



## Dr. Roberto Palazzolo

Head of Energy Recovery

### Areas of Expertise

Thermal treatments, Combustion, Energy & Material recovery, Flue gas and Gas treatment, Hazardous waste treatment, Project management, HAZOP, Special equipment sourcing, Process optimization, Green Technologies

### Education

#### Università degli Studi di Genova

PhD Space Science and Engineering

#### Università degli Studi di Genova

MSc Chemical Engineering

### Language Skills

Italian	Mother tongue
English	Business Fluent
German	Business Fluent
French	Basic
Turkish	Basic

## Experience responsibility

Roberto Palazzolo has more than 20 years of experience in the process design “from the chute to the stack” of complex plants for the recovery of energy and material from waste & by-products. Involved from the concept phase to the commissioning phase of projects, during his professional career he gained profound knowledge of thermal processes in special furnaces (ranging from static to rotary kilns) to be integrated in chemical processes, both upstream or downstream of the core production units. Furthermore he has more than 15 years of experience in leading both, engineering and project teams..

### Key Clients

Adama, BASF, BorsodChem, Celanese, Hansol-Paper, ICL, Indaver, Teva, Tenaris, Shanghai Electric, Shanghai Marine Diesel Engine Research Institute.

### Special Skill Set

- Deep and hands-on knowledge of waste and flue gas treatment plants
- Design of special furnaces: static kiln, rotary kiln and fluidized bubbling bed furnaces
- Process Design of waste heat recovery units and Flue gas treatment
- HAZOP for complex waste treatment plants from chute to stack
- Up-stream and Down Stream integration of waste thermal treatment unit with heat and material recovery
- DeNOX SCR & SNCR design
- Gas treatment plants design: dry, semi-wet and wet type
- Process optimisation of waste treatment plants
- Commissioning supervision of complex waste treatment plants
- Technical and Economic Feasibility studies
- Modelling of complex thermal treatment for feedstock: pyrolysis and gasification
- Biomass and Waste mechanical treatment design and commissioning
- Development of material recovery processes from waste (waste to product)
- Process Simulation: HYSIS, DWSIM, REFPROP and specific Excel-based blocks for special units
- Process Data Analysis for troubleshooting and optimisation
- Python programming (basic)

- Hands-on knowledge of EN 746-2 Norm for High Temperature Equipment and the process requirements of EN 12952/12953 (European Boiler codes), NFPA 86 (US furnaces) and NFPA 85 (US boilers)
- Preliminary SIL Attribution according to EN-50156-1 and preliminary SIL assessment (process)
- Preliminary ATEX Assessment according to ISO 60079-10-1
- Hiring and coaching of process engineers
- Engineering department coordination
- Support to R&D projects with public or private institutions
- Project Management
- Purchasing: suppliers' selection, technical/economical alignment and negotiation

#### Professional Affiliations / Certificates

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Member of UNI-CTI (Italian Thermo- technical EN Committee) (till 2013)

Member of "Ordine degli Ingegneri di Genova" (Italian professional engineer's association)

Awarded Contract professor 2021/2022 for DICCA Università degli Studi di Genova

#### Publications

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*R. Palazzolo "Flue gas cleaning solutions for hazardous waste incineration", Asia Hazardous Waste Treatment Congress 2016 proceedings, Shanghai 2016*

*G. Timmer , R. Palazzolo . "Experience of BWK-Blumenthal WTE plant integration with a textile company" Seminar on the Comparison between WTE technologies proceedings, Piacenza 2008*

*R. Palazzolo, F. Coggiola, F. Coda, G. Porto "RDF ozone sanification" Eurowaste 2008 proceedings, Venice 2008*

*M. Capurro, P. Cirillo & R. Palazzolo "Plane-strain fracture toughness of modern ferritic structural steels" Material science and technology, vol. 17 [1], 39, (2001)*

*D. Beruto, M. Capurro & R. Palazzolo "Role of residual stress in fabrication and use of ceramic-matrix composites reinforced with ductile inclusions: an elasto-plastic analysis" Science of Sintering, 6, (2000), 121-132*

*M. Capurro, P. Cirillo & R. Palazzolo "Phase- velocity spectra of Background internal friction in polycrystalline solids", Current Applied Physics 2 (2) 175-180 (2002)*

