO₂: 6,000 mg/Nm³ dry at 6% O₂
- SO₃: 84.7 mg/Nm³ dry at 6% O₂
- HCl: 25.7 mg/Nm³ wet
- HF: 25.7 mg/Nm³ wet
- Dust: 50 mg/Nm³ wet
The cross flow heat exchanger allows the transfer of a heat quantity recovered from the raw gas directly to the clean gas side of the flue gas desulfurization unit by a cross- or counter-flow heat exchanger without using a transfer medium. The recovered heat is used to increase the gas temperature downstream of the FGD-process. The higher gas temperature upstream of the stack ensures a regular exhaust of the gas to the atmosphere, and in parallel, the stack is protected against the condensates. Therefore no further corrosion protection for the ducts and the stack is needed, which saves the utility investment. All materials in contact with flue and clean gases are made from fluoropolymer materials. The fundamental design of the system is leakage free. An internal water loop is therefore not needed. The Wallstein-design allows the use of larger tube diameters. This heat exchanger type itself is corrosion resistant on both raw gas and clean gas side. With innovative materials and materials mixtures and also with constructional developments, we permanently optimize our products. Examples are weldable fluoropolymer materials or special tube compensators made of fluoropolymer materials.
Cross Flow Heat Exchanger

**Project:** Belchatów 1 + 2, lignite coal  
**Customer:** RAFAKO S.A.  
**Operator:** PGE S.A.

The cross flow heat exchanger for the units 1 and 2 of the Belchatów power plant station has to manage a high volumetric flow of flue gas. Therefore, Wallstein designed a solution using very high diameter tubes. The superior construction consists of 8 bundles in a row and 2 in depth. The total number of 16 bundles forms the entire cross-flow heat exchanger. As the tube material, Wallstein uses AlWaFlon®. Furthermore, we used a special tube compensator made of fluoropolymer materials for this project.

**Design Data**

**Cross Flow Heat exchanger**

- **Flue gas volume flow:** 2,573,316 Nm³/h
- **Flue gas temperature in / out:** 176 °C / 160 °C
- **Flue gas pressure drop:** 9.2 mbar
- **Clean gas volume flow:** 2,770,904 Nm³/h
- **Clean gas temperature in / out:** 66 °C / 81 °C
- **Clean gas pressure drop:** 5.1 mbar

**Heat Transfer**

- **16,600 kW**

**Flue Gas Analysis**

- **SO₂:** 6,000 mg/Nm³ dry at 6% O₂
- **SO₃:** 4.6 mg/Nm³ dry at 6% O₂
- **HCl:** 15 mg/Nm³ wet
- **HF:** 15 mg/Nm³ wet
- **Fly ash:** 125 mg/Nm³ wet

**Flue Gas Analysis - Clean Gas**

- **SO₂:** 10 mg/Nm³
- **SO₃:** 450 mg/Nm³
- **HCl:** 1,200 mg/Nm³
- **HF:** 3.1 mg/Nm³

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**Project:** RZR Herten, 20 MW  
**Customer:** FISIA Babcock Environment GmbH  
**Operator:** AGR GmbH

The municipal waste combustor in Herten is one of the most modern units in Europe. In 2006, an expansion of two new combustion lines was constructed. Each line is characterized by its own desulfurization unit, which allows the plant to undercut all environmental emission laws for pollutants. Furthermore both desulfurization units responsible for the overhaul process of the flue gas are provided by our cross-flow heat exchanger solution. Due to the low dew point of the acid mixture, we constructed the cross-flow heat exchanger from fluoropolymer material.

**Design Data**

**Cross Flow Heat exchanger**

- **Flue gas volume flow:** 97,382 Nm³/h wet
- **Flue gas temperature in / out:** 170 °C / 107 °C
- **Flue gas pressure drop:** 4.4 mbar
- **Clean gas volume flow:** 100,199 Nm³/h wet
- **Clean gas temperature in / out:** 60 °C / 121 °C
- **Clean gas pressure drop:** 6.7 mbar

**Heat Transfer**

- **2,400 kW**

**Gas Analysis - Flue Gas**

- **SO₂:** 450 mg/Nm³

**Gas Analysis - Clean Gas**

- **SO₂:** 10 mg/Nm³
Pictures

Heat Exchanger – AlWaFlon® Tube
Heat Exchanger – Nickel Alloy Tube
Project Ledvice – HRS with AlWaFlon®

Project Belchatów – HRS with AlWaFlon®
Project Belchatów – GGH with AlWaFlon® and Compensator
Project Herten – GGH with AlWaFlon®
Quality control, occupational health and safety and environmental protection

Compliance with and implementation of nationally and internationally recognized standards of quality control, occupational health and safety as well as environmental protection are important components of our business strategy.

With the appropriate certification, we emphasize to our customers and partners our commitment to responsible business conduct.

Certified to
DIN EN ISO 9001/14001/13485, AD2000 · HPo, TRD 201, DIN EN 3834-2 (729-2) / 18 800-7, European Welding Engineer (SFI / EWE) and European Welding Specialist (SFM / EMS), Welding procedure verification 288-3/DIN tests according to EN ISO 15614 · 1, approved welders according to EN 287-1 and DIN EN ISO 9606 · 4 (nickel and nickel alloys), Re-stamping arrangement with TÜV Nord, certified specialist according to § 191 WHG, SCC, SeSaM, approved to the standard AÜG.