NEW COMBUSTION CONTROL SYSTEM

Automatic control system tends to be more massive in function and more complicated in the system in order to improve safety and easy operation. We consider it as the key words that how easily we can handle this modern system.

We have developed graphical touch panel for burner control in order to meet needs of the age. New functions help ship crew supporting maintenance operation, running adjustment, early detection of trouble and decrease of trouble made by wrong operation and bad adjustment and also it enables improvement of the burner system control and burner combustion itself for easier operation.

(Standard specification for SDR-350~SDR-1500 Option for other burner type)

Operating Support
• Duplex control system by PLC & hard-wired relay
• Graphical Indication and Touch Panel Operation
• Running Indicator Lamps with LED
• Visualization of Abnormal Condition by Trend Indication
• Instruction Manual in Graphic Panel
• Option: Control for Water Hunting Prevention Based on Foreseeing Steam Consumption

Maintenance Support
• Maintenance Instruction by Running Time
• Logging Function/Running Status/Alarm etc.
• Reset Function to initial setting
• Option: Automatic Adjusting Function (Oil Flow • Air/Fuel Ratio)

SUNFLAME SERVICE STATION
Japan, China, Singapore, India, Greece, Croatia, Germany, Denmark, Sweden, Netherlands, U.S.A.

HISTORY OF SUNFLAME
1968 Established ‘Osaka-Sunflame KK’ for burner service company
1969 Start producing oil fired burners
1972 Production of waste oil incinerator
1980 Development of 2nd generation rotary cup burner Model “SSR” and “F” type
1981 New company name Sunflame Co., Ltd
1998 Development of new incinerator complying IMO Annex VI Reg. 16
2001 Development of 3rd generation rotary cup burner, Model “SDR” type
2005 Obtained ISO-9001:2000 certificate by NK
2006 Development of new combustion system for VLCC
2008 Development of new products
• Direct driven 3rd generation rotary cup burner for middle range and large range
• New combustion control system
2009 Development of emulsion combustion system

ANOTHER PRODUCT
Marine Incinerator

SUNFLAME CO., LTD.
1-30, NISHINOHATA, OKUBO-CHO, UJI, KYOTO 611-0033, JAPAN
TEL : +81-774-41-3310 FAX : +81-774-41-3311
E-mail : info@sunflame.net

http://www.sunflame.net
**What is rotary cup burner?**

Fuel oil is guided to inside of the cup spinning in high speed, formed thin film by centrifugal power, hit by high air pressure for atomization. It is the mechanism of rotary cup atomization.

The pressure jet burner atomizes fuel oil by high oil pressure through very small hole of nozzle tip. Comparing to it, the rotary cup burner does not need to have this small hole due to above mechanism, and can accept wide viscosity range of fuel. There is no concern of fuel oil stuck during heavy fuel oil burning and the rotary cup burner can obtain stable combustion for long period. Additionally one of big advantage is easy handling at start of burner in cold condition and while continuous running, in a range from small boiler to large boiler. Because it does not require any special procedures nor maintenance due to no assisting steam for combustion. Another advantage is to dispose waste oil which generates onboard.

Wider range of viscosity can be accepted for the fuel oil applying to the rotary cup burner. Recently we have to switch two fuels which have totally different characteristics: one is low-sulphur low-velocity good-quality fuel oil used in emission control harbor areas and the other is high-velocity heavy fuel oil used in other area. Because wider range of viscosity can be accepted in the fuel oil applying to the rotary cup burner and as it does not require oil pressure for atomization, the complicated adjustment or maintenance jobs are not required when you switchover the fuels. It would require only minimum adjustment and can be handled easily.

**3rd generation rotary cup burner**

Some concerns that rotary cup burner requires much maintenance due to many components and also it seems difficult to adjust oil/air ratio in case unbalanced, although it is obvious that rotary cup burner is safe and high performance.

Sunflame rotary cup burner overcomes these anxieties by the results of continuous development such as simplified structure and new original control system which brings out maximum performance. The number of delivery of Sunflame rotary cup burner is increasing rapidly and we have received reputation of high reliability and the best burner for easy operation to high performance since development of 3rd generation rotary cup burner.

