JOSEPH EGLI AG

Incineration plants with

ROTARY KILN
for continuous operation

RK

for: **solid, liquid, pasty and sludgy hazardous waste**

capacity range: **1.25 MW bis 10.0 MW**

FIELD OF APPLICATION

Series RK (**Rotary Kiln**) ovens for continuous operation are suitable for practically all forms of waste of varying density and moisture content.

Type of waste:	Condition:	solid, sludgy, pasty and liquid
	Heating value:	1 ÷ 45 MJ/kg
	Moisture:	up to approx. 86%
	Density:	40 to approx. 1'500 kg/m³
Capacity range:	Thermal:	1.25 MW ÷ 10.0 MW
	Volume (for Hu of 15 MJ/kg)	300 kg/h ÷ 2'500 kg/h

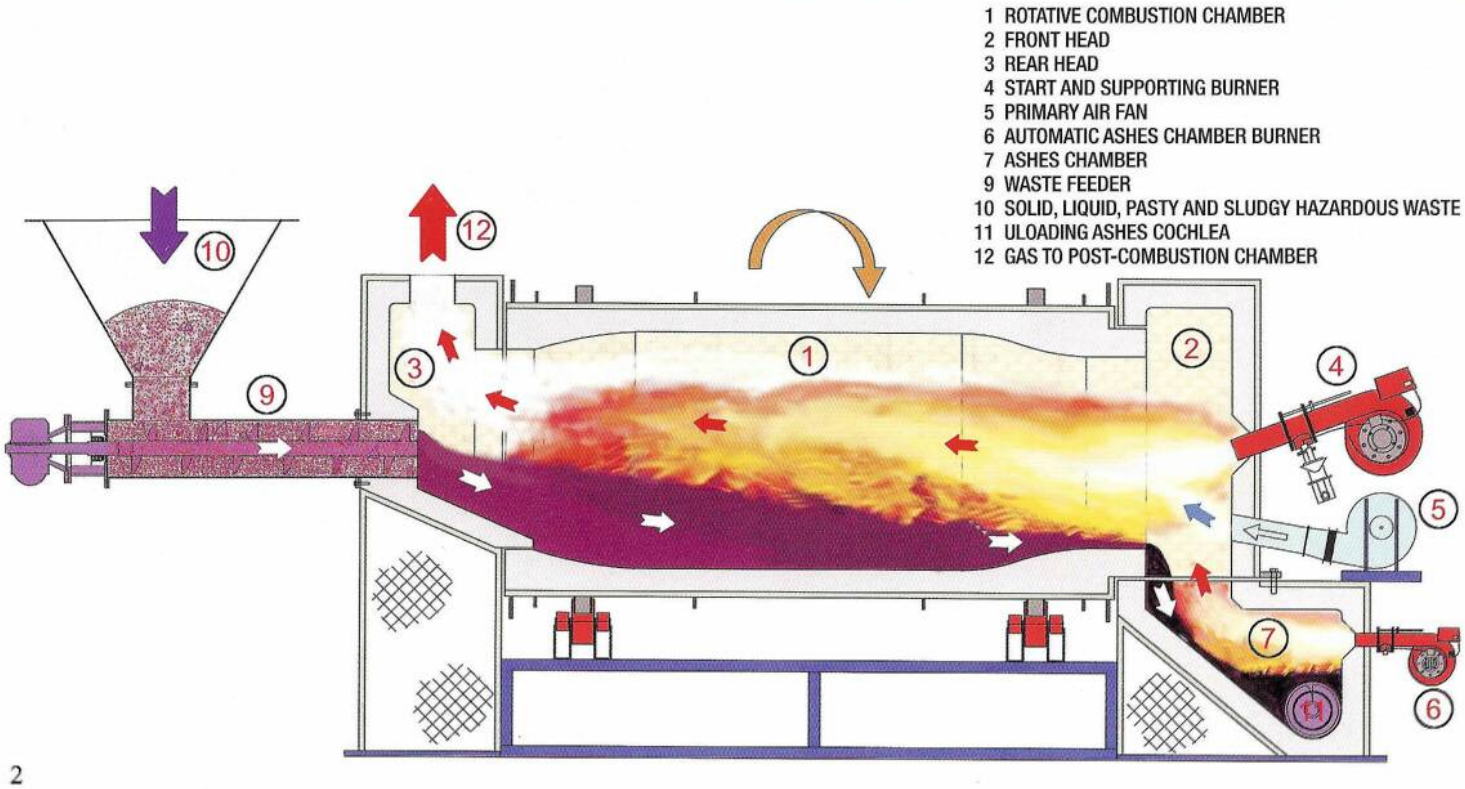
GENERAL

The rotary kiln with corresponding post-combustion chamber is the classical universal unit, a proven and versatile process for the incineration of "hazardous waste".
Owing to the kiln geometry, the main applications are firstly for hazardous waste requiring a high incineration temperature and secondly sludge and creeping waste.

Main advantages of the rotary kiln for the incineration of hazardous waste:

- universal application
- minimum requirements with respect to sorting and preparation of waste
- wide range of waste which can be incinerated simultaneously
- genuinely continuous incineration
- high combustion temperatures, up to 1,400°C
- easily controlled dwell time of waste in combustion chamber
- good and uniform interaction of waste and combustion areas

FUNCTIONAL PRINCIPLE OF THE ROTARY KILN



From left: bag filter, reactor, adsorbent batching, post-combustion, rotary kiln, ash discharge

Charging

Various charging systems are available to suit the type of waste:

- Hydraulic piston ram with sluice system for non-uniform, bulky solid waste
- Water-cooled feed screw for uniform granulated solid waste and sludge
