

**TECNOLOGIE PER IL RECUPERO
A BASSO IMPATTO AMBIENTALE
DI MATERIA E DI ENERGIA
DA RIFIUTI E DA RESIDUI INDUSTRIALI**



Ing. Fabio Salvati

CONVEGNO AIDIC
Recupero e valorizzazione residui industriali e rifiuti
Roma - 21/10/2011



COMPANY MISSION

CSM is a **private Industrial Research Centre, market oriented**, aiming at converting research and technological achievements into **industrial applications**, by a **“critical mass”** of competences based on its own experience gained **“on the field”** and an international collaboration network



COMPANY NUMBERS

- FOUNDATION: 1963
- QUALIFIED AND COMPLEMENTARY SHAREHOLDERS
(Tenaris, Techint, ThyssenKrupp, Fincantieri, Finmeccanica, Vesuvius, ACEA, AMA, etc.)
- TURNOVER: ~ 31 M€/year
- PERSONNEL: 290 EMPLOYEES
(70% with university degree)
- POLICENTRIC STRUTTURA:
Headquarters → Rome



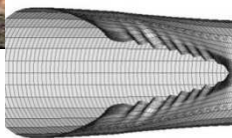


COMPANY BUSINESS AREAS

OIL & GAS

**ENERGY
&
TRANSPORT**

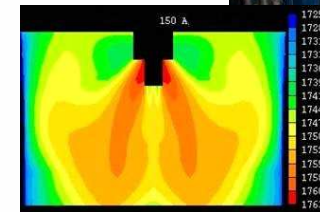
STEEL



**ADVANCED MATERIALS,
VALIDATION AND FULL SCALE
TESTING (e.g. PIPELINES)**



**ENERGY & POWER GENERATION
MATERIALS , COMPONENTS
PROTOTYPING AND
ADVANCED COATINGS**



**PRODUCTS AND PROCESSES
DEVELOPMENT
FOR STEEL INDUSTRY**



TRANSVERSAL PROJECTS FOR THE ENVIRONMENT

OIL & GAS

ENERGY
&
TRANSPORT

STEEL

ENVIRONMENT & SUSTAINABILITY

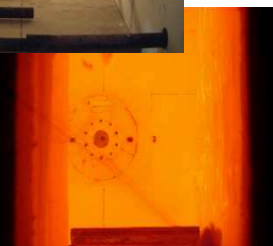
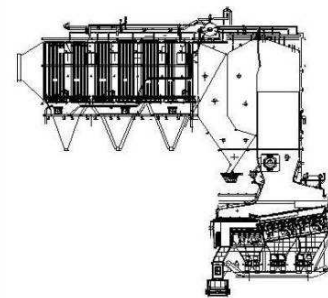


**Plasma
torches**

**Waste
to
energy**



**Hot
corrosion**



**Flameless
burners**



CSM FOR THE ENVIRONMENT

FIELDS OF WORK

CSM offer for the Environment is addressed to three sectors:

- ❑ **Development of innovative treatment technologies** for waste and industrial residues
- ❑ **Optimization of industrial processes** to recover solid residues and to minimize gas emissions
- ❑ **Industrial water treatments**



CSM FOR THE ENVIRONMENT

LEVELS OF OFFER

CSM Projects have typically three development phases:

I. Feasibility study: laboratory activities for waste characterization and technical/economic studies

II. Technological development: realization of a pilot plant and experimental campaigns

III. Industrial scaling-up: realization of an industrial prototype plant in cooperation with engineering companies





CSM FOR THE ENVIRONMENT

EXAMPLES OF APPLICATIONS

MATERIAL RECOVERY

- ❑ Recovery of metals from powders of electric arc furnaces in steelworks
- ❑ Utilization of slags of electric arc furnaces in steelworks
- ❑ Regeneration of exhausted catalyzes
- ❑ Treatment of ASR (Automotive Shredder Residue) for its use in bituminous conglomerates productions
- ❑ Treatment of Stabilized Organic Component of MSW (Municipal Solid Waste) for its use in environmental restorations

ENERGY RECOVERY

- ❑ Gasification of ASR (Automotive Shredder Residue) with electric and thermal power production
- ❑ Gasification of industrial sludge
- ❑ Pyrolysis of oils containing PCBs (PolyChlorinated Biphenyls) with production of hydrogen and carbon powder
- ❑ Energy production from biomass

INERTIZATION

- ❑ Vitrification of ACW (Asbestos Containing Waste)
- ❑ Vitrification of fly ash from municipal solid waste incinerator
- ❑ Reduction and inertization of sewage sludge