*R. Palazzolo et al., "The Dynamic Surface Elasticity of Adsorption Layers In the Presence of a Surface Phase Transition from Monomers to Large Aggregates" Langmuir, 18(9), 3592-3599, (2002).*

*R. Palazzolo , L. Liggieri, " Dilational elasticity of soluble surfactant in the presence of surface aggregation", Meeting of the FASES project, Golm,30/11 – 02/12/2000*

*R. Palazzolo, M. Capurro, L. Liggieri, "A mechanical approach to coalescence", Meeting of the FASES project, Genova, 25-27/11/2001*

*L. Liggieri, M. Ferrari, F. Ravera, R. Palazzolo, "The dynamic surface viscoelasticity of soluble surfactant in the presence of surface aggregation", Meeting of the FASES project, Compiègne, 24-27 May 2001*

*L. Liggieri, M. Ferrari, F. Ravera, R. Palazzolo, R. Miller, V. B. Fainerman, "Dilational elasticity of soluble surfactant in the presence of aggregation and re-orientation processes", American Chemical Society , Pittsburg, 2001*

*Italian Patent : material for the fabrication of bricks with additivation of low volatile matter fuel and preparation process n. 0001372579*

## Abstract of Project Experience/Work Experiences

### WORK EXPERIENCES

#### Clean Technology Universe AG, EMEA

2016 - 2022

##### Technical Manager

Responsible for/ and leading two engineering departments of 8 people (5 process engineers and 3 draftsmen) and the R&D department.

Technical and Project lead for several hazardous waste thermal treatment projects.

Answering comprehensive technical queries for clients (including debottlenecking and feasibility studies) and providing technical training for mother company engineering staff.

Project lead of engineering and EPC projects, including key equipment sourcing and purchasing.

Commissioning supervision & Site technical support.

#### BorsodChem, Hungary, Hazardous Waste Incinerator

2019 – ongoing

Project Direction (Engineering, PJM and Purchasing direction) for the Engineering and Key Equipment supply of the new Energy Recovery Unit for the new Aniline production plant. Aniline and MNB Residues are burnt to rise superheated steam. Natural Gas and Hydrogen are used as support fuel. Production Off Gases zone 1 & 2 are incinerated as well. Catalyst

recovery is implemented in a state of the art 3 stage DeNOx system.

#### Shanghai Electric, China, Rotary Kiln Incinerator

2021 – ongoing

Basic design & Owner Engineering for a 25 MWth rotary kiln incineration unit for the treatment of several industrial wastes.

#### ICL, Israel, material recovery / mining

2020– ongoing

Technical support for a new process for the recovery of magnesium-based byproduct to be used as novel neutralizing agent in wet and dry scrubbing application

#### Confidential customer, Hazardous Waste Incinerator

2019 – 2020

Engineering Direction (Process and Plant Engineering) for the Basic Engineering a new Off gas incineration.

#### SMDERI, China, Rotary Kiln Incinerator

2018 – 2021

Engineering Direction (Process and Plant Engineering) for the Basic & Owner Engineering a 8 MWth new rotary kiln incineration unit for the treatment of high phosphor content liquids and process sludges. Commissioning supervision and plant optimization was achieved within June 2021.

#### Indaver, Europe, HCl recovery unit

2019-2020

Technical study for the increase of HCl concentration from HCl recovery unit

#### Confidential customer, Europe, HCl recovery unit

2017-2021

Engineering Direction (Process and Plant Engineering) for the Basic engineering and key component supply of a HCl recovery unit from chlorinated liquid waste

#### Confidential customer, Energy recovery unit from Aniline byproducts

2017-2019

Engineering Direction (Process and Plant Engineering) for EPC supply of an Energy recovery unit from aniline production byproducts

#### Teva, Israel, Incinerator

2017 – 2018

Engineering of the plant extension and on-site implementation of the addition of exhaust air coming from process driers.

#### BASF, Germany, Spent Acid furnace

2016-2018

Engineering Direction (Process and Plant Engineering) for EPC supply of a new Spent Acid Furnace using 15 ton/h spent acid, liquid sulphur and several organic wastes as energy source.

#### Everbright, China, Dry DeSOx for a biomass CFBB

2016-2018

Engineering Direction (Process and Plant Engineering) for the basic engineering of a low temperature

Dry DeSOx Flue gas treatment downstream a biomass/coal fired CFBB.