- Nozzle injection of liquid and powdered waste.

Combustion

The cylindrical combustion chamber is installed horizontally and rotates about its own axis.
The waste feed, evacuation of flue gases and possibly a water supply for cooling are mounted on the end face of the cylinder tube and the auxiliary burner and air supply on the opposite side. The lower part of the head piece includes the ash container.
The kiln operates on the so-called counter-flow principle, i.e. the solid waste or ash flows in the opposite direction to the flue gases.
The combustion tube rotates very slowly during the incineration programme. This provides a thorough mixing of the waste to be incinerated and a uniform air supply, and therefore also ensures uniformly distributed combustion spaces. Controlled combustion takes place in the combustion tube (practically a pyrolysis) under stoichiometric conditions. With minimum air supply the waste is dried, heated and the volatile components expelled.
At the end of the combustion tube the solid components are in the form of sterile ash and are taken to the ash container of the head piece. The ash container can be provided with post-combustion for the ash.
Regulation of the speed of rotation and the supply of air and fuel ensures complete incineration of the organic component.

Post-combustion

The flue gases emitted during combustion usually have a content of unburnt gas components. The gases not burnt out are mixed with fresh air in the reactor, ignited by the reactor burner and taken to post-combustion. The gases burn in the post-combustion chamber at a temperature and dwell time determined by the waste and by the regulations.
The arrangement of the post-combustion chamber can be either horizontal or vertical depending on the structural circumstances.

