

CEMENT KILN GAS/OIL BURNER

MODEL : **CKGO**

BULLETIN : 901

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INTRODUCTION

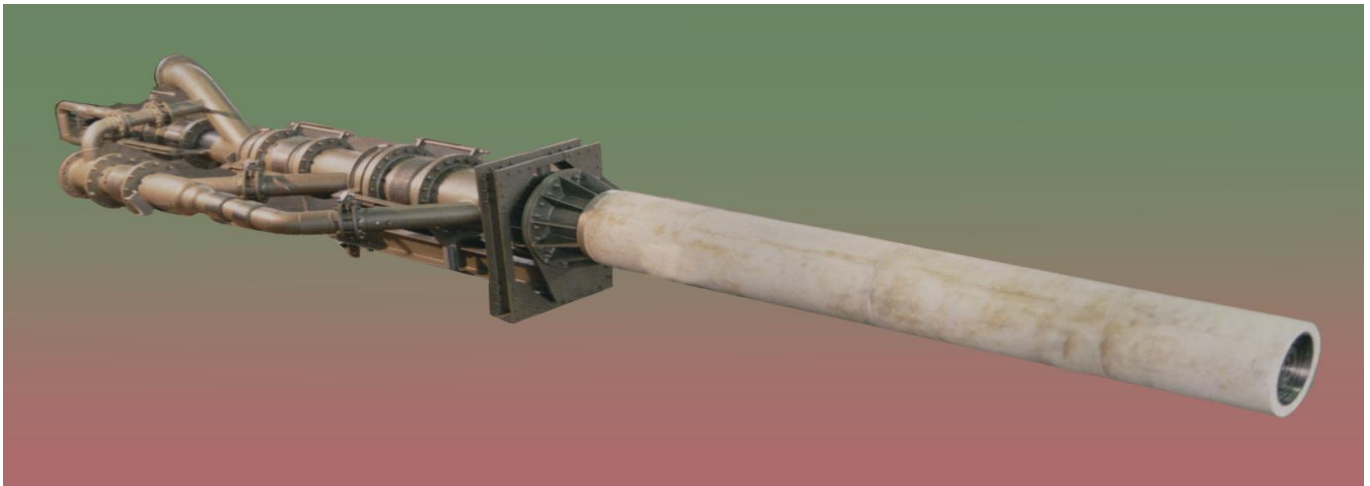
Sholeh Sanat Engineering and Manufacturing Company was established in 1989 by a group of Iranian experts in the utilization of fuel in industry. The company has, since then, been engaged in optimizing methods of using fuel in industry, and its main activity has been the production of burners for industrial furnaces.

CKGO (Cement Kiln Gas/Oil) burners are the outcome of a fifteen-year experience on industrial burners.

CKGO burners are designed to meet the needs of cement industry which is undergoing the process of fuel conversion and development .

In the meantime, the availability of **CKGO** burners is essential for fuel utilization for the production of energy and its application in cement production process.

Since ten years ago, Sholeh Sanat has specifically studied and worked on **CKGO** burners.



CKGO burner is the result of the application of reversed engineering and adaptation with standards and the needs of the country's production process, and consists of optimizing fuel consumption and removing environmental pollutants. Although the first burner was installed in the lime kiln of Sarcheshmeh Copper Complex, its utilization in cement industry is accredited by Isfahan Cement Co. We would like to cordially acknowledge sincere cooperation of the management and staff in Isfahan Cement Co.



