S&S

MICRO OIL IGNITION SYSTEM

(MOIS)

Minimising Fuel oil Consumption

(About one sixth to one tenth of normal consumption)

By

Yantai Longyuan Power Technology Co., Ltd

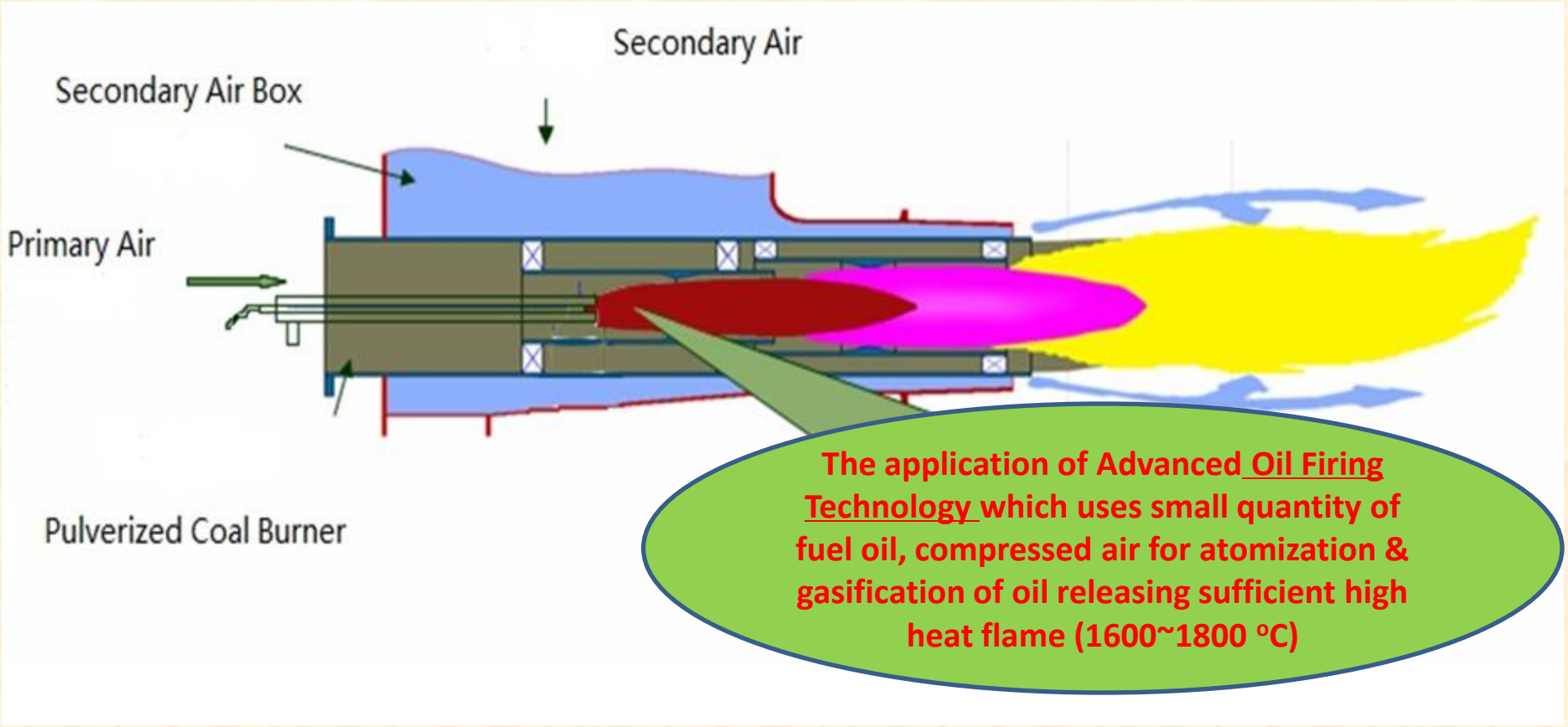
Associate Partner

S&S WATER AND POWER PROJECTS PVT. LTD. (INDIA)

Presentation Index

- Principle of MOIS Technology
- Application of MOIS Technology
- Thermal Power Plants with MOIS
- Benefit Analysis

Principle of MOIS



Principle of MOIS

Ignition Principle

The Mini-oil Ignition Technology is an advanced oil firing technology which combines compressed air atomization with gasification. A strong and stable oil torch with high temperature of 1600~1800 deg C can be obtained by burning only a small quantity of fuel oil only. The pulverized coal goes through the oil flame and quickly absorbs the heat, releasing volatile matters which quickly burst the coal particles and ignite. The start up and low load operation can be achieved with minimal (negligible) oil consumption.

