

## Natural Gas Conference 2008



Conversion of a water tube boiler from coal to gas:  
A fuel switching case from SAACKE

Ian Johnson

17<sup>th</sup> October 2008, Durban, South Africa



## SAACKE – The Company

Head office of the family-run company

Bremen, Germany

Worldwide representation in more than 50 countries by

- Subsidiaries
- Distribution and Service partners
- Service centres

Employees worldwide

1,000

Engineers

More than 300

## Family-owned Enterprise since 1931



- 1<sup>st</sup> generation:** Carl Saacke, the founder (1931 – 1945)  
**2<sup>nd</sup> generation:** Dr. Herbert Saacke (1945 – 1964)  
**3<sup>rd</sup> generation:** Hans-Herbert Saacke (1964 – 2005)  
**4<sup>th</sup> generation:** Henning Saacke, Angelika Saacke-Lumper, Stefan Lumper (collective since 2005)



## SAACKE Companies, Branches and Partners Worldwide



## Quality Assurance

### Certifications



## Business Fields



SAACKE MARINE SYSTEMS



Industrial Firing Systems



Process and Plant Engineering



SAACKE SERVICE

## Industrial Firing Systems Performance Overview

### Burners

- Capacity range 0.24 – 150 MW
- Oil, gas, and dual-fuel burners
- Low-NOx and Ultra Low-NOx burners
- Rotary cup atomisers, pressure jet burner, steam atomisers, gas ring and swirl burners
- Customised burners for special applications, fuels and technologies

### Control systems and plant components

- **se@vis** boiler management – online
- **SAACKE** process control
- **SAACKE** plant accessories (e.g. oil valves and fittings, gas valves and fittings, pre-heaters, pump filter groups)

## SAACKE South Africa



Technical presentation

**Conversion of a water tube boiler from coal to gas:  
A fuel switching case from SAACKE**

Coal to Gas Conversion Project in Durban

- System Design
- Burner choice DDG-Series
- Overview
- Equipment , Installation and Commissioning
- Benefits to NCP

Phase ONE



DDZG Burner System

Steam Assisted Pressure Jet Burners DDZ

Fuel	Capacity [MW]	4.6	7.8	13.3	20.8	32.5	53.1
		10"	12"	15"	18"	22"	26"
	Burner size / Burner type	8	10	12	14	16	18"
Heavy oil	DDZ						
Light oil	DDZ						
Gas	DDG						
Heavy oil/gas	DDZG						
Light oil/gas	DDZG						

\* upon request



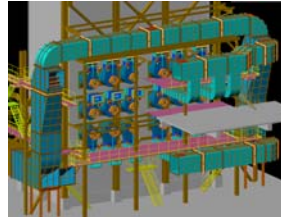
DDZ/G

**Steam Assisted Pressure Jet**



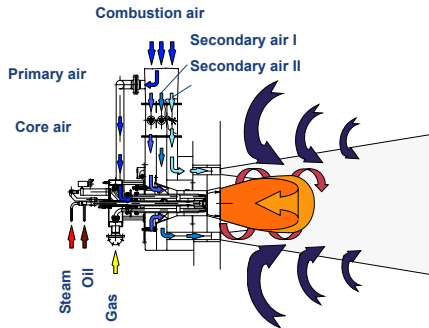
Volvo Car Manufacture  
40 t/h, 1 x TF-DDZG  
with 35 MW capacity

