Off gases and waste treatment in general is an important part of the design and operation of petrochemical, chemical or pharmaceutical production facilities. Lonza Engineering’s innovative process know-how led to a number of successfully delivered capital projects. Especially for environmental technology, Lonza Engineering Ltd has entered into cooperation and licensing agreements with some leading European companies.

Waste liquid incineration technology from DUMAG, Austria
Solid, pasty and liquid waste incineration technology from RASCHKA, Germany
High technology ventilation solutions for explosive and toxic gases from MEIDINGER, Switzerland
Heat recovery solutions from WEHRLE WERK, Germany
Flame arrester technology from PROTEGO®, Germany
Water and wastewater technology from EnviroChemie, Germany

Lonza Engineering technology management including:
- System integration and overall project management
- Technology transfer
- Localized manufacturing with minimum import
- Compliance with Chinese regulation
- Design and implementation of control system
- Installation management and quality Control
- Commissioning and after sales service
Lonza Engineering Incinerator and Waste Management Reference

Lonza Nansha Plant, Guangzhou, China

An important part when designing and operating an active pharmaceutical ingredient batch plant is the treatment of all the off gas and waste solvent generated from it. Small and larger cGMP production campaigns for different products/processes are usually produced over time in an API production train. As a result there is a constant change of waste solvent which does not allow for an economically viable solvent recovery system not to mention the concern of potential cross contamination. Preferred solutions to handle fluctuating off gas and waste streams from such systems are incineration plants with integrated heat recovery and flue gas treatment.

Lonza Engineering has analyzed the typical off gas amount and composition from a standard 10 and 16m³ API batch reactor system, with a product portfolio operated in other Lonza plants around the globe. With such information at hand a URS (user requirement specification) was written containing the basic design values for Lonza Nansha plant:

- Waste water content in liquid incineration feed maximum 2'000 kg/h
- Nominal calorific value of residue 18'000 KJ/kg
- Maximum calorific value of residue 43'000 KJ/kg
- Nominal thermal capacity of the plant 7'200 KW

### Lonza Switzerland Plant

<table>
<thead>
<tr>
<th>Item</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid</td>
<td>48,000 Ton/Year</td>
</tr>
<tr>
<td>Solid</td>
<td>2,000 Ton/Year</td>
</tr>
<tr>
<td>Waste Gas</td>
<td>10,100 Nm³/H</td>
</tr>
<tr>
<td>Waste Water</td>
<td>60 Ton/Day</td>
</tr>
</tbody>
</table>
Established in 1930.
More than 40 years ago the company succeeded in developing a unique industrial burner which is capable of completely incinerating viscous industrial waste and much more. The core of the device is an ultra-sonic nozzle. Since the 1960s the Austrian and ISO 9001 certified company DUMAG has produced and exported more than 7000 ultrasonic nozzles to all parts of the world.

Products:

- Industrial burners for the combustion of:
  - single or combined standard fuels
  - contaminated and/or high viscose waste fuels
  - lean- or waste gases in incinerators
  - hydrogen
  - sulfur
- Mainly used in:
  - combustion chambers
  - rotary kilns
  - fluidized bed incinerators
  - power plants
  - municipal waste incinerators

- process specific designed spray nozzles
- instrument racks
- burner management systems

Reference in China

LENZING AG Nanjing
- Sulfuric acid production plant and Lean-/ Rich gas disposal
- Scope of supply: Sulfur burner GGS5000KE-GÜ with lances and nozzles for light fuel oil, sulfur and H2S gas, valve racks and burner management system.
- Burner capacity: 30MW
- Installation site: Combustion chamber front plate
- Start up: 1st quarter 2007

Suzhou Novartis Pharma Technology Co. Ltd
- Burner capacity: 6MW
- Scope of supply: DUMAG ultrasonic burner GGG250KE, gas tubes for Offgas and Natural gas, Combustion chamber, DeNOx System, valve racks and burner management system.
- Installation site: Combustion chamber front plate
- Start up: 4th quarter 2008
Established in 1946 for the design and construction of

- Fluidized Bed Incinerators
- Waste Heat Steam Boilers

Application:

- Biomass, waste wood, bark, secondary fuel
- Ballast coal, low quality coal, pyrolysis coke, coal sludge
- Residuals from paper, cellulose and chemical industry
- Sewage sludge, waste sludges from industry and refineries
- Domestic waste, waste from slaughter houses, carcasses
- Pyritiferous ore