**Plasma
Torches**



**Rotary Kiln
Gasifier**



**Rotary Kiln
Pyrolyser**



**Electric Arc
Furnace**



**Flameless
Burners**



ENVIRONMENTAL SECTION

THE CSM ENVIRONMENTAL PLATFORM

**PLASMA
TORCHES**
[0.5 MW]



**ROTARY KILN
GASIFIER**
[150 kg/h]



**ELECTRIC ARC
FURNACE**
[0.5 MW]



**ROTARY KILN
PYROLYSER**
[120 kW]

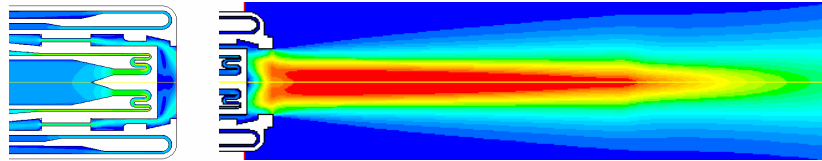
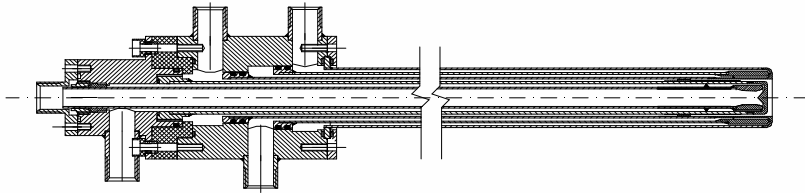




ENVIRONMENTAL SECTION

CSM PLASMA TORCHES

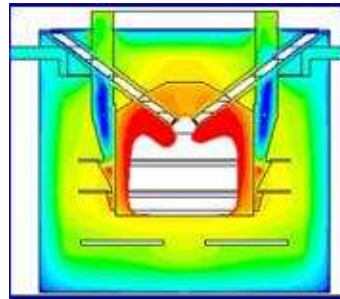
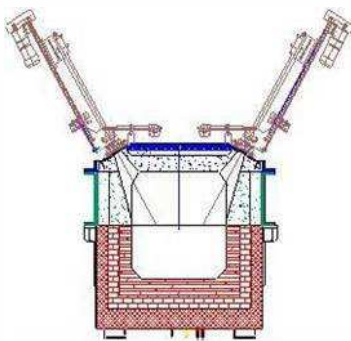
patented



PLASMA TORCHES DESIGN



1000 A Plasma Torches
diameter: 50 mm
length: 1200 mm



PLASMA REACTOR DESIGN



Plasma Reactor for
ShipBoard Waste Treatment



CSM FOR THE ENVIRONMENT

CSM PLASMA TORCHES



CSM 500 kW Plasma Torch Pilot Plant

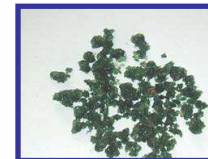
experimental campaigns on different waste
(domestic and industrial, solid and liquid, organic and inorganic)