<table>
<thead>
<tr>
<th>1st Generation</th>
<th>2nd Generation</th>
<th>3rd Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belt drive system</td>
<td>Belt drive system</td>
<td>Motor drive system</td>
</tr>
<tr>
<td>Primary fan is included in the rotation shaft</td>
<td>Primary fan is included separately</td>
<td>Primary fan is installed separately</td>
</tr>
<tr>
<td>High speed spinning &amp; atomization air pressure are unstable</td>
<td>Better for high speed spinning &amp; Atomization air pressure.</td>
<td>Improved reliability &amp; maintenance-ability. Revolution control is possible by reduction of torque on the rotation shaft.</td>
</tr>
</tbody>
</table>

Emulsion combustion system is designed and used for marine Aux. Boiler, can be installed in the existing system & layout without changing much f.D. operation arrangement. (Water supply line to be added) Automatic control system with graphical control panel is adapted to make operation / handling simpler. This control panel is a standard arrangement.

**Advantage of Sunflame Emulsion fuel burning system**

- No fuel and air mixing device
- No risk of overflow and underflow of fuel
- No noise
- No smoke
- No fume
- No pollution

**MGO**

The most suitable burner to burn “MGO”

We are entering into a new environmental protection requirement to burn low sulphur content fuel oil at certain restricted areas. It is MGO, extremely low viscosity oil and the ships shall fire two totally different kinds of fuels switching over with heavy fuel oil of high viscosity oil.

Sunflame rotary cup burner, capable to accept quite wide range of viscosity oils, does not need special counter-measures such as complicated operational procedures or replacement of parts/components when switches over and burns these two different fuels safely.

In case you take Sunflame rotary cup burner now and you intend to fire MGO in the future, you do not require any special changes, and can still use the system as is. Hence it is simple, safe, eventually lower cost and the most suitable burner to meet and satisfy present environmental requirement.

**Easily switching over the fuels**

Sunflame rotary cup burner can manage this, same way as conventional use of diesel oil and heavy fuel oil, does not require replacing nozzles for different viscosity fuel, no need to use special pumps, nor necessary managing delicate adjustment of atomizing oil pressure to keep same capacity, different from the cases of other type of burners such as pressure atomizing burner and steam atomizing burner.

Rotary cup burner can accept wider range of viscosity, and can burn HFO at rather lower temperature than other type of burners. It results comparatively safer operation at changing fuels.

**Needs to change system to comply with MGO firing**

- One of the advantages of the rotary cup burner has been able to accept heavier oil viscosity for firing and even for much lower viscosity oil use, it can accept without special conversion of parts/components.
- Fuel oil can be used at the low pressure (0.15~0.5MPa) and can manage handling MGO/ HFO and HFO by same pump.
- Rotary cup burner does not require steam for atomization and no need to refuel diesel fuel oil line and high temp, steam supply line, nor apply special MGO compliance parts.

**Note**:

Some cases of Sunflame rotary cup burners running now are using European screw pumps which can accept MGO but in case viscosity goes down to below 44cSt, they recommend to replace core parts only for MGO.

**Can burn fuels safely?**

- No special extra procedures and counter-measures are required, hence crew can handle the burner, the same way as usual meaning less chance to trigger mistakes.
- Not like pressure atomizing burner of which system requires high oil pressure (1.5~2.0MPa), we give low oil pressure (0.15~0.5MPa) and even if MGO (supersheath at leakage, it is not fatal.
- When different quality fuels are mixed, there is a possibility of creating sludge, but as there is no nozzle in rotary cup burner, it is not probable to suffer from failure caused by choking of oil passage with sludge.
- Rotary cup burner does not use atomizing steam for MGO, by the way it is not allowed to use steam unless it is designed to do so, hence Sunflame rotary cup burner is safe in operation.

**EMULSION COMBUSTION SYSTEM (OPTION)**

Emulsion combustion system is an optional device, has successfully developed in order to bring out maximum performance of rotary cup burner from high viscosity oil combustion with accurate adjustment of air/fuel ratio. Also this system offers reduction of soaring fuel expenses and of environmental gas emission which will become more severe in the future.

This system, designed compact and used for marine Aux. Boiler, can be installed in the existing system & layout without changing much f.D. operation arrangement. (Water supply line to be added) Automatic control system with graphical control panel is adapted to make operation / handling simpler. This control panel is a standard arrangement.