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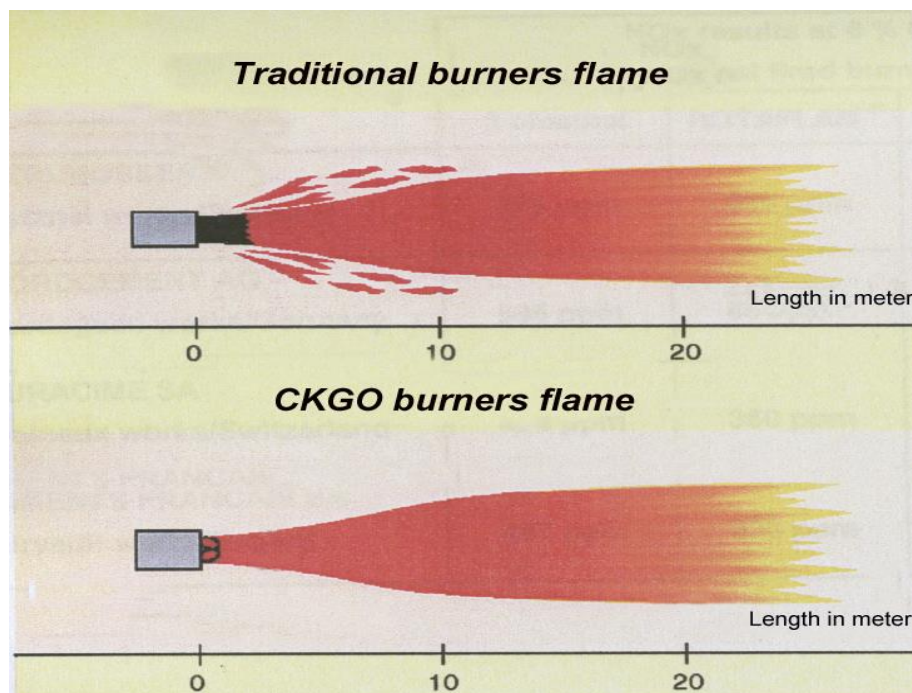
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Comparison of CKGO vs. Traditional burners

- 1 - **CKGO** burner is equipped with a disc for stabilizing the flame. The disc increases the flame stability and turn-down ratio as well as enhancing the application of the burner for the furnace warm-up.
- 2 - Compared to other parts, the burner head is a bit more projected to form a better flame shape.
- 3 - Heavy fuel oil, natural gas, radial and axial air channels are arranged to reduce the amount of oxygen in the flame base and consequently decrease the flame maximum temperature. This is a significant factor which ultimately reduces the NOx.
- 4 - Axial air outlet is built in the form of circular nozzles to control the distribution of air in the path. It also causes the uniform protection of external layer while increasing the rotation of CO₂ filled gases in the flame base and decreasing the amount of oxygen in this area.
- 5 - Air pressure drop from the burner fan to its opening reduces to the half.
- 6 - Primary air flow is adjusted through the replacement of nozzles and causes omission of primary air (radial and axial air) pressure drop in adjustable butterfly valves.
- 7 - In traditional burners the air pressure in the burner head is 80mbar and its volume is 10%. These figures for **CKGO** burner are 170 mbar and 6% respectively. However, special kinetic energy for traditional burners is $80 \times 10 = 800$ and for a **CKGO** burner is $170 \times 6 = 1020$.
The above comparison indicates that despite the reduction of primary air volume, its role in forming the flame has enhanced.



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ADVANTAGES OF CKGO BURNERS

- 1 – Creating a better flame of a few meters while reducing its maximum temperature.
- 2 – Reducing primary air up to four percent and replacing it with secondary pre- heated air which decreases the fuel consumption up to 1.5%.
- 3 – Better application:
 - Considering the increase of special kinetic energy, the possibility of forming rings in the furnace decreases.
 - The flame shape is controlled better and easier.
 - It is very easy to turn on the furnace from cold condition and less temperature tension is imposed on the furnace refractory.
 - Compared to traditional burners, the amount of NOx reduces to 50%.
 - A suitable coating is formed.
 - Due to the reduction of flame peak temperature and the suitable coating , the temperature of the external layer gets more even.
 - There is the possibility of simultaneous consumption of gas and liquid fuel.