**FLY ASHES FROM
MUNICIPAL SOLID WASTE
INCINERATORS**



CSM 1 MW Mobile Plant for Asbestos Containing Waste



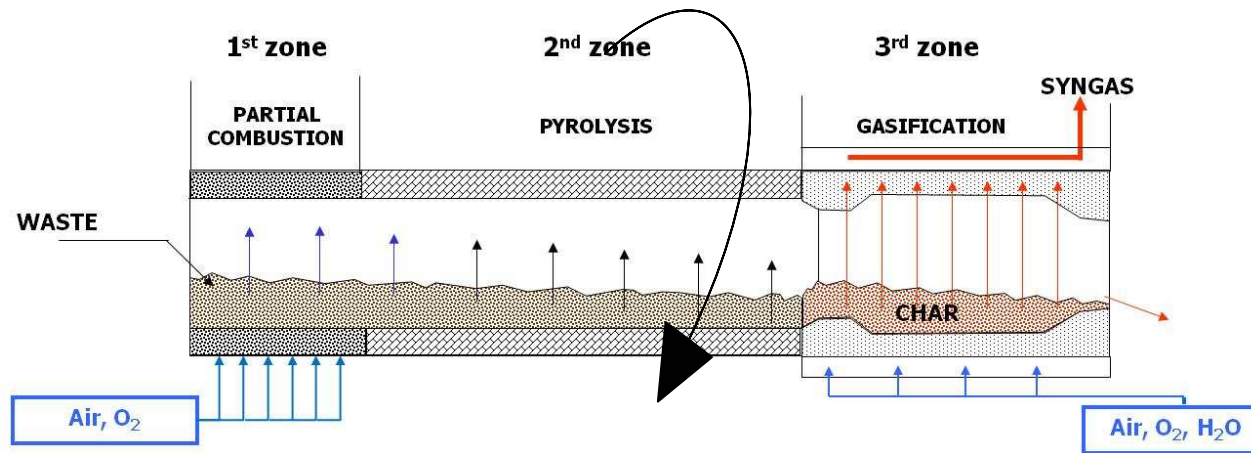
**ASBESTOS CONTAINING
WASTE**



CSM FOR THE ENVIRONMENT

ROTARY KILN GASIFIER WITH DISTRIBUTED INJECTION

patented



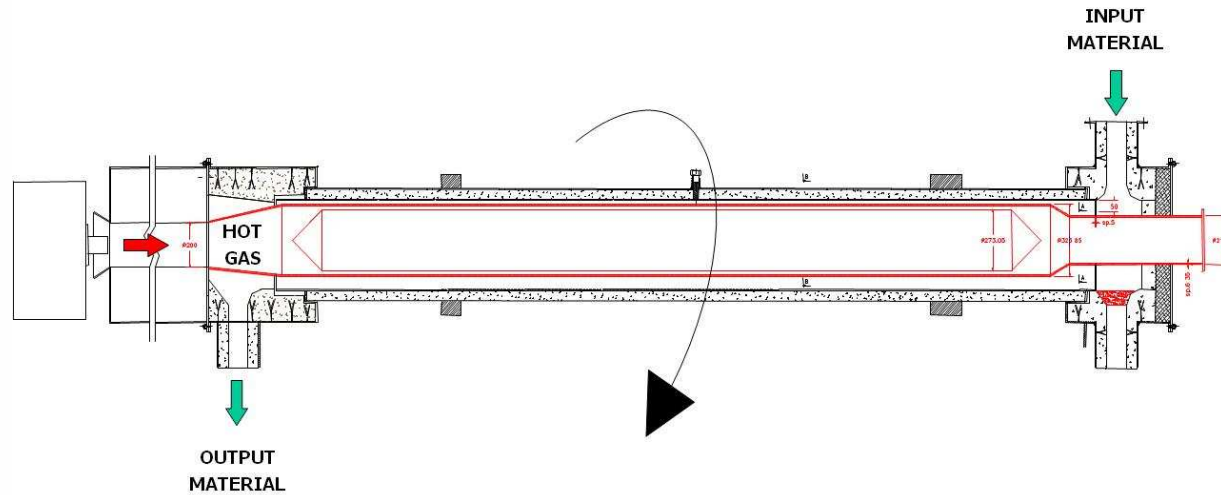
CSM 150 kg/h Pilot Plant



CSM FOR THE ENVIRONMENT

ROTARY KILN DRYER AND PYROLYSER

patented

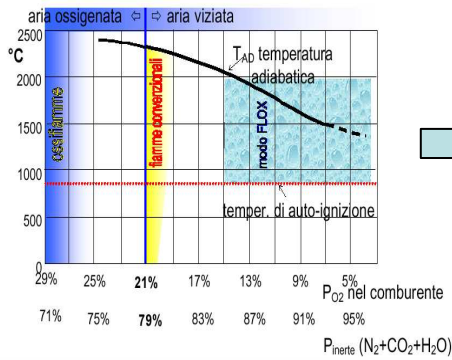


CSM 120 kW Pilot Plant

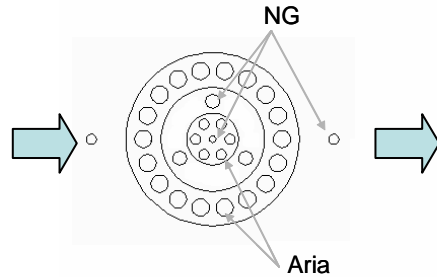


CSM FOR THE ENVIRONMENT

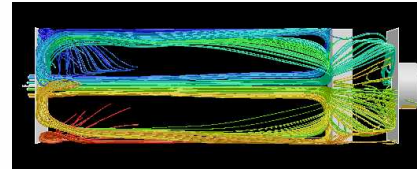
BURNER DEVELOPMENT (FLAMELESS AND REGENERATIVE BURNERS)



