

OPTI-FLOW™ 四角和墙式
高效低污染燃烧系统

2005年8月3日中国—大连

OPTI-FLOW™ LOW NO_x T-Fired & Wall-Fired
COMBUSTION SYSTEM

August 3rd 2005, Dalian, China

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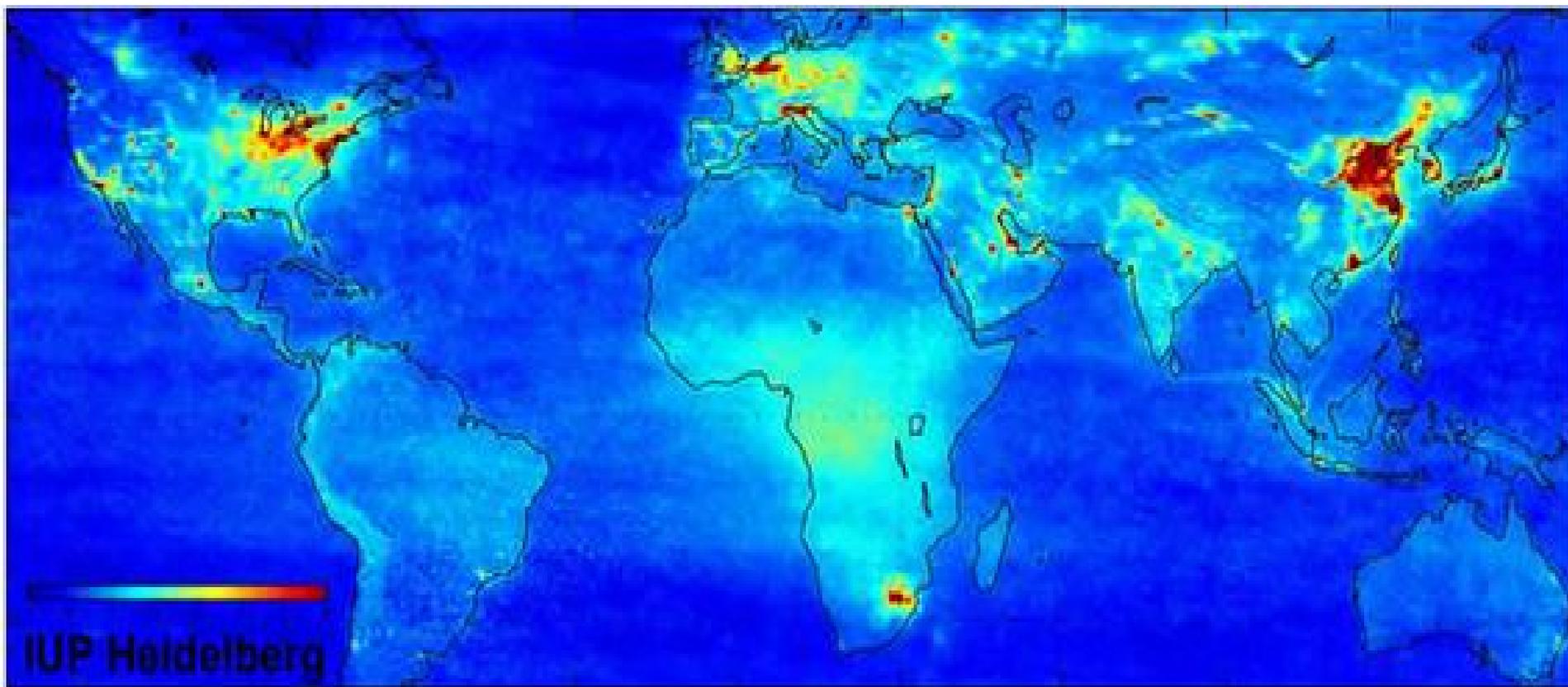
- ABT公司简介 Introduction for Advanced Burner Technologies (ABT)
- ABT的产品 Equipment Supplied by ABT
 - » 燃烧器及其部件 Opti-Flow™ Burner and Components
 - » 燃烬风系统 Opti-Flow™ OFA
 - » 煤粉空气平衡系统 Coal Pipe Balancing and Secondary Air Balancing
 - » 防高温腐蚀结渣系统 Anti-Corrosion/Slagging System
- ABT业绩 Cases Study
 - OMU T-Fired Boiler 四角切园，降低氮氧化物和结渣
 - JEA Wall-Fired Boiler 墙式锅炉，低挥发份石油焦，强稳燃能力和低氮氧化物