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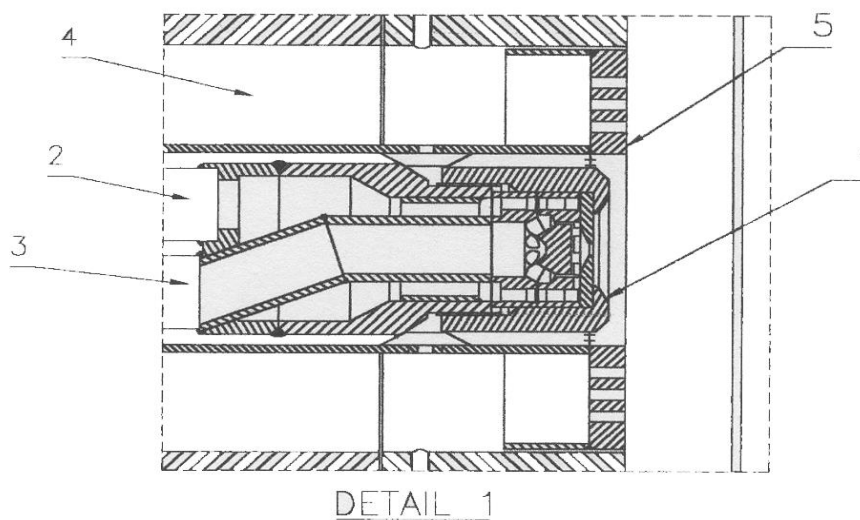
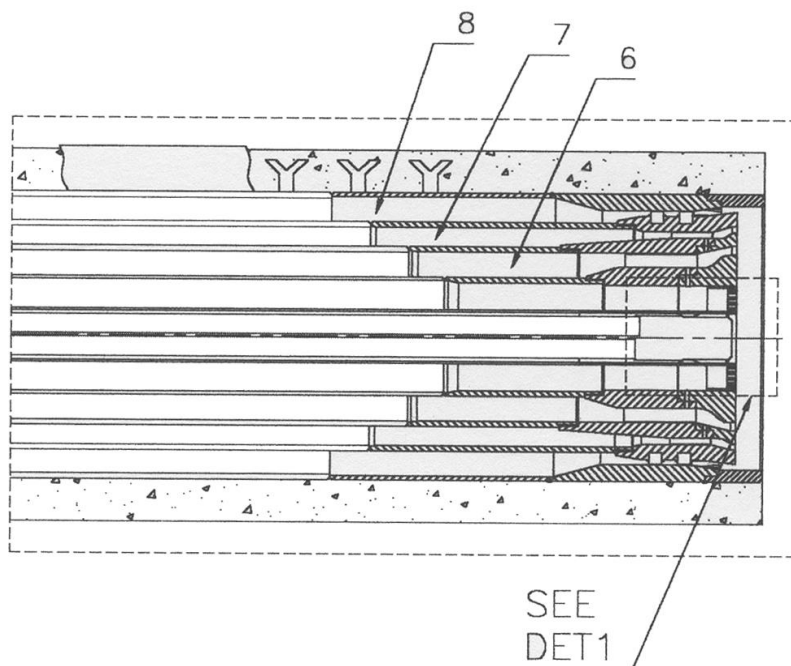
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DESCRIPTION OF NOZZLES AND BURNER PATHS

- 1- Oil nozzle
- 2- Radial oil path
- 3- Axial oil path
- 4- Cooling air path
- 5- Flame stabilizer
- 6- Gas path
- 7- Radial air path
- 8- Axial air path



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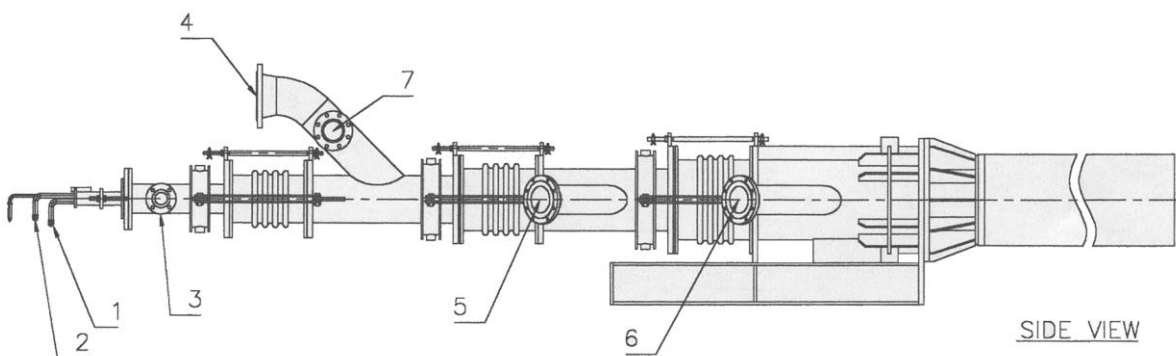
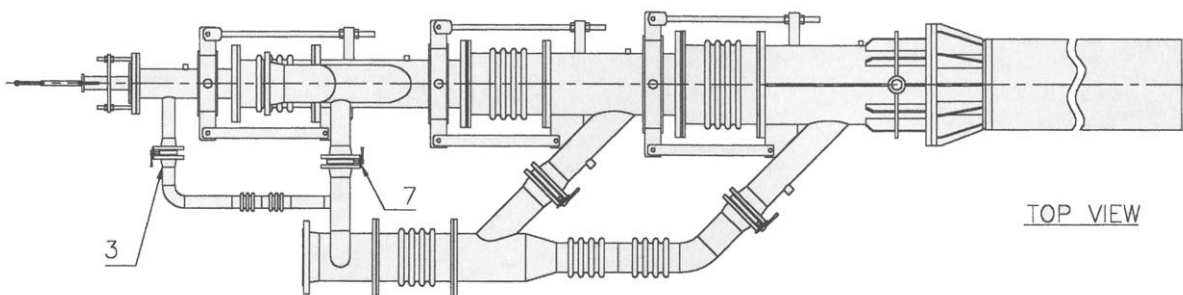
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DESCRIPTION OF BURNER INLETS