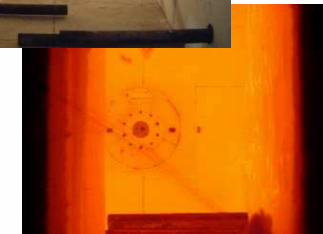
TECHNOLOGY IDENTIFICATION



BURNER DESIGN



PROTOTYPE CONSTRUCTION



EXPERIMENTATION



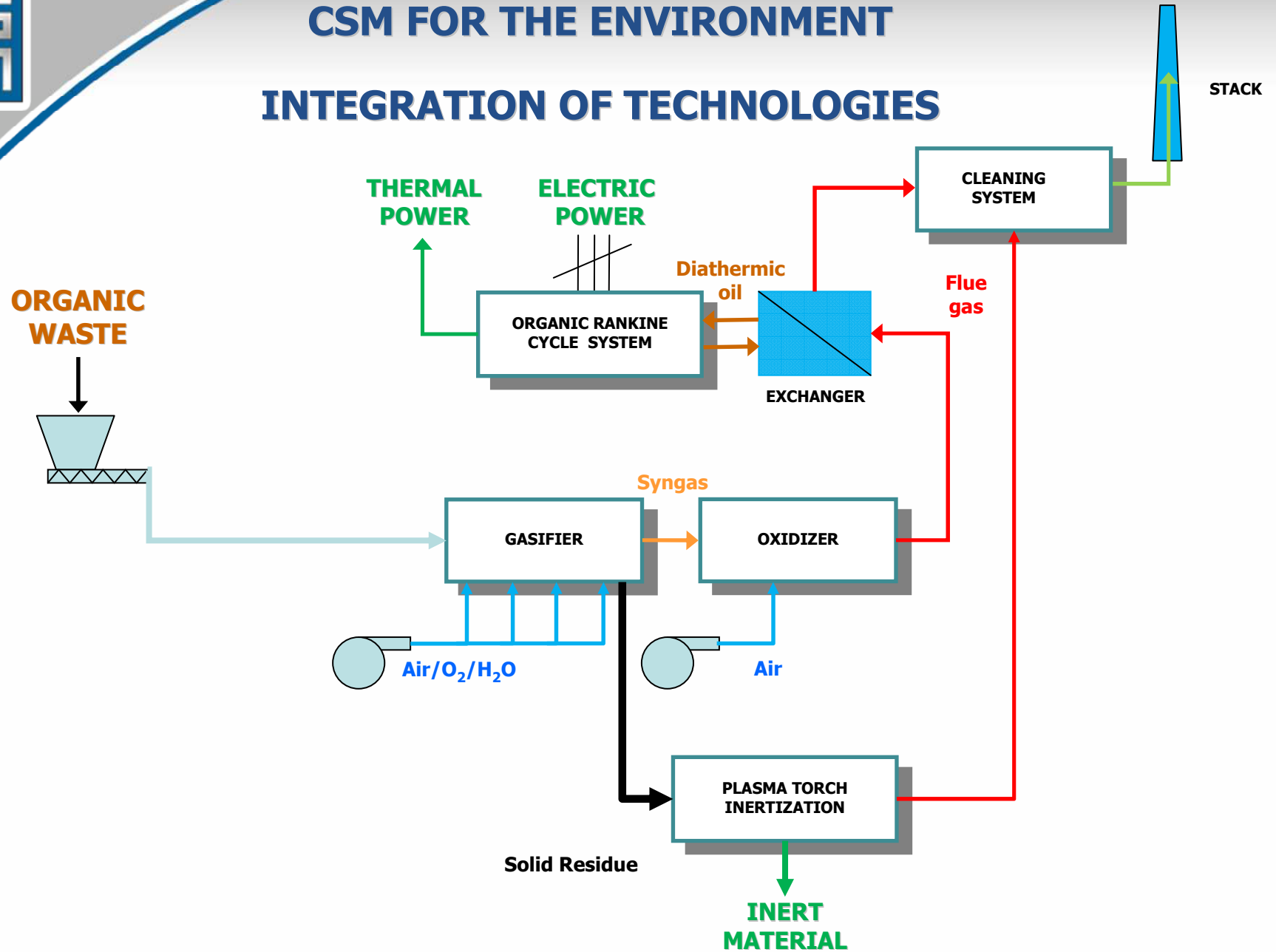
2.5 MW Experimental Furnace in the CSM's Combustion Station

- Height:** 6 m
- Variable Length:** 3, 4.5, 6 o 7.5 m
- Temperature:** 1300 °C
- Visual accesses along the whole lateral wall**
- Heat loads by means of extractable cooled lances**