Project Reference - extracts

<table>
<thead>
<tr>
<th>Company/Project</th>
<th>Description</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMS CZ S.R.O., ROKYGAN (CZ)</td>
<td>Basic and detail engineering and supply of special parts for a fluidized bed incinerator</td>
<td>2008</td>
</tr>
<tr>
<td>STADT KARLSRUHE, KARLSRUHE (DE)</td>
<td>Engineering (project and detail planning, approval planning, preparation of the tender documents, examination of the offers, preparation of order placement, assistance in order placement) for the erection of a new ash storing and loading plant, for the ashes resulting from the existing fluidized bed incineration plants (Plants #1 and 2, s.b.)</td>
<td>2007</td>
</tr>
<tr>
<td>STADT KARLSRUHE, KARLSRUHE (DE)</td>
<td>Engineering, supply, mounting of a RASCHKA-spreader for the fluidized bed incinerator (Plant #1, s.b.), including all adaptions and modifications of the existing incinerator casing and bricklining</td>
<td>2007</td>
</tr>
<tr>
<td>KALOGEO ANLAGENBAU GMBH, LEOBERSDORF (AT)</td>
<td>Engineering consulting: Elaboration of the process parameters and process alternatives, project and detail planning services for a fluidized bed incinerator</td>
<td>2007</td>
</tr>
<tr>
<td>EMSCHERGENOSSENSCHAFT ESSEN (DE)</td>
<td>Engineering: planning of a two-line waste water treatment plant for separating heavy metals from the scrubbing waters from the scrubbing systems, required for the two fluidized bed incineration plants (Plants #1 and 2, s.a.)</td>
<td>1991</td>
</tr>
<tr>
<td>CELLULOSEFABRIK ATTISHOLZ RIEDHOLZ (CH)</td>
<td>Engineering, supply and erection of a pre-boiler for the fluidized bed incineration plant (s.a.) in order to increase the steam production from 8 t/h to 12 t/h</td>
<td>1991</td>
</tr>
<tr>
<td>STADT KARLSRUHE, KARLSRUHE (DE)</td>
<td>Engineering, supply, erection, commissioning of the fluidized bed incinerator for the fluidized bed incineration plant (Plant #1, s.b.), Throughput: 5.4 t/h of sewage sludge (36% DS) and 0.6 t/h of residues of WWTP (45% DS)</td>
<td>1991</td>
</tr>
<tr>
<td>EMSCHERGENOSSENSCHAFT ESSEN (DE)</td>
<td>Engineering, supply, erection, commissioning of a fluidized bed incineration plant (Plant #2)</td>
<td>1991</td>
</tr>
<tr>
<td>CONSORCIO D. AGUAS BILBAO BIZKAIA BILBAO (ES)</td>
<td>Engineering, partial supply of a fluidized bed incineration plant (Plant #1)</td>
<td>1991</td>
</tr>
<tr>
<td>PHARMACEUTICAL FACTORY ANTIBIOTIKA IASSI (RO)</td>
<td>Engineering, supply of a fluidized bed incinerator</td>
<td>1974</td>
</tr>
<tr>
<td>CELLULOSEFABRIK ATTISHOLZ RIEDHOLZ (CH)</td>
<td>Engineering, supply, erection, commissioning of a fluidized bed incineration plant throughput of 4 t/h of sewage sludge (22% DS) and 3 t/h of bark (50% DS)</td>
<td>1974</td>
</tr>
<tr>
<td>FRIEDRICH UHDE GMBH HAGEN (DE)</td>
<td>Engineering, supply, erection, commissioning of a fluidized bed incineration plant</td>
<td>1972</td>
</tr>
</tbody>
</table>

RASCHKA

Power generation plant innovatherm GmbH, Linen
MEIDINGER

Largest zone 0 fan program developer and producer worldwide.

The company was founded in 1900 and since 1992 it has worked intensively with the conveyance of explosive gases and dusts and developed the first generation of zone 0 fans. In 1996 Meidinger AG won the Basel Innovation Prize for their zone 0 equipment. Henceforth, the third generation of exhaust fans has been placed in service. These ventilators are designed to comply with the most recent ATEX directives. Meidinger is one of only a few manufacturers which are licensed to build zone 0 fans.