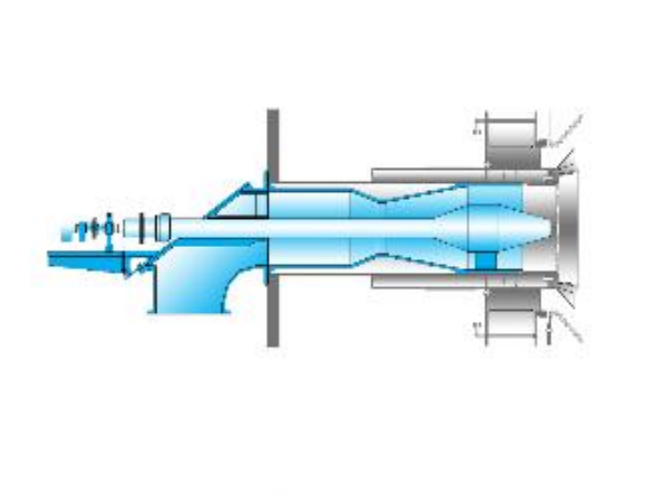
Installation Principle of MOIS

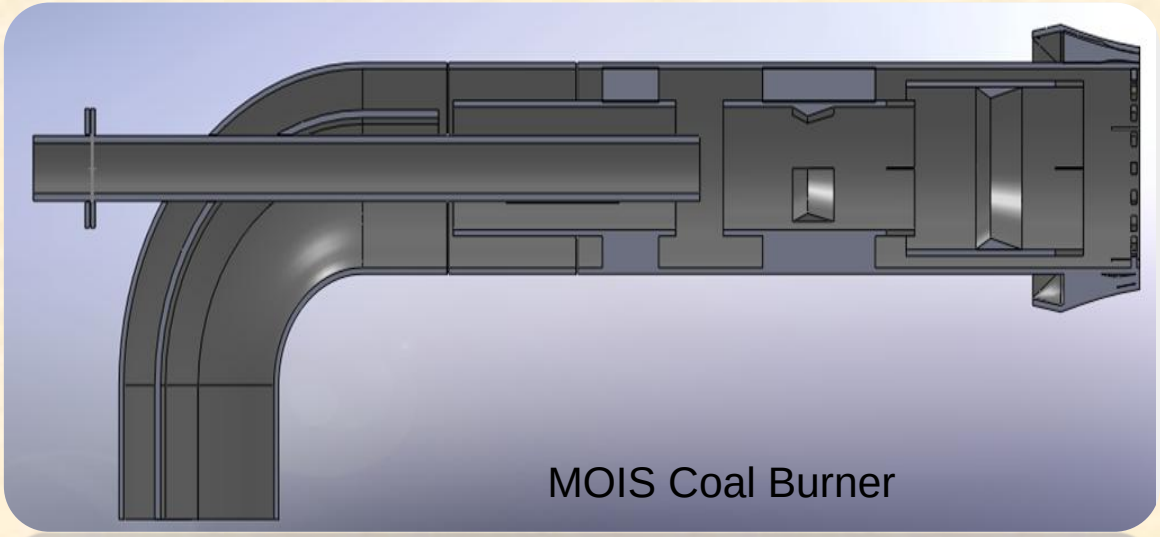
Mini-oil Ignition System

It is proposed that 4 Mini-oil ignition coal burners be installed and replace the present coal burners at lowest elevation (A level) associated to mill A.

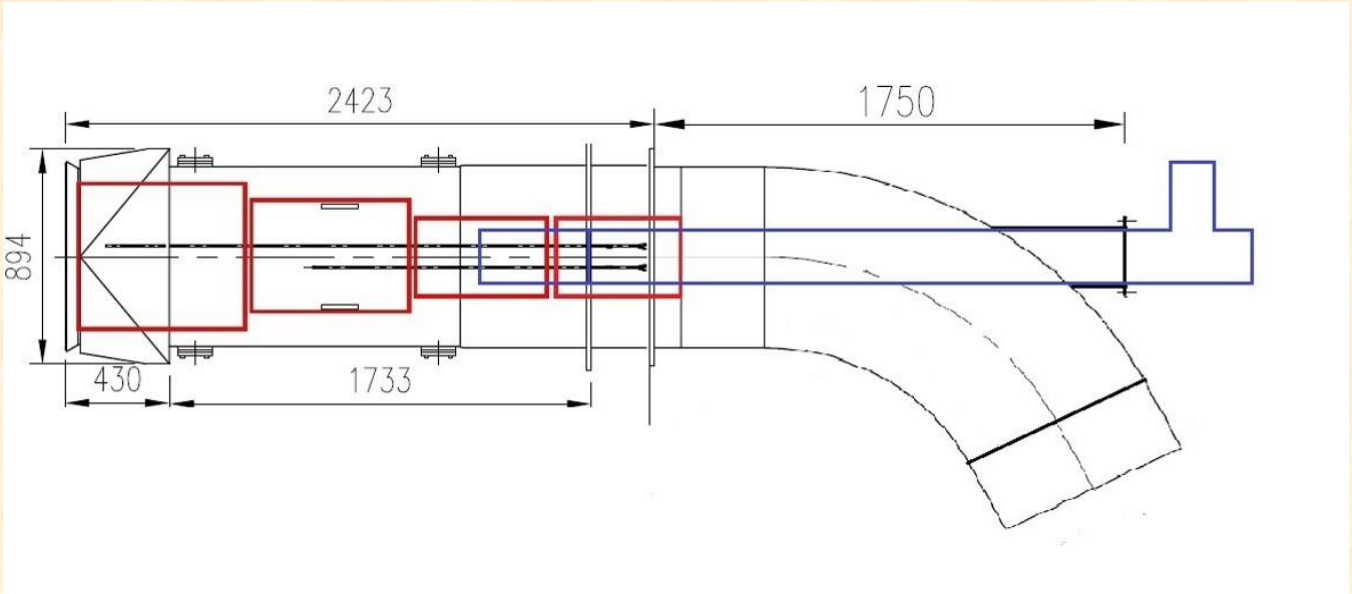
The coal nozzles and inlet bend of coal burners needs to be replaced with Mini-oil ignition coal burners together with its dedicated inlet bends, while the tip area of Mini-oil ignition coal burner is the same as that of original burner. LDO/HFO burners will remain unchanged and be kept as standby ignition measure, if required.