## **Hansol-Paper, South Korea, Technical Support and Studies**

2016-2019

Technical Studies for the addition of a SCR DeNOX downstream a Fluidized Bed boiler fired with bio-sludge and household waste.

2014 – 2016

## **Head of Process Engineering**

Responsible for/ and leading the process engineering department of 4 process engineers.

Process engineering lead for several hazardous waste thermal treatment projects.

Answering technical queries for clients (including debottlenecking and feasibility studies) and providing technical training for mother company process engineering staff.

Process lead of engineering and EPC projects, including key equipment sourcing.

Commissioning & Site technical support.

## **Shanghai Electric, China, Rotary Kiln Incinerator**

2015 – 2016

Basic Engineering for a 24 MWth rotary kiln incineration unit for the treatment of several industrial wastes. Project was sold in 2016.

## **Shanghai Electric, China, Rotary Kiln Incinerator**

2015 – 2019

Basic design & Owner Engineering for a 10 MWth rotary kiln incineration unit for the treatment of several industrial wastes. Commissioning supervision and plant optimization was achieved within 2019.

## **ADAMA, Israel, Incinerator**

2015 – 2016

Basic Engineering and Key Equipment supply for a 6 MWth incineration unit for the treatment of Zone 2 Off gas. Natural Gas, LFO and Hydrogen are used as support fuels. Several studies have been so far additionally supplied to extend the plant capacity to other streams.

## **Teva, Israel, Incinerator**

2014 – 2016

Basic Engineering and Key Equipment supply for a 6 MWth incineration unit for the treatment of Zone 0 & 2 Off gases as well as liquid wastes. Support fuels are Natural Gas and LFO. In 2016 a 3 MWth ground Flare has been

## **Hansol-Paper, South Korea,**

2014-2015

Engineering and Commissioning for the Repowering of a Fluidized Bed Boiler fired with bio-sludge and Household Waste/RDF from 30 to 40 MWth.

## **DICCA Università degli Studi di Genova**

2016 – ongoing

Lecturer

Seminars on HCL recovery from chlorinated waste

Seminars on Hazardous Waste Incinerators with energy and material recovery

Contract professor 2021/2022

“Multiscale analysis and computer simulation of chemical processes”

## **SAIF S.p.A. and Enviro S.r.l. (100% SAIF), EMEA**

2005 - 2014

## **Technical Manager**

Responsible for/ and leading of the engineering department of 5 people

2010-2014

Engineering and production Manager of the Biomass Pellet and Powerplant (24 Workers) in Turkey (BOO Project of SAIF S.p.A.).

2008-2014

Member of the Management Board of SRF Energy S.r.l. (60% UNIECO s.c.a.r.l. and 40% SAIF S.p.A.) for the production of high quality RDF for the use in Cement and Power Plants

2005-2014

Several projects EMEA:

Process Design and commissioning of a small-scale Biomass fired ORC CHP Plant

Straw Pellet plant design build and operation 40'000 tpy.

FEED for RDF firing system for Cementizillo S.p.A.

RDF firing system design and supply for Calme Cementi S.p.A.

Dioxin Removal Flue gas treatment  
for Electric Arc Furnace (TENARIS  
S.p.A. thru TTF S.r.l.)

Feasibility and Preliminary Design  
of a 200'000 TPY Petcoke and  
Coal Stockyard and Milling site for  
SAIF S.p.A.

**FISIA ITALIMPIANTI S.p.A.**  
**EMEA, WTE and Flue Gas  
treatment**

2001 - 2005

**Process Engineer**

**FIBE S.p.a. , Italy,**

2001-2005

Process Engineering for the MBT  
Plant from MSW and Acerra 120  
Mwe WTE Plant

**Fenice S.p.a. , Italy,**

2003-2004

Combustion optimisation of the  
hazardous waste rotary kiln and  
roller grate furnace

Several customers

2001-2005

International Tender design for Flue  
Gas treatment (DeNOX) and large  
scale WTE

**INFINEUM S.r.l. , Italy,**  
**Petrochemical Plant**

2001 - 2001

**Contact Engineer**

**IENI CNR , Italy, PhD Fellowship**

2000 - 2003

**PhD fellow**

Emulsion stability

**DICAT Università degli Studi di  
Genova**

1999 - 2000

**Lecturer/assistant**

Process and Material Science