简介 Introduction

- Advanced Burner Technologies (ABT) 已经在1200万千瓦机组容量的锅炉上安装了Opti-Flow™ 低 NOx 燃烧系统,单个机组容量从7万到95万千瓦。Over 12,000 MW of large utility boilers have been converted to the ABT Opti-Flow™ design. Unit range in size from 70 to 950 MW
- 涉及墙式燃烧锅炉，四角切园燃烧锅炉 Wall-Fired, T-Fired Boilers
- 改造内容包括： Retrofit Details:
 - » 高效低污染的燃烧器 Low NOx Burners
 - » 燃尽风系统， Overfire Air
 - » 磨煤机煤粉平衡系统, 风箱改造 Coal and Air Balancing
 - » 防高温腐蚀结渣系统Anti-Corrosion/Slagging System
- 煤种涉及烟煤，次烟煤，褐煤等和石油焦Diverse range of fuel firing experience including lignite, subbituminous, high S bituminous and petroleum coke/bituminous blends.

ABT has over 250 combined years of power industry experience!

绘) NO_x Distribution All Over the World





ABT 可提供燃烧和尾部烟气的综合解决方案 Completed Solution for NOx Control

- Reduce NOx to Minimum by Combustion Retrofit 利用最先进的燃烧系统把氮氧化物降低到最低
- Working with Small Scale SNCR or SCR for lower NOx. 加装小规模SNCR和SCR进一步降低
- Reduce Operation Cost and Improve the Combustion Performance. 运行费用和总体投资大幅减少，锅炉燃烧性能得到根本改善

- 低挥发份 Low in Volatile Matter Content
- 高水份 High Moisture
 - » 火焰稳定性 Flame Stability
 - » 低负荷稳燃 Unit Turndown
- 高灰份 High Ash Contents
- 加装脱硫装置后可能的高硫份 High Sulfur Contents
 - » 结渣 Furnace Slagging
 - » 高温腐蚀 Furnace Waterwall Corrosion
- ABT 对于上述煤质特性取得了很好的业绩 ABT's Combustion System Yields Excellent Results with These Conditions



ABT全套解决方案 ABT Complete Solution for Chinese Power Industry

- 采用高性能的低NOx 燃烧器作为降低NOx 的主要方式 **Utilize a Highly Effective Low NOx Burner**
 - » 采用剧烈燃烧方式降低污染物，未燃尽碳，CO和结渣。 Using Intensive Combustion to Reduce NOx, CO, UBC and Slagging.
 - » 剧烈燃烧, 高亮度火焰, 近着火点, 喉部着火 Intensive Combustion, Bright Flame and Well Established Flame in Throat.
 - » 提高火焰稳定性和低负荷稳燃能力 Combustion Stability Improvement
 - » 依靠燃烧器降低氮氧化物, 炉膛不深度分级 NOx control by Burner, Not Deep Staging Furnace
- 减小燃烧器内部煤粉和空气的不均匀 **Minimize Fuel Imbalances within the Burner** 控制煤粉管道间以及不同燃烧器之间煤粉和空气的分布 **Control Fuel and Air Distribution between Burners**
- 采用少量的高效的燃尽风系统来降低CO&LOI, **Use a Maximally Effective Overfire Air System to Minimize CO&LOI,**
- 采用独创的技术降低高温腐蚀和结渣 **Minimize Sidewall Corrosion with a Novel Anti-Corrosion/Slagging System**

- Novel Burner for T-Firing and Wall-fired 新型的四角和墙式锅炉燃烧器
- Opti-Flow™ 燃烬风系统：炉内分级降低NOx同时控制一氧化碳和未燃尽碳 **Opti-Flow™ OFA System External Staging for Lower NOx**
- ABT 防止高温腐蚀和结渣系统：针对燃用高硫煤的锅炉用空气保护水冷壁防止高温腐蚀的系统 **ABT's Anti-Corrosion/Slagging System**
- ABT平衡阀：制粉系统的煤粉分布控制系统 **Balancing Valve**