CSM FOR THE ENVIRONMENT

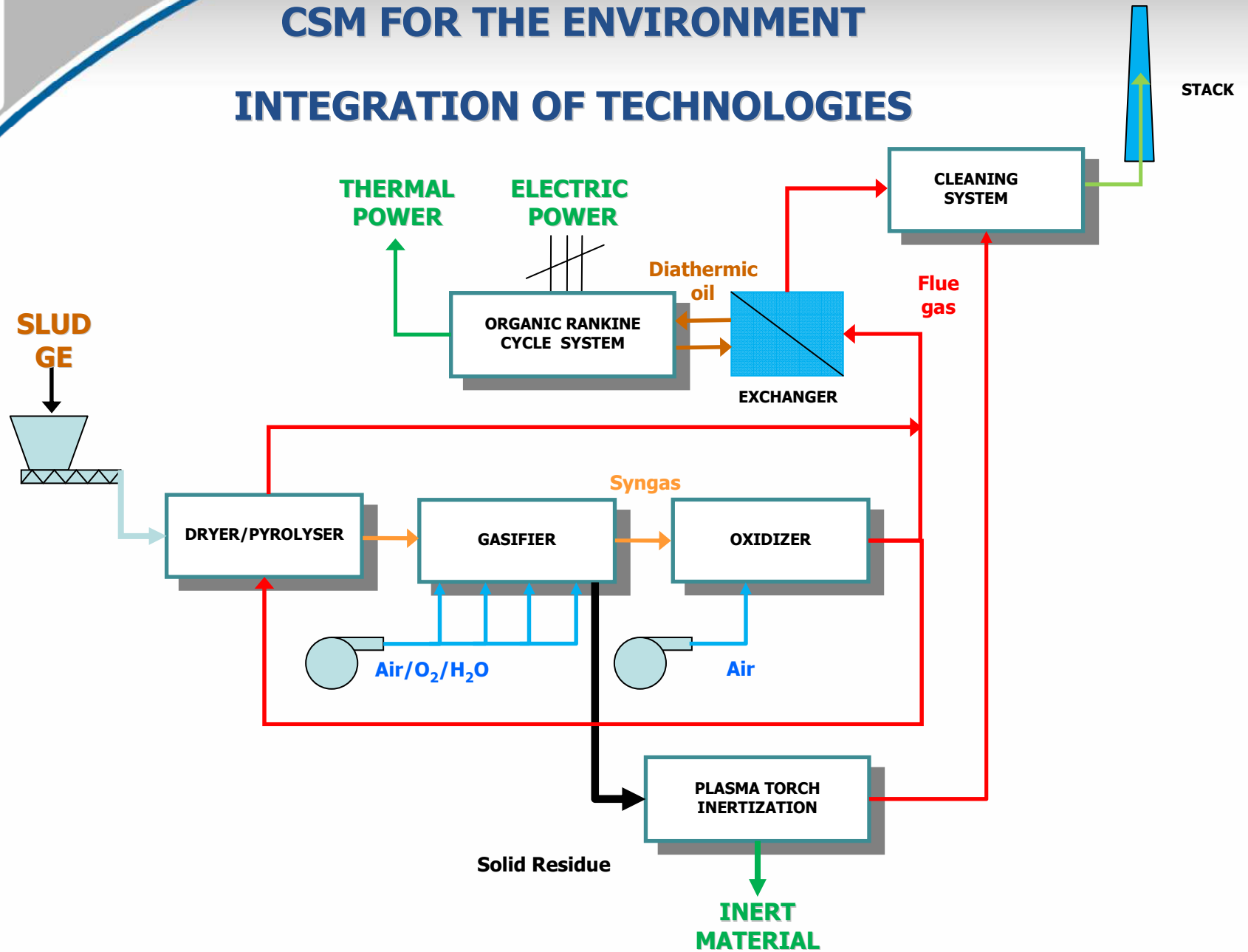
INTEGRATION OF TECHNOLOGIES





CSM FOR THE ENVIRONMENT

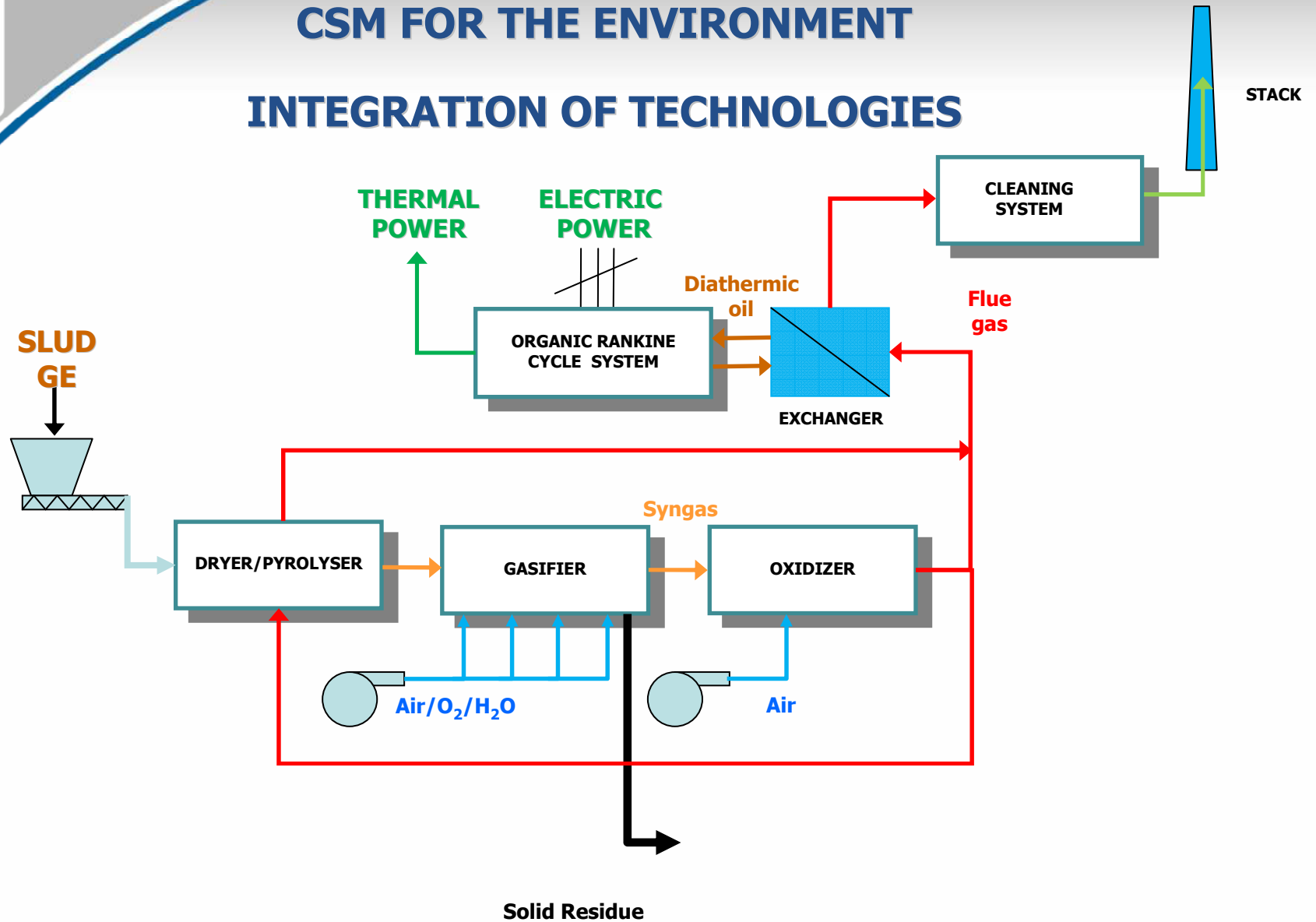