Arrangement of New Coal Burner with MOIS

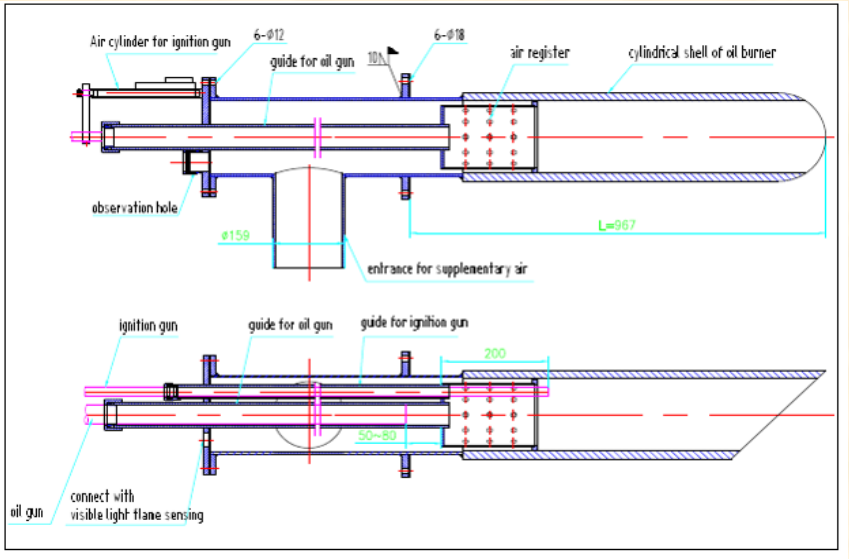


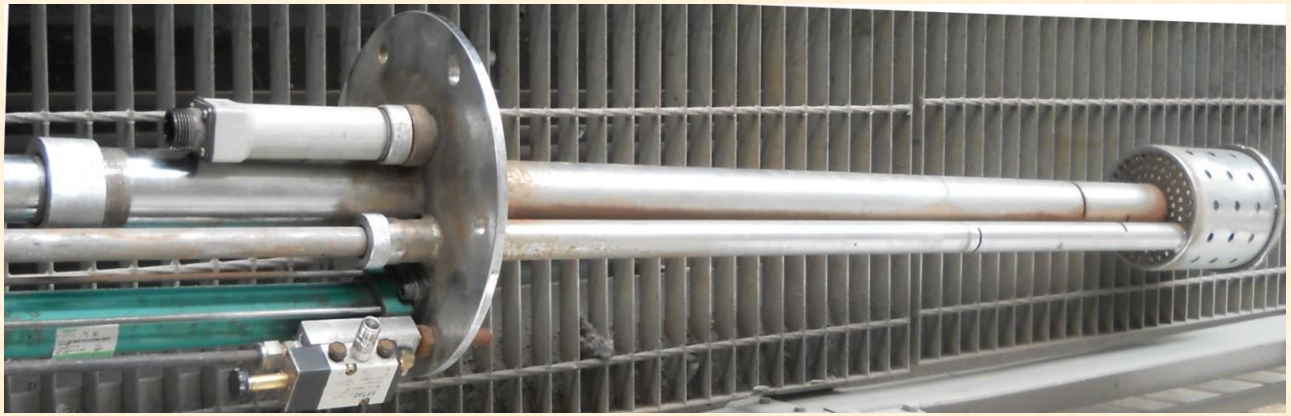


New Coal Burner and Elbow Assembly

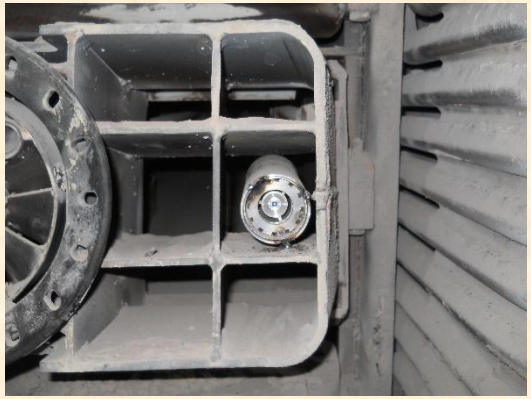