Application:

- Pharmaceutical and chemical industries
  Drain of solvents generate often zone 0 gas mixtures. To avoid costly inertisation or continuous monitoring of concentration levels these fans are certified to run safe with permanent ignitable gases. Without inertisation gas the equipment also is more compact due to the smaller volume flow.
- Tank facilities
  the conveyance of gasoline or kerosene vapoors of zone 0 for recovering solvents (VRS), for combustion, or filtration through activated charcoal filters
- Energy technology
  cooling fans for gas turbines, drain of hydrogen leakage gases
- Environmental technology
  conveyance and pressurisation of natural gas
- Process technology
  design according to PED [Pressure Equipment Directive]
- Food and nutrition industry

Products:

Different designs are available for different tasks
- centrifugal fans
- axial fans

Adapted to the special performance requirements, MEIDINGER supplies a wide range of different fan designs. Customer specific design possible, following national and international regulation. All essential performance data of the fans are stored in MEIDINGER's design program enabling accurate and fast response to customer inquiries.

Benefits of MEIDINGER fans:

- comprehensive drive variants
- the complete model range for optimal design
- wide selection of materials [casting, steel, stainless steel, nickel-alloy, titanium...] and coatings
- high efficiency due to optimized blade design
- high-quality, durable construction
Wehrle-Werk

Established in 1860.
Experience in plant construction and process equipment manufacturing in the field of energy and environmental technology.

- Combined Heat-and-power stations
- Thermal treatment of household waste and special waste
- Energy recovery from biomass
- Waste heat recovery (waste heat boiler)
- Plants for the treatment of waste water
- Plants for the mechanical-biological treatment of solid waste

The characteristics of plants:

- High efficiency
- Recognized combustion technologies
- Low emissions
- Long service life
- Flexible construction allowing the use of various raw materials and the production of variable electrical and thermal energy
- Speedy planning and construction using modular components
- Controlled combustion air-preheating
- Flue gas cleaning meeting national and international standards

References in Europe
(some examples out of more than 150):

MVA/KVA:

- KVA Fribourg
  Waste incinerating plant 47 t/h
  Max. allowable overpressure: 70 bar
  Superheated steam temperature: 405 °C

- Renova, Göteborg
  Waste incinerating plant 54,8 t/h
  Max. allowable overpressure: 56 bar
  Superheated steam temperature: 400 °C

- Satom, Monthey
  Waste incinerating plant 44 t/h
  Max. allowable overpressure: 66 bar
  Superheated steam temperature: 410 °C

Biomass:

- Glunz AG, Hamm for plant Eiweiler
  Pre-boiler with grate and sprinkling stoker firing for coarse wood chips 17 MW
  Max. allowable overpressure: 80 bar

- Helbra
  Radiation boiler with grate and sprinkling stoker firing for wood 31,5 t/h
  Max allowable overpressure: 52 bar
  Superheated steam temperature: 420 °C

- Mannheim
  Biomass heat-and-power station 78,8 t/h
  Max. allowable overpressure: 64 bar
  Superheated steam temperature: 450 °C

  international standards
Braunschweiger Flammenfilter GmbH (PROTEGO®)

More than 50 years of experience; Development and production of flame arresters, valves and tank accessories for industrial process engineering; Its internationally registered trademarks PROTEGO®, FLAMEFILTER® and FLAMMENFILTER® have become a synonym for quality and functionality and process safety; Product quality is assured according to international standards.

- DIN ISO 9001/2000
- DIN ISO 14001

The international testing and approval institutions have issued over 5000 product-approvals. The approvals are from:

- ATEX
- DIN-ISO 14001
- DIN-ISO 9001-2000
- PED A1
- PED H1
- WHG H1
- AD2000-Merkblatt HP0 in connection with DIN EN 729-2
- GOST
- RTN

Applications:

1. In tank farms
2. In processing plants for chemicals and pharmaceuticals
3. In vapour combustion units
4. In shipbuilding, offshore platforms and loading facilities
5. In vapor recovery systems
6. As components for blowers and machines
7. In biogas and landfill
8. In flare system
ENVIRO-CHEMIE

International competence in water and wastewater technology. Renowned for its broad product range and requirements-oriented applications. EnviroChemie with her subsidiary company EnviroDTS, EnviroFALK composed a competent partnership.

