

# CEMENT KILN GAS/OIL BURNER

MODEL :  
**CKGO & PCGO**

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 up to Twenty-years experience on cement kiln 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.

Many years ago, Sholeh Sanat has specifically studied and worked on cement kiln 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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**SHOLEH SANAT ENG. & MFG. Co.**

MANUFACTURER OF BURNERS FOR FURNACES

FUEL CONVERSION OF BOILERS & FURNACES, DESIGN CONSULTATION AND INSTALATION

REV.1 of 10<sup>th</sup> Oct. 2021

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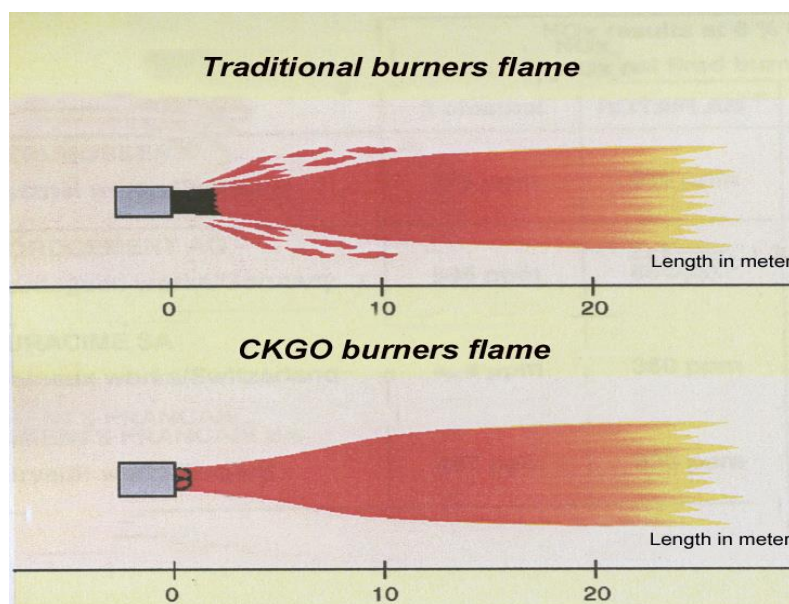
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## Comparison of CKGO vs. Traditional burners

- 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 CO<sub>2</sub> 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 decreasing of primary air (radial and axial air) pressure drop by 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 ~ 240 mbar and 6~8% respectively. However, special kinetic energy for traditional burners is  $80 \times 10 = 800$  and for a **CKGO** burner is  $\min 170 \times 6 = 1020$ .  
The above comparison indicates that despite the reduction of primary air volume, its role in forming the flame has enhanced.



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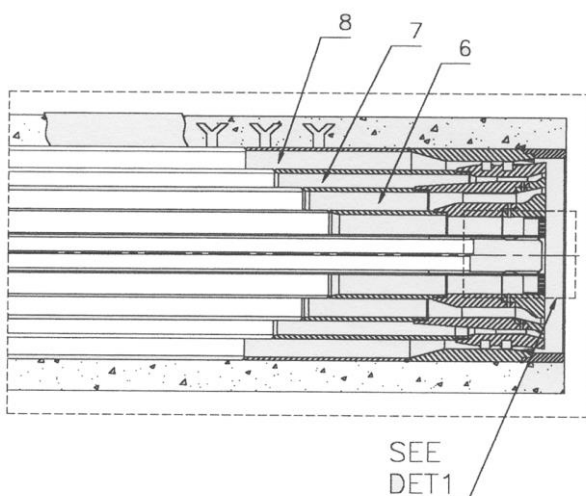
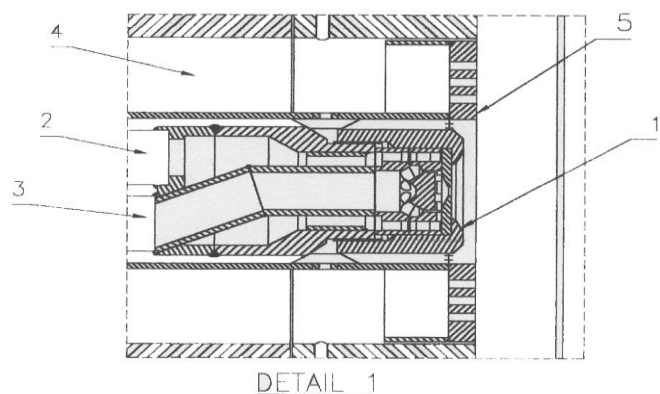
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## ADVANTAGES OF CKGO BURNERS

- 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.