INTEGRATION OF TECHNOLOGIES





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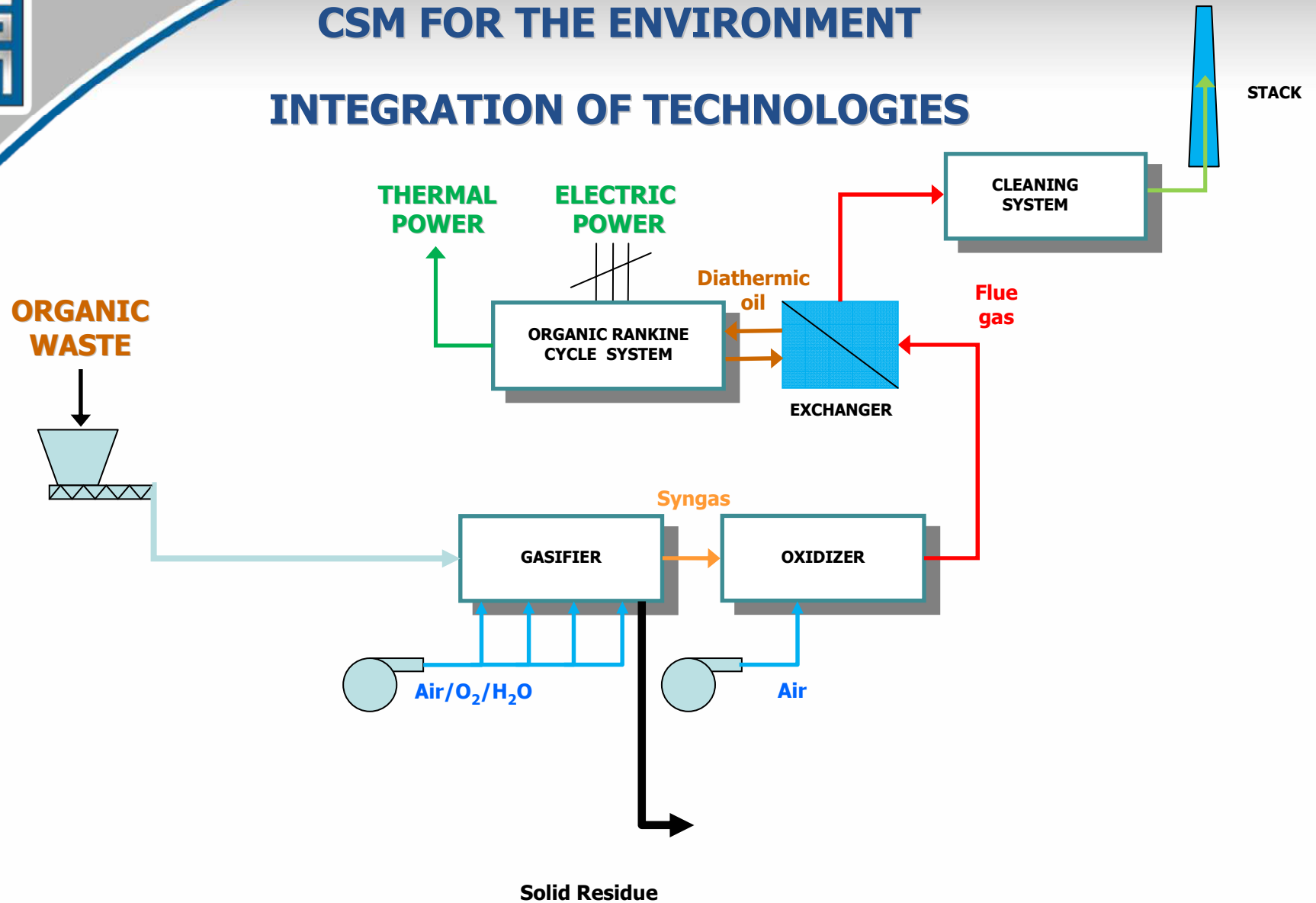
INTEGRATION OF TECHNOLOGIES