- 1- Radial oil inlet
- 2- Axial oil inlet
- 3- Oil nozzle cooling air inlet
- 4- Gas inlet
- 5- Radial air inlet
- 6- Axial air inlet
- 7- Gas path cooling air inlet (open on oil operation)



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Burners manufactured by Sholeh Sanat Engineering and manufacturing company for cement kiln furnaces

Burner Model	Maximum Heat Capacity(Kcal/hr)
<i>20,000 CKGO</i>	<i>20,000,000</i>
<i>34,000 CKGO</i>	<i>34,000,000</i>
<i>48,000 CKGO</i>	<i>48,000,000</i>
<i>60,000 CKGO</i>	<i>60,000,000</i>
<i>80,000 CKGO</i>	<i>80,000,000</i>
<i>110,000 CKGO</i>	<i>110,000,000</i>
<i>140,000 CKGO</i>	<i>140,000,000</i>
<i>170,000 CKGO</i>	<i>170,000,000</i>

- 1- Oil pressure at maximum heat input 40 bar
- 2- Gas pressure at maximum heat input 0.7bar
- 3- Primary air pressure at maximum heat input in burner head 170mbar

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FUEL CONTROL AND MEASURING SYSTEM

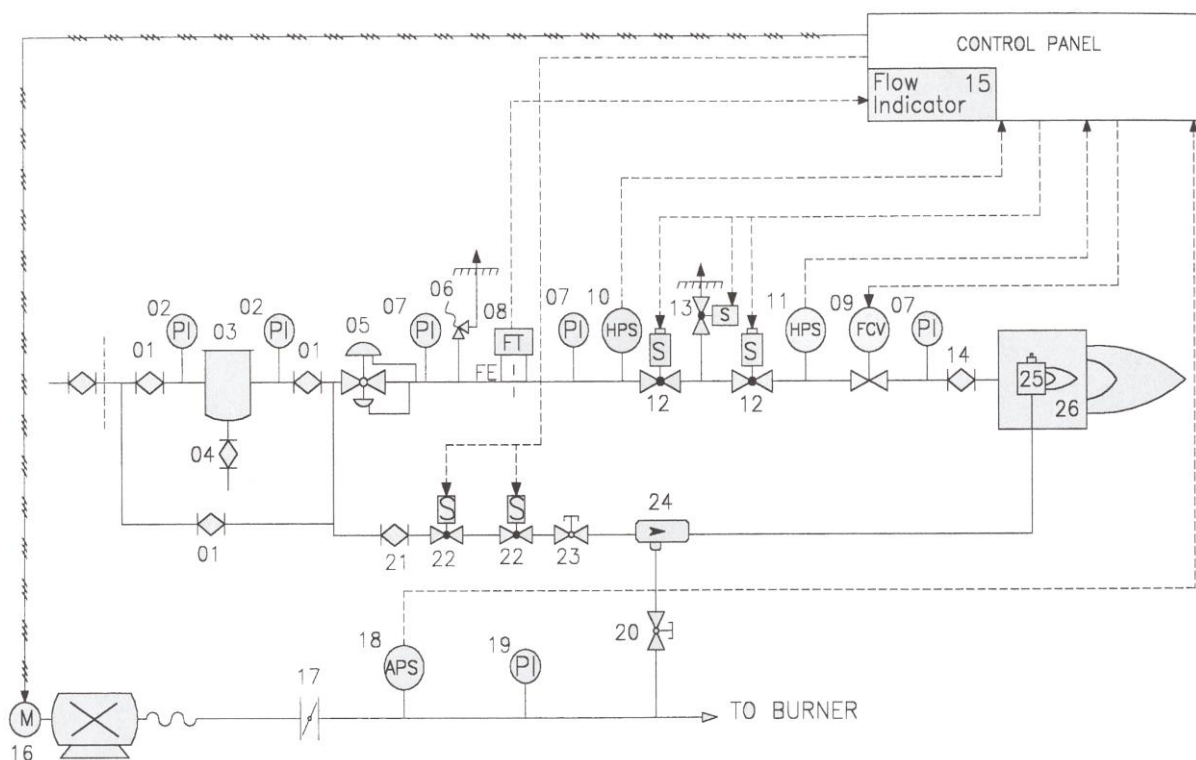
1- Liquid fuel control and measuring systems:

This system consists of primary and secondary filters, primary and secondary oil pumps, indirect oil heaters, up-stream and down-stream oil meter, security cut-off system (electric valves), pressure and temperature indicators, liquid fuel flow control system (axial and radial) and its relevant valves.

2- Gas fuel control and measurement system:

Sholeh Sanat Eng. & Mfg. Co. has designed and executed the most advanced and complete system in the gas sector to control the fuel in cement industry .

Meanwhile, it always recommends a flame supervision system for the main flame and the pilot to enhance the safety system. Sholeh Sanat is capable of installing this system.



Gas control system in **CKGO** burner

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COMPONENTS OF GAS FUEL CONTROL SYSTEM IN CKGO BURNERS

- 1 – Gas hand valve
- 2 – Pressure guage
- 3 – Gas filter for cleaning gas before feeding into the system
- 4 – Valve beneath the filter
- 5 – Gas regulator equipped with shut off valve to adjust the gas pressure as needed
- 6 – Safety valve
- 7 – Pressure guage
- 8 – Gas flow measurement system
- 9 – Flow control valve to control the amount of gas feeding into the burner
- 10- Gas low pressure switch
- 11- Gas high pressure switch
- 12- Gas automatic safety shut off valves (N.C.)
- 13- Gas automatic safety shut off valves (N.O.)
- 14- Gas hand valve
- 15- Gas flow indicator
- 16- Primary air blower
- 17- Primary air hand valve
- 18- Primary air pressure switch
- 19- Pressure guage
- 20- Pilot air adjustable valve
- 21- Pilot gas hand valve
- 22- Pilot gas solenoid valves
- 23- Pilot gas adjustable valve
- 24- Pilot gas and air mixer
- 25- Gas pilot equipped with automatic ignitor
- 26- **CKGO** burner

Sholeh Sanat also manufactures Hot Gas Burners with different capacities that are being utilized in the Iranian industry.

CKGO BURNER SET UP

- Prior to setting the burner up, nozzles must be in (0) position by means of adjusting mechanisms.
- Start the primary air blower.
- Adjust the axial air at 10° by adjustable butterfly valve.
- Adjust the radial air at 40°-60° by adjustable butterfly valve.
- Open nozzles cooling air completely
- If operating on liquid fuel, open the natural gas path cooling air and if operating on natural gas, close this path.
- Place the liquid fuel nozzle in its suitable position.
- If the burner is equipped with gas pilot and flame supervision system, adjust the pilot air and gas valves and turn on the pilot system. Adjust the pilot flame in a way that can be detected by ionization rod and the main flame can be ignited easily.
- Set the fuel flow by adjusting the burner at 10% of the maximum heat input. If, considering the burner adjustment range, the minimum flame is set, special attention should be paid to radial and axial air pressure and liquid and gas fuel flow. This information can be used as a criterion in future set ups.

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- In normal situations, open the primary air adjusting valves completely and adjust the amount of air only through replacement of nozzles to reach the desired flame.
- After sudden cut-offs, the burner can be set up based on the adjustment of the shutter on constant operation mode.

The flame shape is identified by adjusting radial and axial air through the replacement of nozzles and is a function of the furnace diameter and the process requirements. The more the radial air, the ticker and shorter the flame would be, and the more the axial air, the thinner and longer the flame would be .

It should be noted that any change in the amount of radial and axial air will result in a change in the flame temperature. This temperature affects the nozzles and has a minor effect in coming liquids as well.

Upon observing this effect, gradual re-adjustment is recommended.

Pay attention that the axial air which is the cooling factor for the burner's external coat, should not be less than the standard amount, otherwise the high temperature might damage the coating.

The furnace pre-heating should be done following the manufacturer's instructions.

TURNING OFF THE BURNER

If the burner turns off, the primary air blower should be placed in the circuit to avoid nozzles and burners from overheating.

BURNER CARRIAGE

As well as transferring the burner into the furnace the carriage should be capable of positioning the burner in the furnace in an appropriate direction and angles position.

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