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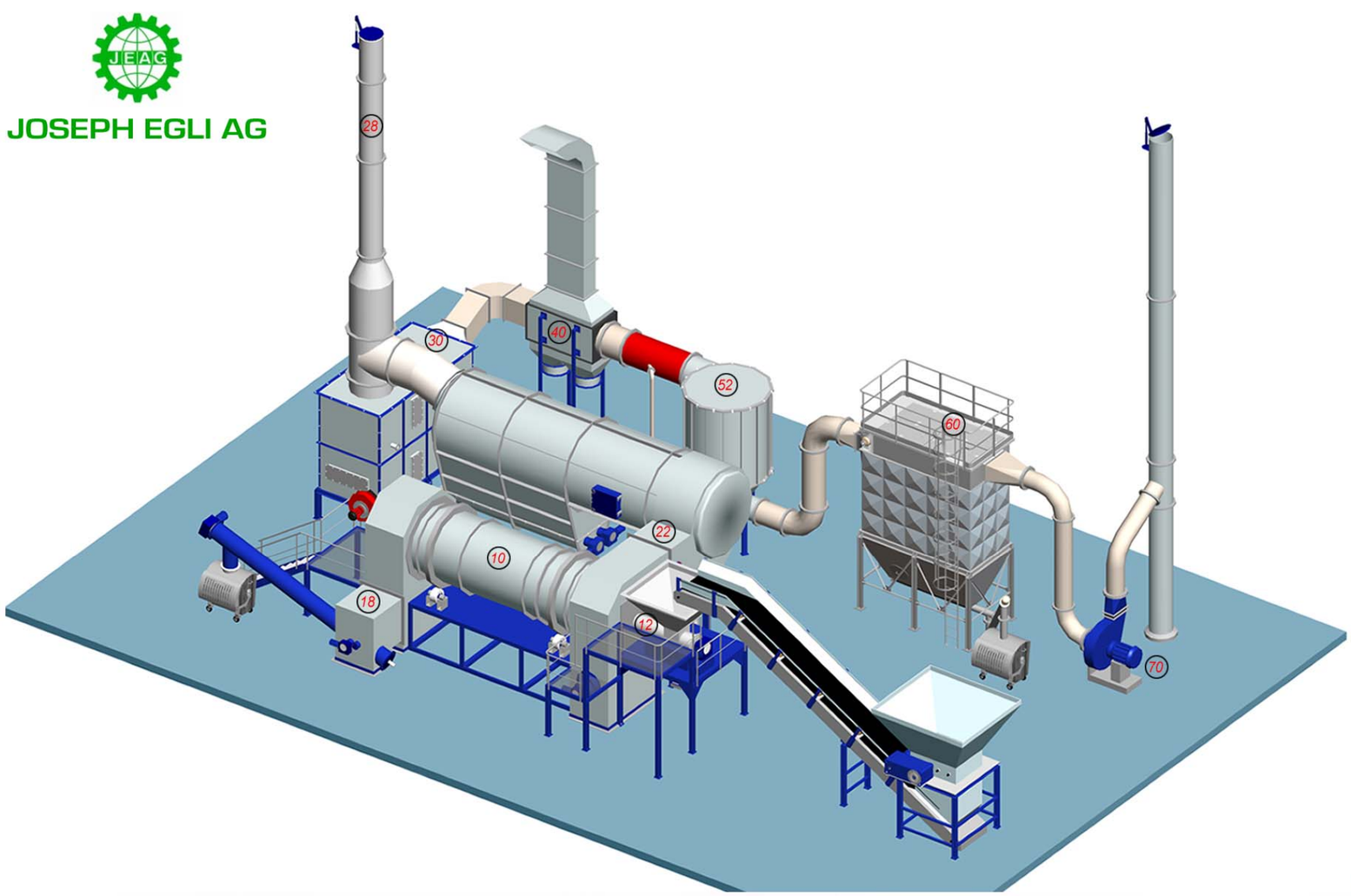
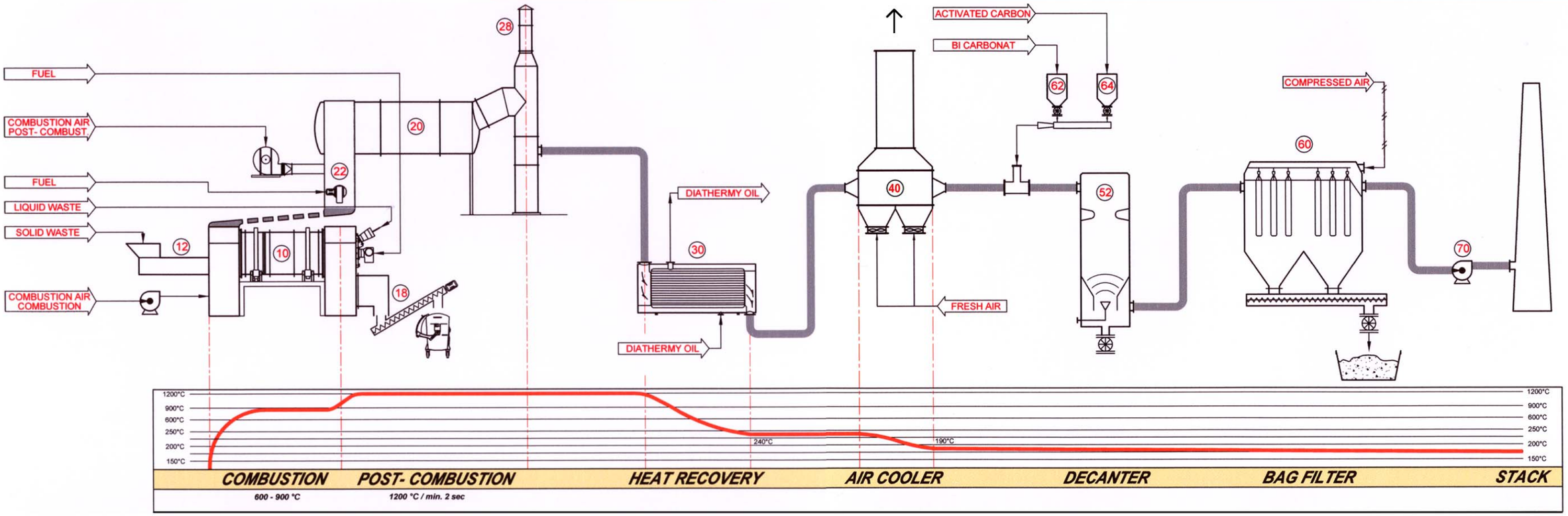