CSM FOR THE ENVIRONMENT

INTEGRATION OF TECHNOLOGIES

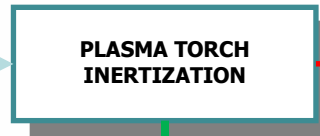
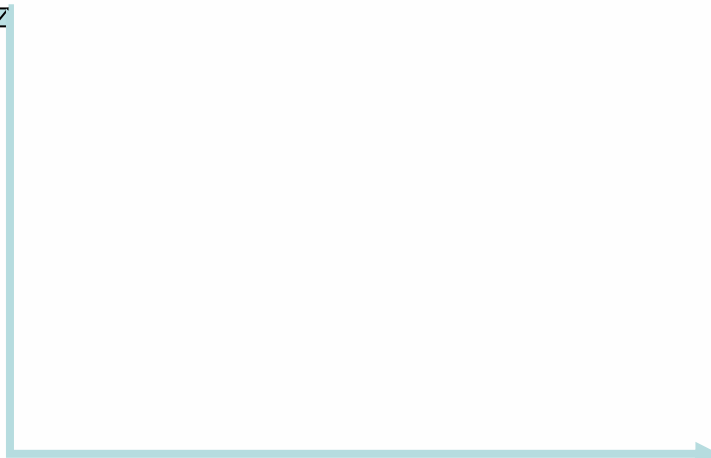
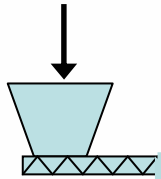