## DESCRIPTION OF NOZZLES AND BURNER PATHS

- 1– Oil nozzle Set
- 2– Primary (Swirl) oil Stream
- 3– Secondary oil Stream
- 4– Central oil Stream
- 5– Flame stabilizer (Central air)
- 6– Gas path
- 7– Radial air path
- 8– Axial air path



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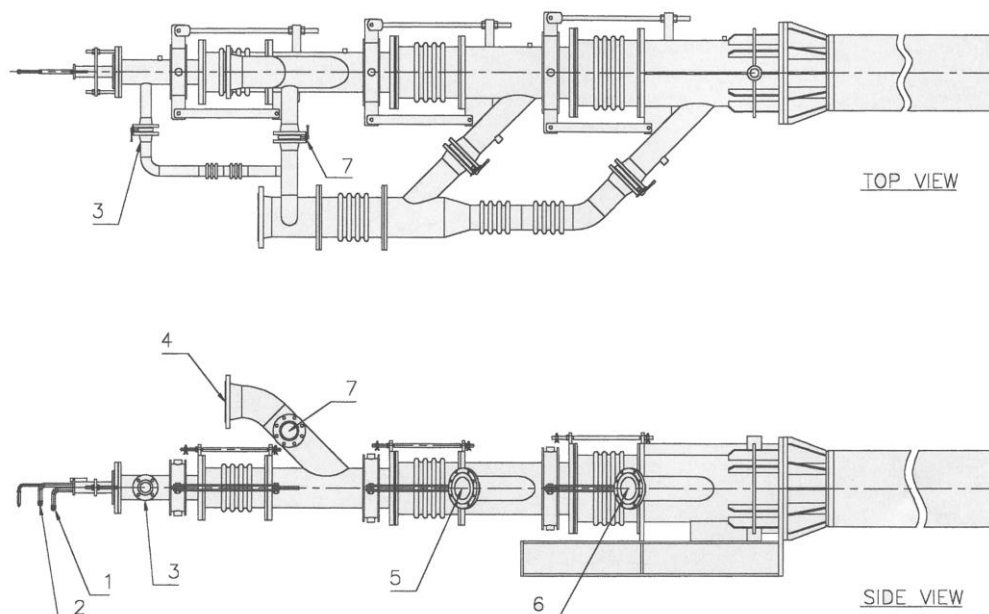
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## DESCRIPTION OF BURNER INLETS

- 1- Primary oil inlet
- 2- Secondary oil inlet
- 3- Central air inlet
- 4- Gas inlet
- 5- Radial air inlet
- 6- Axial air inlet
- 7- Gas path cooling air inlet (just open on oil operation)



A CKGO burner

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

1- Oil pressure at maximum heat input 40 bar

2- Gas pressure at maximum heat input 1bar

3- Primary air pressure at maximum heat input in burner head 170mbar ~ 240mbar

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## FUEL CONTROL AND MEASURING SYSTEM