- Creating micro water particles in fuel oil.
- Water particles are evaporated in furnace high temp zone and made micro-explosion, resulting better atomization.
- Finer oil particles expose wider surface to O2
- Due to nice atomization, we can reduce excess air very much resulting minimizing cooling affect to the furnace.

**Advantage of Emulsion system**

- No need to use surface active agent
- No recirculation of emulsion fuel
- No risk of overflow and underflow of fuel
- No noise
- No soot
- No maintenance-ability
- No special gas supply required to be fuel oil system
- No extra additives
- No fume
- No pollution
- No running cost

**MGO**

MGO viscosity of 1.55 at 40°C

**MGO**

Viscosity of 1.55 at 40°C
<table>
<thead>
<tr>
<th>Rotary Cup Burner Type</th>
<th>SDR-1</th>
<th>SDR-1.5</th>
<th>SDR-2</th>
<th>SDR-2.5</th>
<th>SDR-350</th>
<th>SDR-500</th>
<th>SDR-700</th>
<th>SDR-1000</th>
<th>SDR-1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (kg/hr)</td>
<td>45~100</td>
<td>50~150</td>
<td>50~200</td>
<td>50~250</td>
<td>50~350</td>
<td>50~500</td>
<td>70~700</td>
<td>100~1000</td>
<td>150~1500</td>
</tr>
<tr>
<td>Fuel Oil</td>
<td>Heavy oil viscosity 700 mm²/s at 50°C, MGO, MDO and waste oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Oil Pressure (MPa)</td>
<td>0.15</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4~0.5</td>
<td>0.4~0.5</td>
</tr>
<tr>
<td>Revolution (RPM)</td>
<td>6000</td>
<td>3000~8000</td>
<td>3000~8000</td>
<td>0.75 kW x 2P</td>
<td>1.5 kW x 2P</td>
<td>3.75 kW x 2P</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Rotary Cup Drive System
- **Motor Direct Drive System**
- **Bolt Drive System**

### Automatic Control System
- ON/OFF Control
- ON/OFF & HIGH/LOW Control
- ON/OFF & Proportional Control

### Ignition System
- MGO/MDO Pilot Burner

### Burner Motor
- Wind Box (Secondary Air Damper, Secondary Air Vane, Primary Air Duct, Peep Hole), Air Pressure Switch, Flame Eye, Pilot Burner for Ignition, Oil Control Valve, Control Motor and Linkage, Oil Pressure Gauge, Junction Box, Oil Flow Regulating Valve and Oil Flow Meter (This is standard for above SDR-350)

### Main Accessories
- Turbo Blower

### Primary Air Blower
- Air Volume (Nm³/min): 1, 2.3, 4, 4, 6, 8, 11, 17, 24, 40, 68
- Air Pressure (MPa): 9.8

### Secondary Air Blower
- Motor (kW x P): 3.7 x 2P, 5.5 x 2P, 5.5 x 2P, 5.5 x 2P, 11 x 2P, 18.5 x 2P

### Dead Oil Pump for Ignition Burner
- Type: Trochoid Gear Pump (MDO, MGO)
- Pressure (MPa): 0.7
- Revolution (RPM): 3600
- Motor (kW x P): 0.4 x 2P

### Heavy Oil Pump
- Type: Trochoid Gear Pump (HFO, MDO, MGO)

### Heavy Oil Heater
- Type: Electric Heater
- Heating Capacity: Inlet Temperature 60 deg C-Outlet Temperature 130 deg C (70 deg C up) Heating capacity may be changed by oil specification
- Electric Capacity: 3~12 kW
- Steam usage (kg/hr): abt 26~250
- Steam Pressure: Saturated Steam

### For Waste Oil Combustion Type (Option)
- Main Accessories: Pump, Electric Auto Cleaner, Press. Cont. Valve, FO/WO Change Over 3way Valve (SDR-1~2.5), Oil Flow Meter (SDR-350~1500), Oil Regulating Valve (SDR-350~1500), R-9~40
- Pump Type: Trochoid Gear Pump (TOP-210~OS Type), 600 kg/h x 0.55 kW, 0.4 kW x 6P
- Remarks: Standard Unit is One(1) Set. Due to ship class or capacity requirement, FO pump and FO Heater can be provided as extra unit.
- Type of Rotary Cup Burner may be changed by necessary combustion capacity, furnace pressure and fuel oil specification.