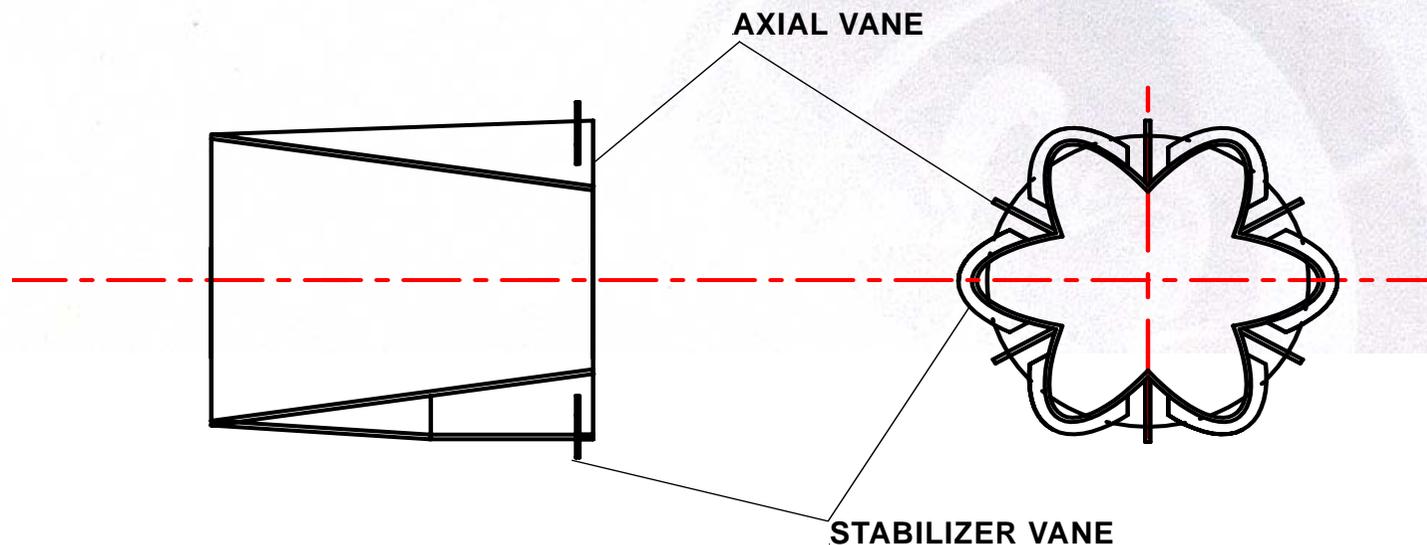
燃烧器及其部件

四角和墙式燃烧锅炉

Burner and Components

T-Fired Boilers and Wall-Fired Boilers

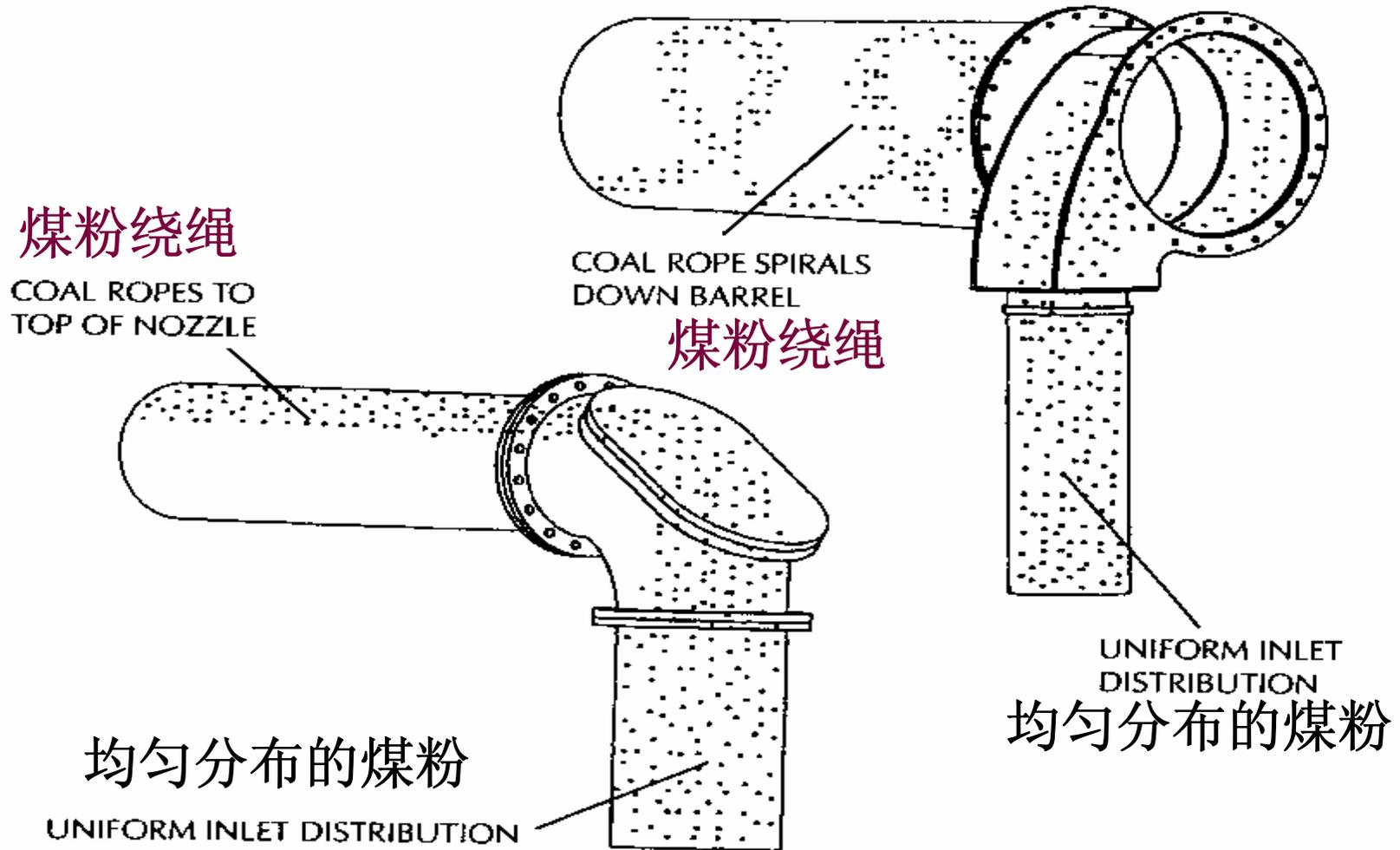
- **OPTI-FLOW™低NOx燃烧器的核心部件Heart of the Opti-Flow™ Low NOx burner**
- **比其他同类的低NOx燃烧器降低35%NOx**
35% Lower NOx than the Conventional LNB Replaced by ABT
- **比常规的单调风湍流非低NOx燃烧器至少低60%-70%**
At Least 60 to 70% below Turbulent Burner.
- **不存在燃烧器结焦烧坏问题 Open Nozzle, No Coking**



- 燃烧器喷嘴周围近乎均匀的煤粉流分布可以同时显著地降低NOx 和未燃尽碳 **Uniform Fuel Distribution Around Burner Nozzle**
- 可调的高度稳定明亮的火焰 **Highly Stable Very Bright Flame**
- 喷嘴压降小，安装调整阀来控制煤粉流而不增加系统阻力 **Lower Pressure Drop**