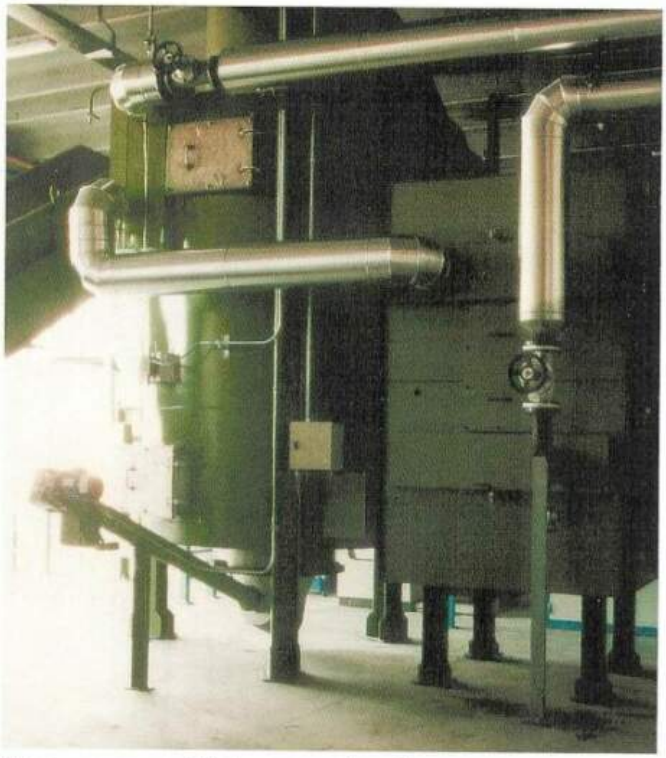
INCINERATION PLANT FOR INDUSTRIAL & HOSPITAL WASTE