**Typical Large DDZG Application**



Reference Project Romania:  
18 x DDZGS 12, 420 t/hr  
steam

**Low Nox Dual Fuel Burner (Gas/Oil):  
TF-DDZG**



**TF-DDZG Burner**



Front view of  
TF-DDZG burner

DDZG TF Burner



Gas piping system with gas distribution ring

Multi Burner Plant for Natural Gas Combustion



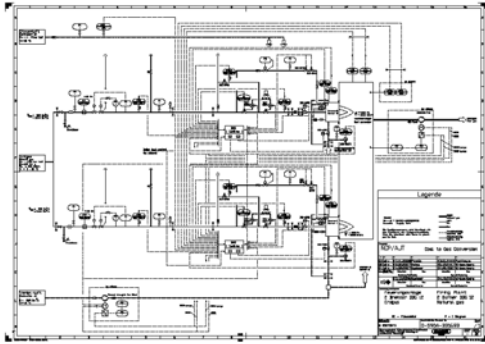
Natural Gas Flame at NCP



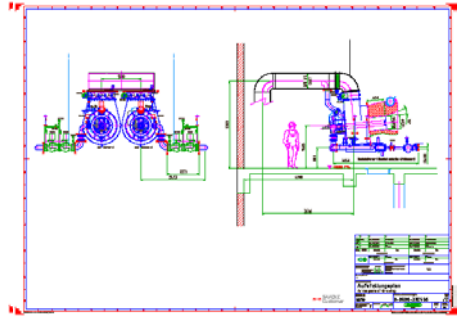
Requirements on Gaseous Fuels

Fuel	Firing Capacity	Particle mg/Nm³	CO mg/Nm³	NOx			SO₂ mg/Nm³
				< 383,75K mg/Nm³	≥ 383,75K bis ≤ 483,15K mg/Nm³	> 483,15K mg/Nm³	
Natural gas	≥ 50MW to ≤ 300MW	5	50	100	110	150	35
	> 300MW				100		
LPG	≥ 50MW to ≤ 300MW	5	80	200			5
	> 300MW			100			
Other gases	≥ 50MW to ≤ 300MW	5	80	200			35
	> 300MW			100			
Blast furnace gas	≥ 50MW to ≤ 300MW	10	100	200			200
	> 300MW			100			
Coke oven gas	≥ 50MW to ≤ 300MW	10	100	200			350
	> 300MW			100			

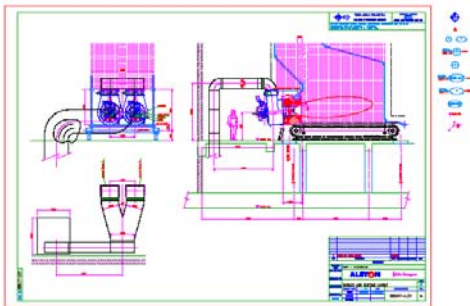
### Firing plant 2 burner DDG 12 Natural Gas



### Arrangement drawing



### Burner and ducting layout



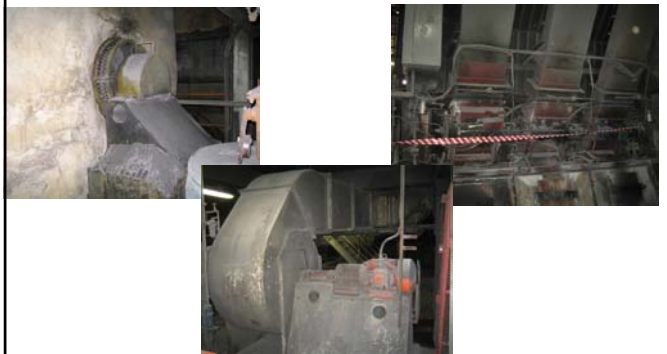
### The coal firing plant



The coal firing plant



The coal firing plant



New SAACKE equipment ex works



Equipment installed



New SAACKE equipment



SAACKE equipment installed



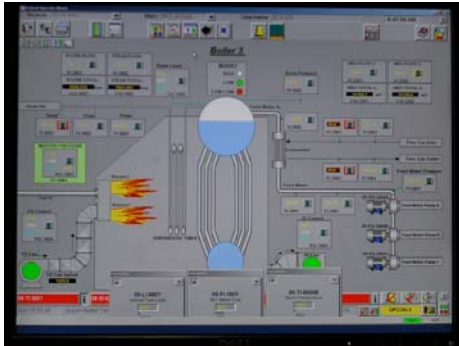
New SAACKE equipment installed



New SAACKE equipment installed



Equipment overview



New SAACKE equipment



New SAACKE equipment



Reference Projects DDG/DDZ/DDZG  
(Selection from 264 projects since 1984)