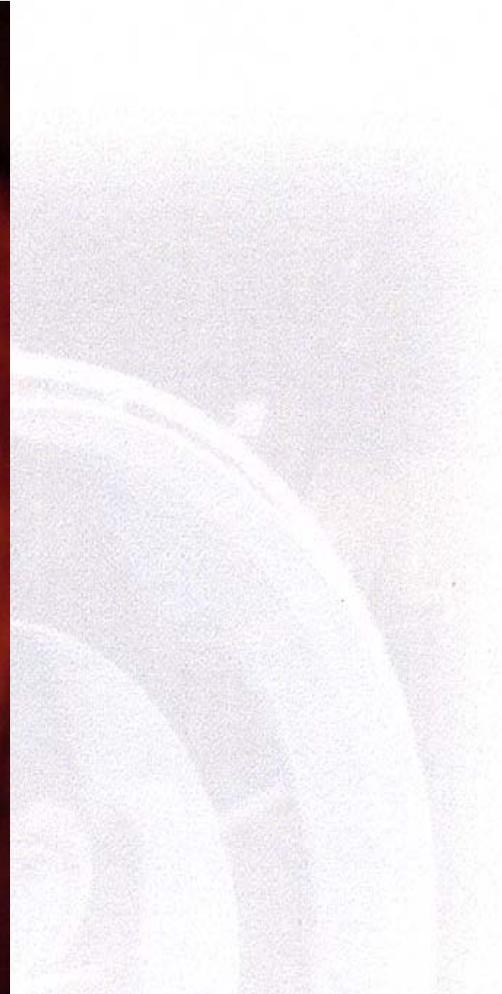
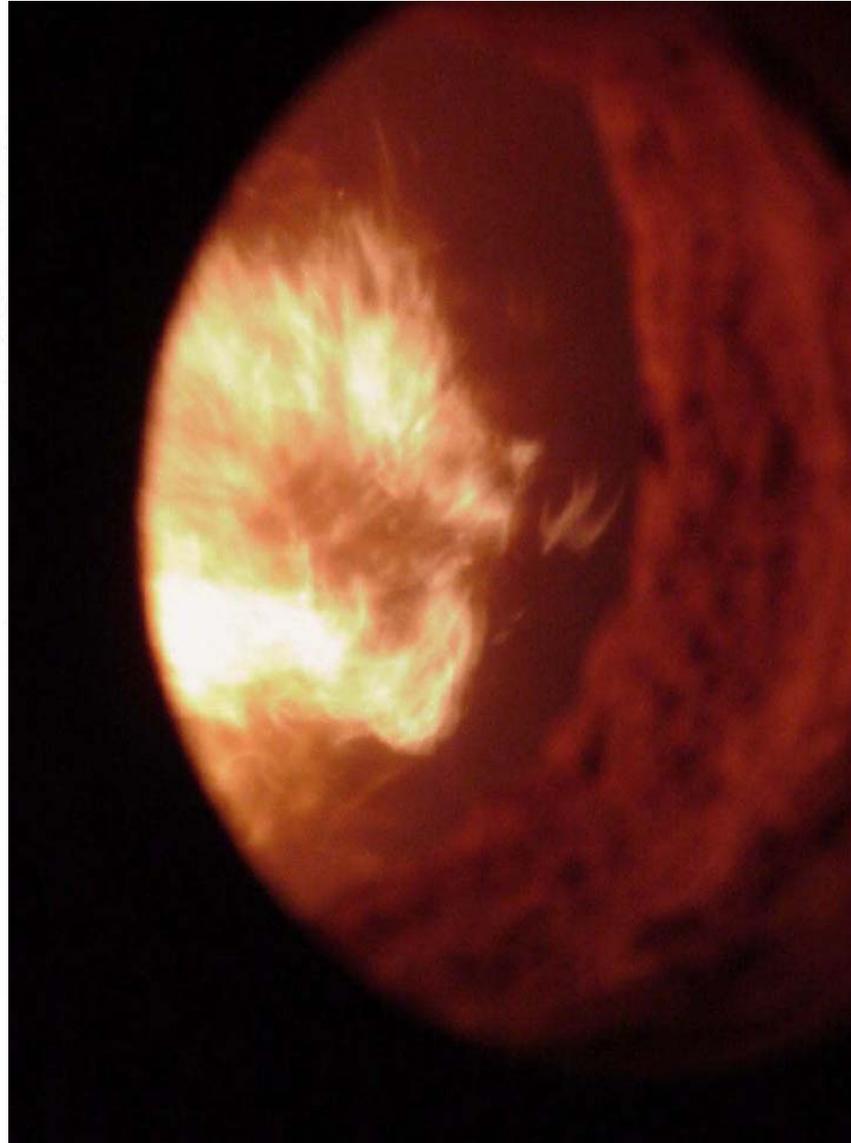