MOIS Oil Burner & Oil Gun Assembly

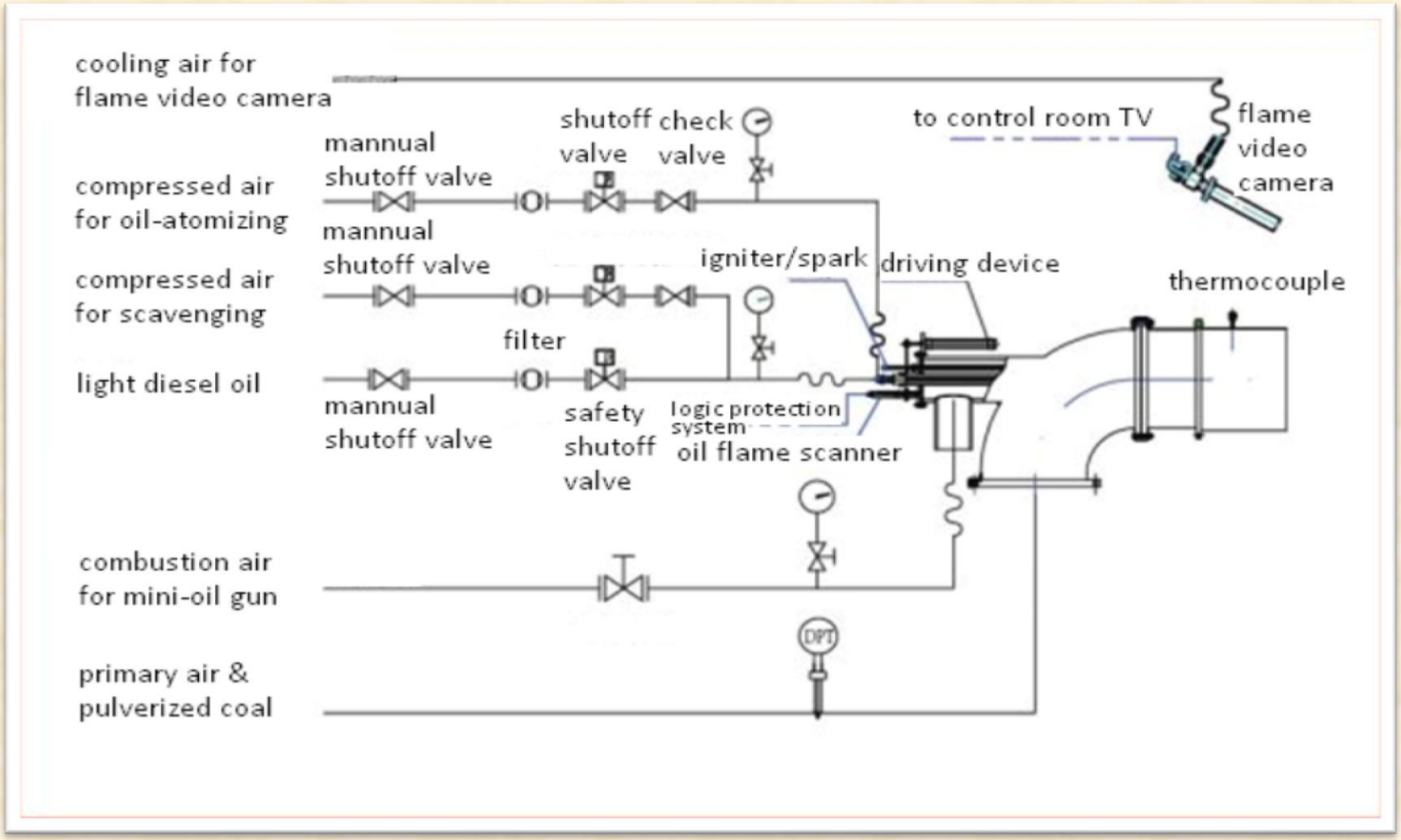




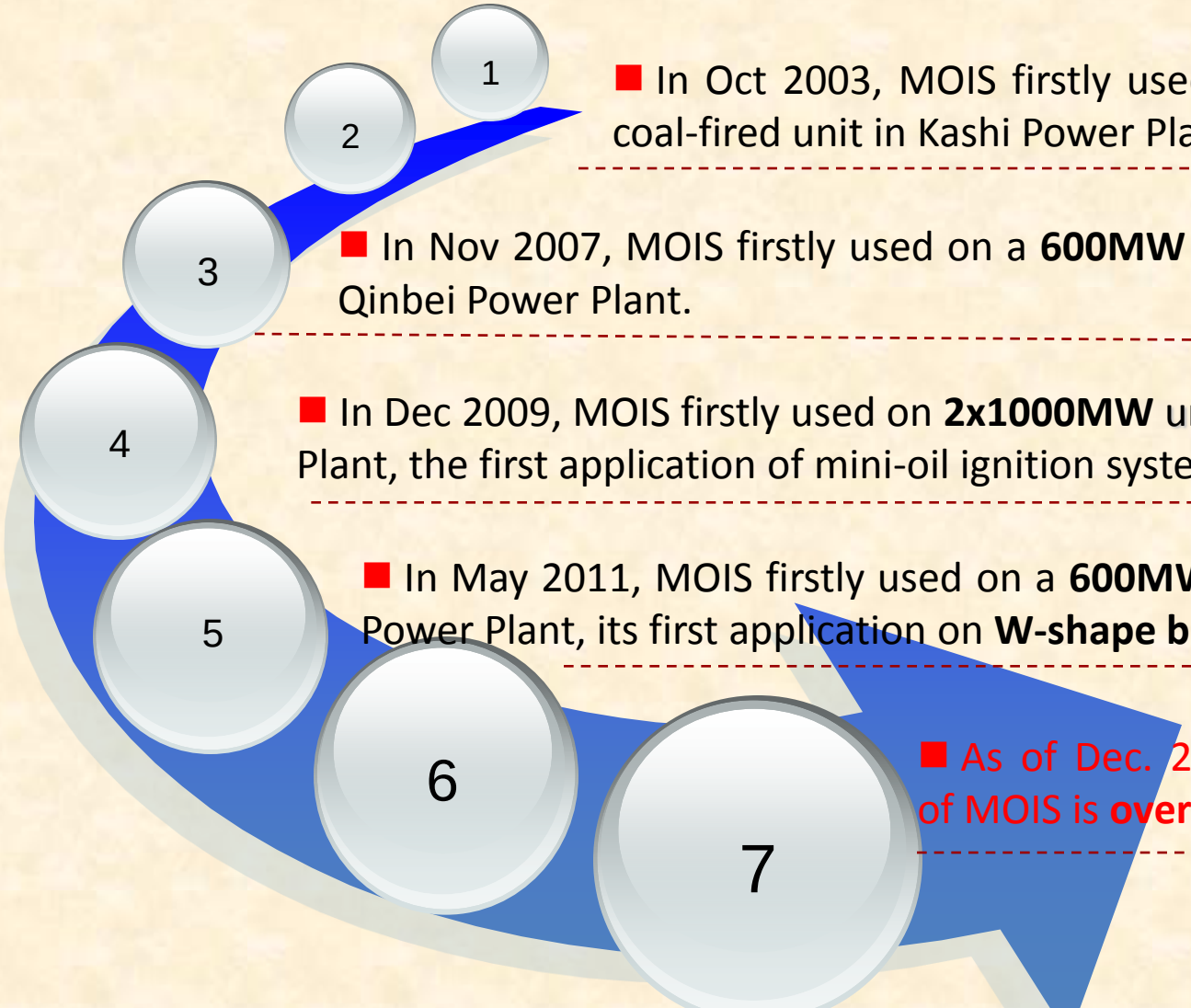
MOIS Gun Arrangement in Corner



MOIS Gun Arrangement in Corner



Development Trajectory of MOIS