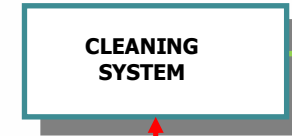
CSM FOR THE ENVIRONMENT

INTEGRATION OF TECHNOLOGIES

**HAZARDOUS
INORGANIC
WASTE**



**INERT
MATERIAL**



**Flue
gas**

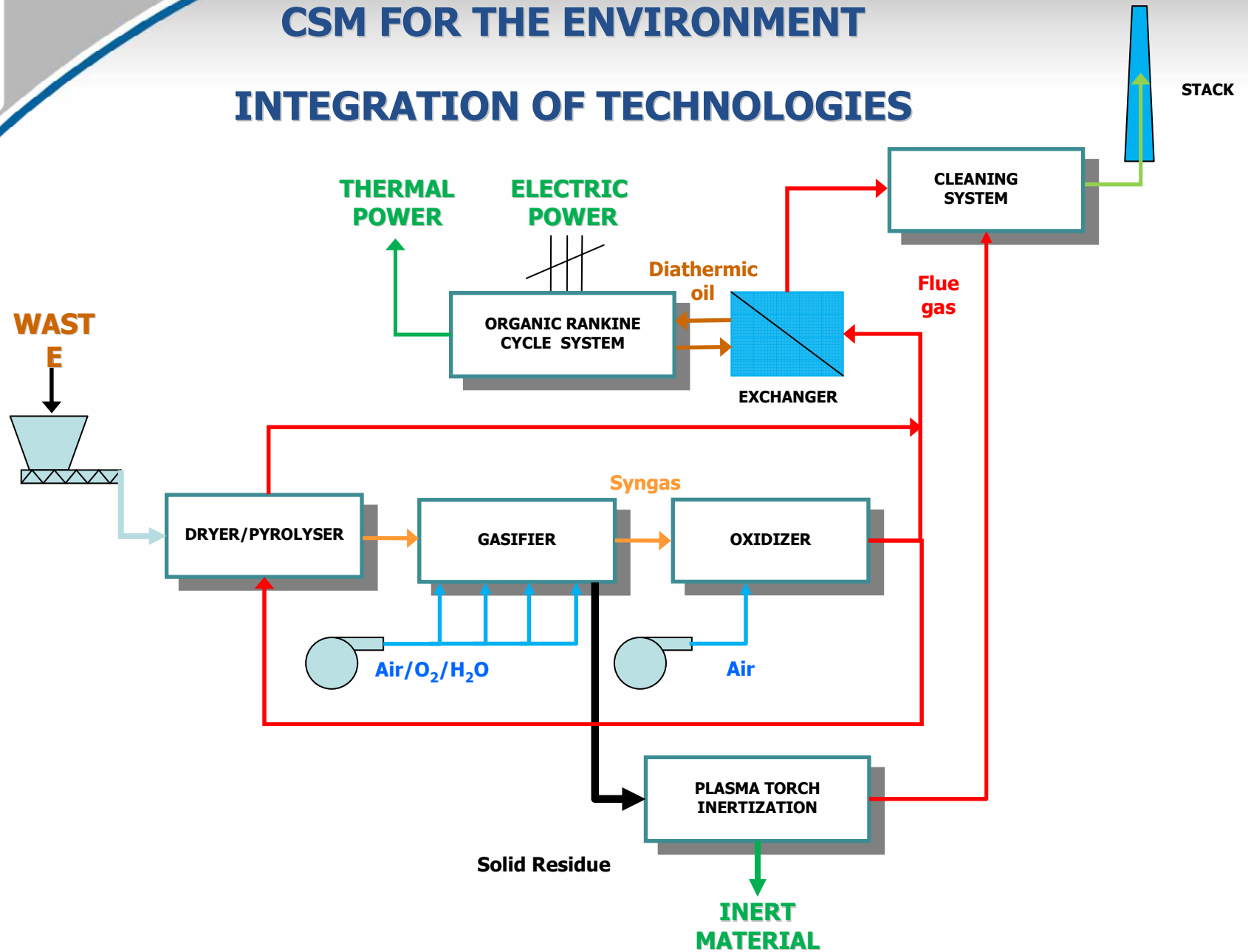


STACK



CSM FOR THE ENVIRONMENT

INTEGRATION OF TECHNOLOGIES





CSM FOR THE ENVIRONMENT

SELECTED REFERENCES

- **Tenaris**
- **Tenova**
- **Thyssen-Krupp**
- **eni**
- **SYNDIAL**
- **ARVEDI**
- **CONAI**
- **ACEA**
- **AMA**
- **ISPRA**
- **HERA**
- **Actelios**
- **Centro Rottami**
- **Hengelhard**
- **Chimet**
- **CETMA**
- **Bagnoli**



CSM FOR THE ENVIRONMENT

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TRITURATORE





ROTARY KILN DRYER/PYROLYSER





ROTARY KILN GASIFIER





OXIDIZER CHAMBER





ORGANIC RANKINE CYCLE SYSTEM





DEPOLVERATORE





EXHAUST GAS CLEANING SYSTEM





PLASMA TORCH INERTIZATION SYSTEM





MODIFICHE IMPIANTO PILOTA E PROVE DI PIROLISI E GASSIFICAZIONE