(10) INCINERATOR
(12) WASTE FEEDING
(18) ASH OUT LET
(20) POST COMBUTION CHAMBER
(22) REACTOR
(28) EMERGENCY STACK
(30) HEAT RECOVERY
(40) AIR COOLER
(52) DECANTER
(60) BAG FILTER
(70) I.D. FAN



Post-combustion chamber with burner, dosing system



Heat recovery with heat transfer oil

Ash removal

Removal of the ash depends on the composition of the waste or the ash expected and the inert proportion.

With a low ash and inert proportion the ash containers are emptied by water-cooled screws.

With varying amounts of ash and different granulations the discharge from the rotary kiln is usually made to the water bed, from where the cooled ash together with the inert fractions is then taken by chain conveyor to the ash container.

Flue gases

In addition to the surplus air and "normal" products of combustion such as carbon dioxide, steam and flue-dust, the flue gases contain varying proportions of noxious gases such as sulphur dioxide, nitrogen, hydrogen chlorides and fluorides, as well as heavy metals and traces of toxic chlorinated hydrocarbons, depending on the composition of the waste.

The higher the combustion temperature, the more heavy metals appear in gaseous form in the flue gas. The heavy metals partly recondense in zones of lower temperatures and are deposited on the flue-dust.

Heat recovery

Before cleaning the flue gases they must first be brought to a considerably lower temperature determined by the cleaning process. The temperature reduction can take place in various ways. A sensible method is heat recovery with the production of steam or hot water. The same result can also be achieved with diathermic carrier oil.

Flue gas cleaning

The flue gas cleaning method is determined by the waste to be processed and the local regulations.

In most cases "dry flue gas cleaning", consisting of a batching and injection system, the reactor and a bag filter, is sufficient for familiar uniform waste.

With unknown and varying waste a two- or multi-stage washer is normally connected in series to perform primary cleaning. The dry system acts as monitor filter and is used for the re-formed dioxins and furanes, as well as for the slightly volatile heavy metals.

Control

The combustion process is controlled and monitored by a freely-programmable control system. The most important parameters are displayed on the screen of a personal computer. Important data such as combustion and post-combustion temperatures, oxygen content, CO and NOx values are measured and recorded continuously.

Continuous measurement and recording of dust, HCl, HF and other emissions is also possible as an option.

An integral modem allows us to review the process, change parameters and analyze and eliminate faults from the factory.

Process visualization display

TECHNICAL DATA

Model		RK 13	RK 29	RK 42
Capacity				
Thermal capacity	MW	1,25	2,90	4,20
Throughput volume	kg/h	300	700	1000
Max. daily charging time	h	24	24	24
Max. daily capacity	to/day	4,2	7,2	24
Combustion				
Combustion chamber volume	m^3	4,0	7,5	10
Burner capacity	MW	0,7	1,2	1,9
Incineration temperature	ºC	600–1'200	600–1'200	600–1'200
Post-combustion				
Post-combustion chamber volume	m^3	7	14	21
Burner capacity	MW	3,0	4,0	4,8
Post-combustion temperature	ºC	1'100	1'100	1'100
Residence time	sec.	2	2	2
Flue gas cleaning				
Cleaning system		dry adsorption / Hovalit		
Filter area	m^2	80	186	266
Max. filter speed	m/min.	0,8	0,8	0,8
Max. gas temperature	ºC	240	240	240
Consumption				
Fuel: heating oil light	kg/h	32	72	100
Alternative: natural gas (G 20)	Nm3/h	38	86	120
Adsorbent / Hovalit	kg/h	13	29	40

- The technical data for our standard systems were recorded at the time of printing. They are, however, subject to continuous modification and cannot be guaranteed.
- All data are based on waste with a lower heating value of 15 MJ/kg and 10% moisture.
- All consumption data are experience values, highly dependent on the composition of the waste and operating conditions and are therefore only indicative and not guaranteed.

Fire and water are „our“ elements

JOSEPH EGLI AG

Incineration plants

Linthlistr. 9, 8868 Oberurnen/Switzerland, +41 55/617 23 00, Fax +41 55/617 23 09
Internet: www.jeag.com; E-mail: info@jeag.com