Customer	Client	Burner typ	Quantity	Burner cap.MW	Fuel	Boiler type capacity	Built	Comment
Dong Hoo	Shindaeyang	DDZG 14	1	39.7	Heavy fuel oil / Natural gas	Watertube 50 t/hr	1998	
Babcock	EFC Suez / Egypt	DDG 14	4	32.5	Natural Gas	Watertube 1x151 t/hr	1999	
SAACKE Australia	Murray Goulburn Site, Victoria Australia	DDG 12	1	23	Natural Gas Simulated NG	Watertube 18 MW	2000	
Mindl	Jordan	DDZG 14	4	41	Natural Gas Heavy Fuel Oil	Watertube 188 t/hr	2000	
Kvaerner Pulpang Finland	International Paper Svebogorsk Russia	DDG 10 DDG 14	2 4	15 35	Natural Gas	BFB-Boiler 150 t/hr	2001	
Moss Varmeteknikk	FPSO-Ship "Berge Helene"	DDZG 10	4	16	Erilgas Hoelol	Watertube	2002	FPSO Schip
Alstom Recovery	Zagros I	DDG 12 DDZG 14	3 1	28 41	natural gas Cilgas Siedelgas	Superheater 136 t/hr	2003	Special gas application
Zengzhou Aluminium	Zengzhou Aluminium	DDZG 12 S	4	14.2	Natural Gas / Heavy fuel oil	4 pcs Thermaloil heater	2004	
SAACKE China	Chongqing	DDG 14	1	35	Natural Gas	1 x 40 t/hr	2005	
Montaver Metafine Nova, Marbor	Topiana "Zapad" Novi Sad	DDG 16 S	2	70	Natural Gas	140 MW	2007	WRK / Stage Air
SAACKE South Africa	NCP Durban	DDG 12	2	16	Natural Gas	32 t/h, 35 bar, 390 C	2008	Coal to Gas Conversion
Shanghai Resource Trading Developm.	Qinghai / China	DDG 14	2	33.5	Natural Gas	1 x 75 t/hr	2008	Water Tube Boiler

## Benefits to NCP Alcohols

Performance Data of previous Coal fired Boiler vs Current Gas fired

Emissions related to 3% O2 in flue gas	Before conversion (Coal Chain Grate)	After conversion (Gas Burners)	Improvement
Efficiency in %	ca. 78	> 92	+ 18 %
CO in ppm	ca. 100	< 5	- 95 %
NOx (mg/Nm <sup>3</sup> )	ca. 600	< 190	- 68 %
SOx (mg/Nm <sup>3</sup> )	ca. 1500	< 50	- 96 %
Dust (mg/Nm <sup>3</sup> )	ca. 200	ca. < 10	- 95 %

## Benefits to NCP Alcohols

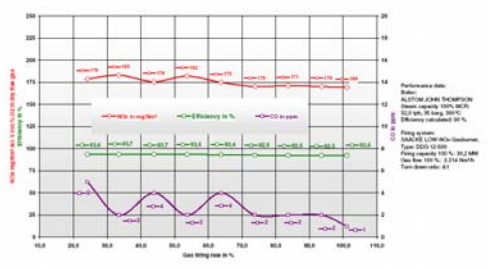
### Benefit to NCP Alcohols:

This project has benefited NCP Alcohols in the following ways:

- No harmful stack emissions
- No ash removal costs
- Quicker start up times
- Efficient operation
- Use of energy that is on-tap, clean burning and efficient
- Financial benefit from the sale of carbon credits
- Reduction of maintenance costs

## NCP Durban Efficiency and Emissions

NCP Durban, Coal to Gas Conversion of ALSTOM JOHN THOMPSON Boiler  
Efficiency  
Emissions NOx, CO



## Thank you from SAACKE South Africa