■ In Oct 2003, MOIS firstly used on a **50MW** bituminous coal-fired unit in Kashi Power Plant.

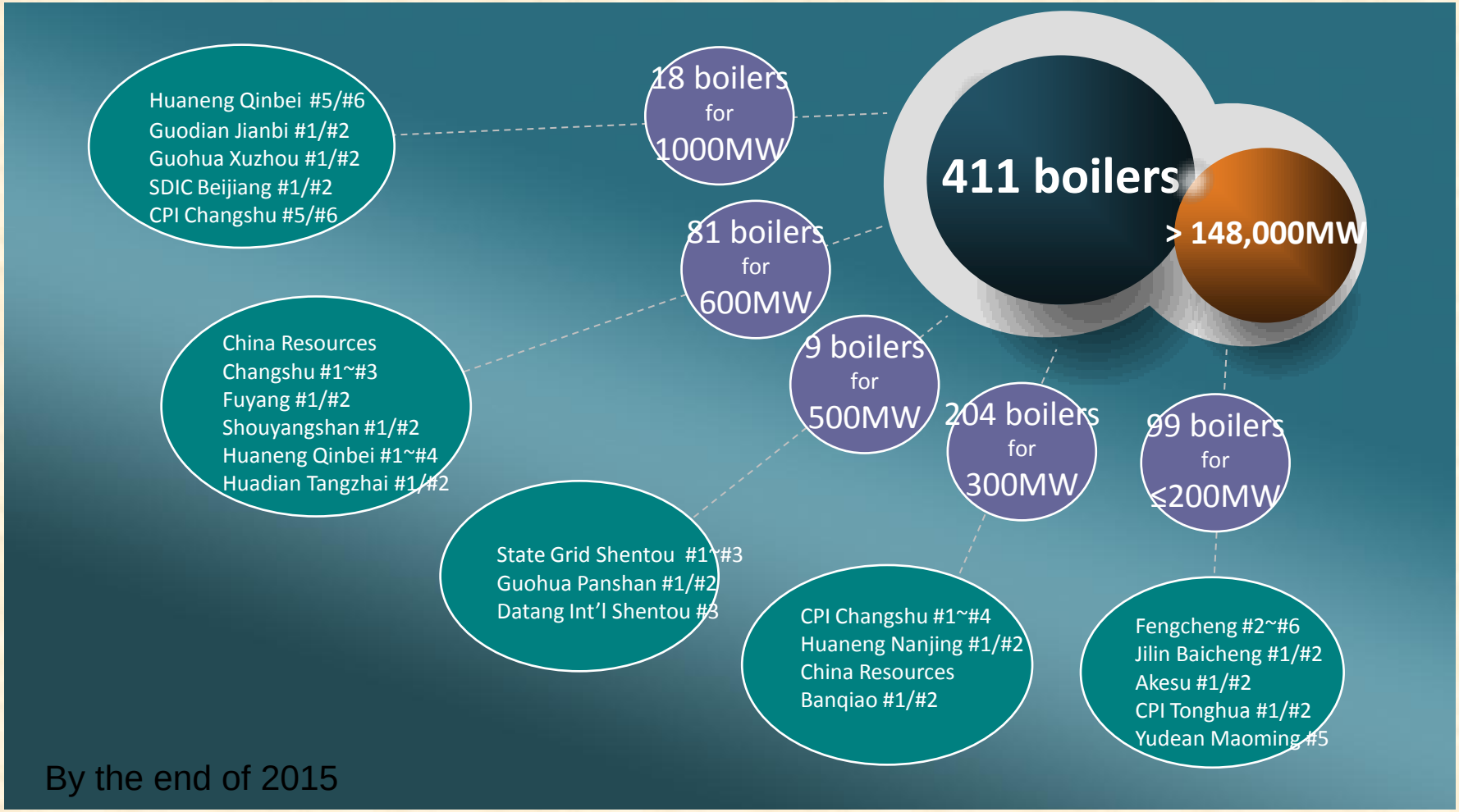
■ In Nov 2007, MOIS firstly used on a **600MW** coal-fired unit in Huaneng Qinbei Power Plant.