- Solar/Glass/Ceramics/Optics
- Metal/Electrics/Automotive
- Food/Beverage
- Chemical/Pharmaceutical/Cosmetics
- Transportation
- Textile/Laundry
- Health/Facilities
- Waste/Landfill/Energy
- Facilities/Building Services/Trade
- Oil and gas industry/Metallurgy/Raw materials industry
- Neutralization
- Detoxification
- Thermal & Chemical disinfection
- Decontamination
- Reverse osmosis
- Optical industry
- Metal Processing Industry
- Flat glass
- Solar technology
- Graphics industry
- Professional Catering trade

Reference of Chemical Industry:

<table>
<thead>
<tr>
<th>Company</th>
<th>Country</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adler-Werk Lackfabrik</td>
<td>Austria</td>
<td>Paint and Dye Industry</td>
</tr>
<tr>
<td>Agan Chemical Manufacturers Ltd.</td>
<td>Israel</td>
<td>Chemical Industry</td>
</tr>
<tr>
<td>Altana Chemie.</td>
<td>Brazil</td>
<td>Pharmaceuticals</td>
</tr>
<tr>
<td>Astra Zeneca GmbH</td>
<td>Germany</td>
<td>Pharmaceuticals</td>
</tr>
<tr>
<td>RRA Karlsruhe</td>
<td>Germany</td>
<td>Power plant</td>
</tr>
<tr>
<td>BASF Schwarzheide GmbH</td>
<td>Germany</td>
<td>Chemical Industry</td>
</tr>
<tr>
<td>Beiersdorf AG/NV</td>
<td>Germany, The Netherlands, Brazil, Mexiko</td>
<td>Chemical Industry</td>
</tr>
<tr>
<td>Bode Chemie GmbH &amp; Co.</td>
<td>Germany</td>
<td>Chemical Industry</td>
</tr>
<tr>
<td>Boehringer Mannheim GmbH</td>
<td>Germany</td>
<td>Pharmaceuticals</td>
</tr>
<tr>
<td>DSM</td>
<td>Switzerland</td>
<td>Chemical Industry</td>
</tr>
<tr>
<td>Merck Serono</td>
<td>Switzerland</td>
<td>Biotechnology</td>
</tr>
</tbody>
</table>
Lonza Engineering

Lonza’s fast experience in designing and operating chemical and pharmaceutical production facilities and the clear aim to handle waste in a safe and environmentally compliant way, makes Lonza Engineering Ltd. a competent partner for waste handling systems for your facility.

- Proven design with know-how and competence supported by licensing partners
- More than 90% of the value is purchased locally
- Full compliance with Chinese regulations

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Hydraulic flame arrestor with Lonza Engineering holding an exclusive manufacturing license for China market

Safety and control valve rig to feed various incineration nozzles/lances

Incineration chamber with access platform, including steam generator with integrated steam blower to clean heat transfer area during operation

Flue gas treatment with DeNOx unit and economizer
In this context, Lonza Engineering’s service could include:

- Conceptual design, URS, Basic design
- Environmental assessment report
- Cost estimation
- Detail design (equipment, piping, instrumentation, electrical, civil)
- Risk analysis
- Procurement, quality supervision
- Schedule and cost control
- Qualification, Documentation and maintenance manuals
- Operator training
- Maintenance and on call service

Pls. contact us for a quotation. An extensive service list is available on our website: http://www.lonza.com/engineering

Lonza Engineering Ltd

Lonza Engineering is a subsidiary of Lonza Group Ltd and provides customer oriented services with a professional, experienced and highly motivated engineering team. We have more than 13 years of successful project management experience in China which makes us a perfect partner for the chemical, pharmaceutical and biopharmaceutical industry. A broad range of services with a project reference list underlining our capabilities is available upon request.

Lonza Engineering Ltd. Basel, Switzerland, created in August 2008, has founded a wholly owned subsidiary called Lonza Guangzhou Engineering & Consulting Co., Ltd.

Lonza Engineering has successfully managed multiple and complex projects such as continuous operating plants for the production of food and feed additives as well as active pharmaceutical ingredient plants including waste gas and liquid waste treatment facilities. The management team of the new company consists of current Lonza employees from Switzerland and China.

Contacts

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