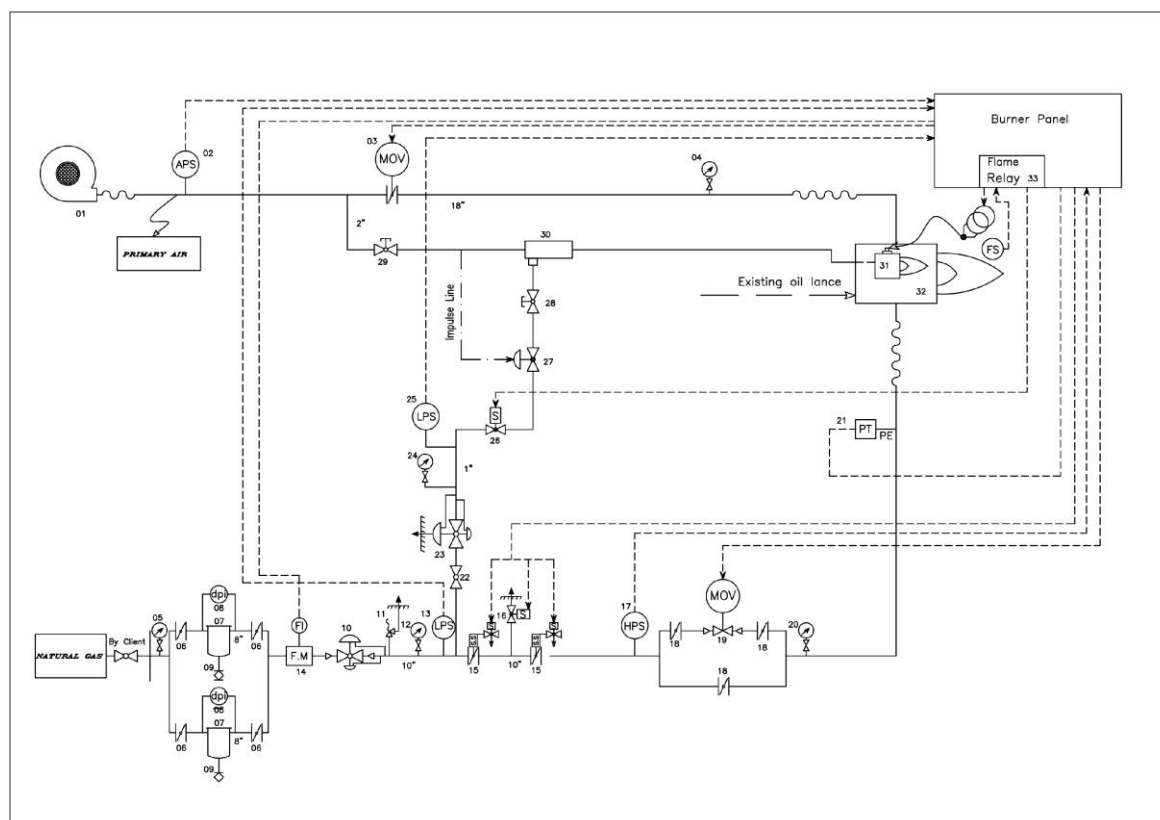
### 1- Liquid fuel control and measuring systems:

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 train:

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 train in **CKGO** burner

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## COMPONENTS OF GAS TRAIN IN CKGO BURNERS

- 1 – Primary air Blower
- 2 – Air Low Pressure Switch
- 3 – Primary Air Control Valve
- 4 – Pressure Gauge + Valve
- 5 – Pressure Gauge + Valve
- 6 – Gas Hand Valve
- 7 – Gas filter for cleaning gas before feeding into the system
- 8 – DP Gauge
- 9 – Drain Valve
- 10- Pressure Regulator Equipped with Shut-off Valve
- 11- Relief Valve
- 12- Pressure Gauge + Valve
- 13- Low Pressure Switch
- 14- Flowmeter Equipped with Temperature and Pressure Corrector
- 15- Gas automatic safety shut off valves (N.C.)
- 16- Vent. Gas Solenoid Valve (N.O.)
- 17- High Pressure Switch
- 18- Gas hand valve
- 19- Gas Control Valve
- 20- Pressure Gauge + Valve
- 21- Pressure Element and dp-Transmitter
- 22- Gas Hand Valve
- 23- Regulator for Pilot
- 24- Pressure Gauge + Valve
- 25- Gas Low Pressure Switch
- 26- Pilot Gas Solenoid Valve
- 27- Air Gas Ratio Controller for Pilot
- 28- Gas Adjustable Valve
- 29- Air Adjustable Valve
- 30- Pilot gas and air mixer
- 31- Gas pilot equipped with automatic ignitor
- 32- **CKGO** burner
- 33- Flame Safeguard included UV Sensor as Flame Detector

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

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## 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.
  - 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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## **PCGO (Precalciner Gas/Oil) burners :**

PCG(O) Model is one of different burners available in preheat zone of cement kilns. Generally these burners Contained fixed nozzles (burner tips), cooling (Air, gas), stabilizer & oil set optional. The burner tips don't move & their position doesn't change however the structure and arrangement of nozzles , creat a very desired emition of air and fuel in the calcining shaft. Suitable length & width flame for max heating efficiency by min amount of primary air (named cooling air)



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<b>Burner Model</b>	<b>Maximum Heat Capacity(Kcal/hr)</b>
<b>8000 PCG(O)</b>	<b>8,000,000</b>
<b>10000 PCG(O)</b>	<b>10,000,000</b>
<b>12000 PCG(O)</b>	<b>12,000,000</b>
<b>18000 PCG(O)</b>	<b>18,000,000</b>
<b>25,000 PCG(O)</b>	<b>25,000,000</b>

- 1- Oil pressure at maximum heat input 40 bar
- 2- Gas pressure at maximum heat input 2bar
- 3- Primary air pressure at maximum heat input in burner head 120mbar



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