■ In Dec 2009, MOIS firstly used on **2x1000MW** units in SDIC Beijiang Power Plant, the first application of mini-oil ignition system to 1000MW in China.

■ In May 2011, MOIS firstly used on a **600MW** unit in Huaneng Hanfeng Power Plant, its first application on **W-shape boiler** in China.

■ As of Dec. 2015, domestic application of MOIS is **over 410 boilers**.

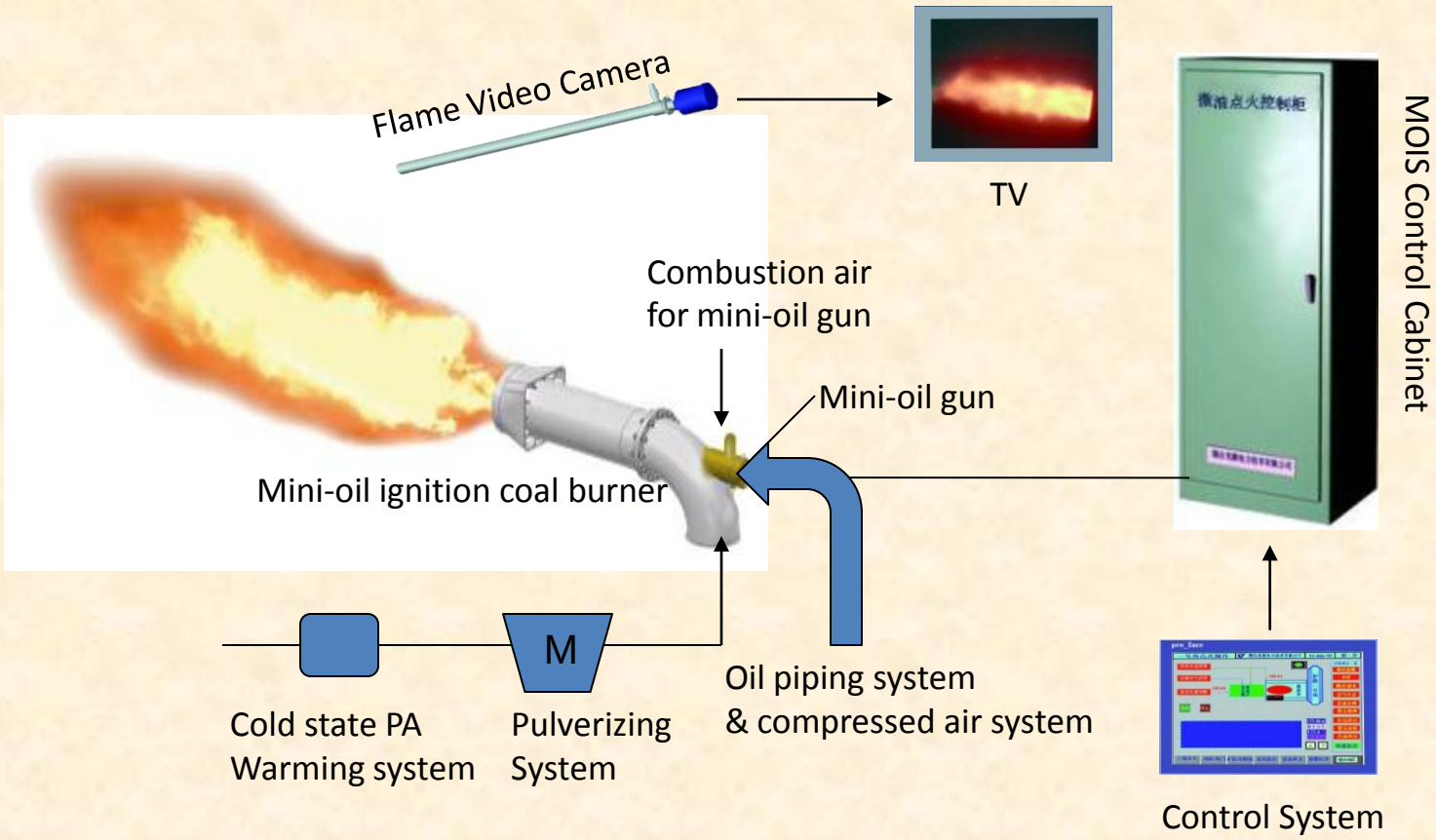
Achievements in China



Some Overseas Projects

Name of Power Plant	Unit Capacity	Retrofit /New	Corner(T)-/wall-fired	Coal	Status Quo
India, Jhajjar CLP	2x600MW	New	T-fired	High-ash coal	In operation
Cambodia, Sihanouk Port	3x135MW	New	Corner-fired	High-moisture coal	In operation
Indonesia, Jeneponto	2x125MW	New	Corner-fired	High-moisture coal	In operation
Indonesia, (CFK) East Kalimantan	1x60MW	New	Corner-fired	High-moisture coal	In Operation
India, Adani Power Group	12x660MW	Retrofit	Corner-fired	High-ash coal	Seven finished, others in process
Pakistan, Qadirabad	2x660MW	New	Corner-fired	Bituminous coal	In process

Monitoring System



Case Study- Adani Power, Mundra Plant, India

Unit Overview:

- Unit Capacity : 5 x 660MW (Unit #5/#6/#7/#8/#9)
- Boiler Supplier : Harbin Boiler Company, Corner-fired boiler
- Type of coal : High Moisture Indonesian Coal

  Var≈ 22%, Aar ≈ 16%, M ≈ 25%, HHV ≈ 4000 kcal/kg
- C/O date : 2008 / 2010

Application Results:

- All the units retrofitted from July 2014 to July 2016, oil saving rate from **85%** to **93.2%.**
- All the 5 units MOIS modifications were finished successfully.

Relative Advantages over conventional Light-up

- Extremely small quantity of oil is required for startup (Boiler light-up upto 40% BMCR load)
- Greater than 80% oil saving achieved as compared to conventional light up method.
- Startup can be controlled smoothly matching the boiler temp & pressure ramp-up curves
- Less maintenance as compared to conventional oil guns due to simple micro oil gun construction
- Clear chimney conditions during cold start-ups
- Very consistent, stable & concentrated oil flame enabling coal combustion during start-up
- Long time (several hours) can not be synchronized, due to the turbine or other equipment problems, will not significantly impact the SOC KPI.

Patents & Certificate

DNV

DET NORSKE VERITAS
MANAGEMENT SYSTEM CERTIFICATE

Certificate No. 0362-2002-AQ-RGC-RvA

This is to certify that

YANTAI LONGYUAN ELECTRIC TECHNOLOGY CO., LTD.

at

No. 9 Heng Shan Road, Economic & Technological Development Area, Yantai, P.R. China

has been found to conform to the Management System Standard:

ISO 9001:2000

This Certificate is valid for the following product or service ranges:

DESIGN, MANUFACTURE, INSTALLATION AND SERVICE OF FURNACE OIL BURNING SYSTEM, FURNACE FLAME SCANNING SYSTEM, FURNACE SAFEGUARD SUPERVISORY SYSTEM AND PLASMA PULVERIZED COAL IGNITION SYSTEM

Original Certification date: July 24th, 2002

Place and date: Hong Kong, November 1st, 2005

This Certificate is valid until: July 24th, 2008

for the Accredited Unit: DNV CERTIFICATION B.V., THE NETHERLANDS

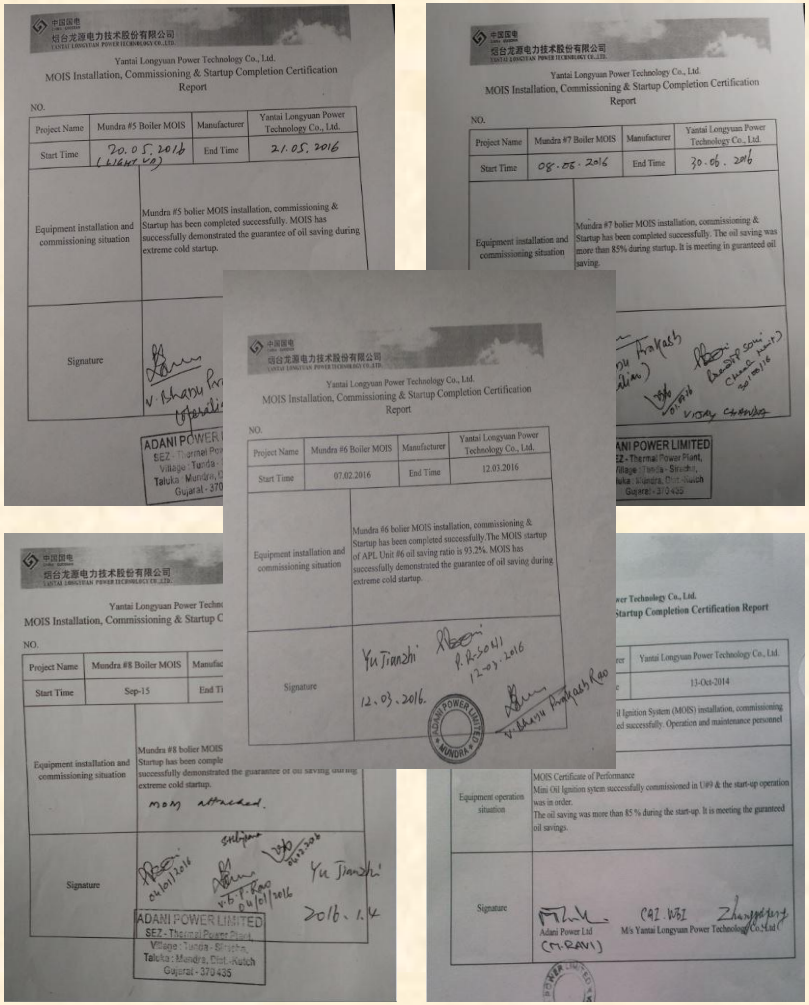
MGMT. SYS. RvA C024

Compliance to the Standard in respect to the indicated scope is verified by the DNV approved registered Team Leader:

Xu De Xiong
Lead Auditor

C.K. Wong
Management Representative

Project Certification & Appreciation Letters in Mundra Plant



Yantai Longyuan Power Technology Co., Ltd.
MOIS Installation, Commissioning & Startup Completion Certification Report

NO.

Project Name	Mundra #5 Boiler MOIS	Manufacturer	Yantai Longyuan Power Technology Co., Ltd.
Start Time	20.05.2016	End Time	21.05.2016
Equipment installation and commissioning situation	Mundra #5 bolier MOIS installation, commissioning & Startup has been completed successfully. MOIS has successfully demonstrated the guarantee of oil saving during extreme cold startup.		
Signature			

Yantai Longyuan Power Technology Co., Ltd.
MOIS Installation, Commissioning & Startup Completion Certification Report

NO.

Project Name	Mundra #7 Boiler MOIS	Manufacturer	Yantai Longyuan Power Technology Co., Ltd.
Start Time	08.05.2016	End Time	30.06.2016
Equipment installation and commissioning situation	Mundra #7 bolier MOIS installation, commissioning & Startup has been completed successfully. The oil saving was more than 85% during startup. It is meeting in guranteed oil saving.		
Signature			

Yantai Longyuan Power Technology Co., Ltd.
MOIS Installation, Commissioning & Startup Completion Certification Report

NO.

Project Name	Mundra #6 Boiler MOIS	Manufacturer	Yantai Longyuan Power Technology Co., Ltd.
Start Time	07.02.2016	End Time	12.03.2016
Equipment installation and commissioning situation	Mundra #6 bolier MOIS installation, commissioning & Startup has been completed successfully.The MOIS startup of APL Unit #6 oil saving ratio is 93.25%. MOIS has successfully demonstrated the guarantee of oil saving during extreme cold startup.		
Signature			

MOIS Installation, Commissioning & Startup C

NO.

Project Name	Mundra #8 Boiler MOIS	Manufac
Start Time	Sep-15	End Ti
Equipment installation and commissioning situation	Mundra #8 bolier MOIS Startup has been comple successfully demonstrated the guarantee of oil saving during extreme cold startup. mom attached.	
Signature		

Startup Completion Certification Report

	Yantai Longyuan Power Technology Co., Ltd.
	13-Oct-2014
Equipment operation situation	MOIS Certificate of Performance Mini Oil Ignition sytem successfully commissioned in U#9 & the start-up operation was in order. The oil saving was more than 85 % during the start-up. It is meeting the guranteed oil savings.
Signature	

adani

Appreciation Letter

Expert services provided by Mr Yu Jianzhi for erection, commissioning and operation of Micro Oil Gun System (MOIS) in M/s Adani Power Limited, Mundra (APL) U#5, 6, 8 & 9

Dt.: 21.05.2016

- Mr Yu Jianzshi has provided services for erection, commissioning and operation of Micro oil Gun System (MOIS) in M/s Adani Power Limited, Mundra, Gujarat, India in Unit # 5, 6, 8 & 9.
- Mr Yu Jianzhi has helped M/s APL Engineers during erection, commissioning and operation of MOIS. He has provided quick response to all the problems faced during erection and commissioning of system.
- Mr Yu Jianzhi has positive attitude and commited to his work.
- Mr Yu Jianzhi is very time punctual and he never left the site during emergency and has provided best possible solution to problems.
- Mr Yu Jianzhi shared his knowledge during commissioning and operation of MOIS.
- Mr Yu Jianzhi timely communicated instruction to avoid any delay in erection and commissioning.
- Mr Yu Jianzhi has provided his services 24X7 on cell phone also.

M/s APL appreciate the work of Mr Yu Jianzhi for successfully completion of Micro Oil Gun System in Unit # 5, 6, 8 & 9.

Pradip Soni
General Manager
Boiler Maintenance

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SEZ - Thermal Power Plant,
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Taluka : Mundra, Dist.-Kutch
Gujarat - 370 435

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Thank you