煤粉绕绳现象 Coal Roping



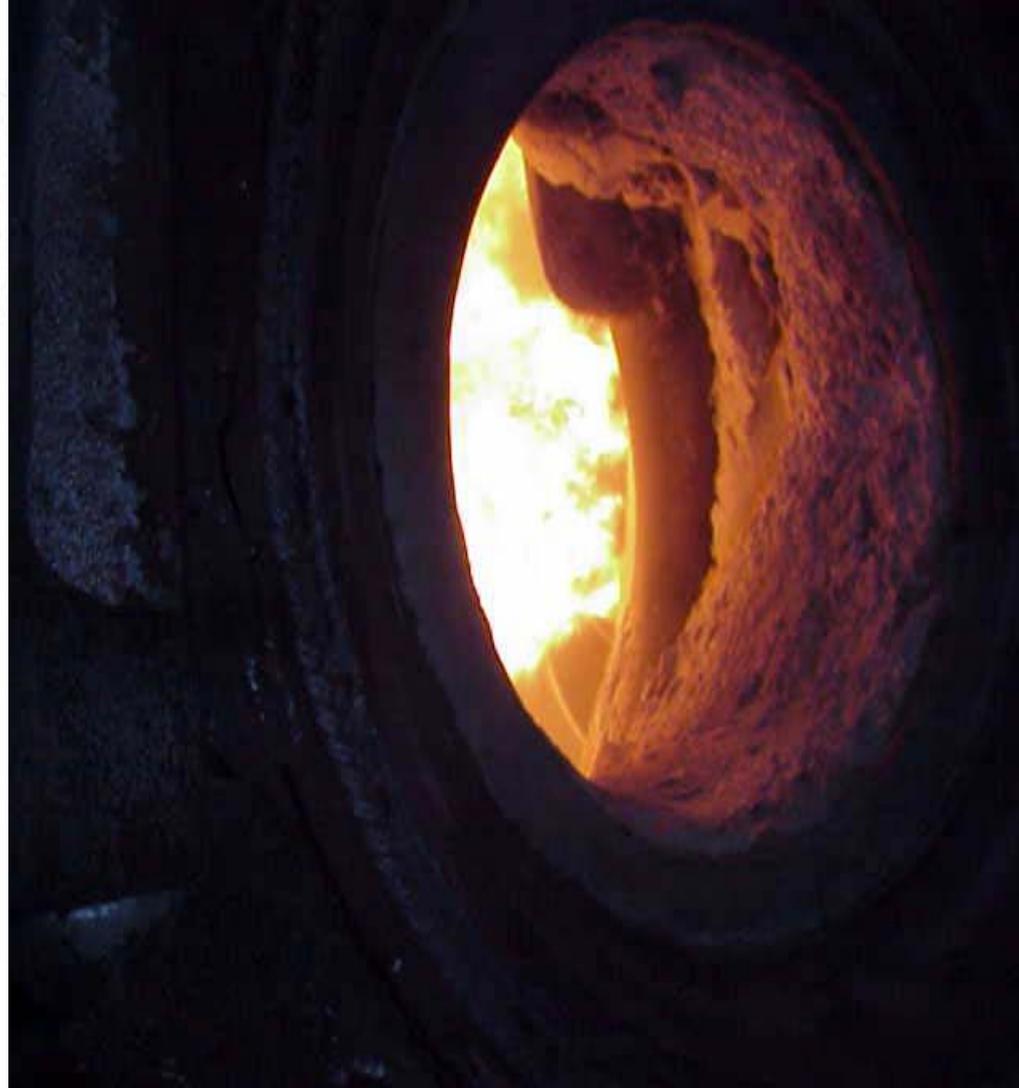


煤粉分布不均匀导致糟糕的燃烧火焰 POOR FLAME DUE TO POOR FUEL DISTRIBUTION





良好的煤粉分布产生明亮稳定的燃烧火焰
CORRECT FLAME WITH PROPER FUEL DISTRIBUTION

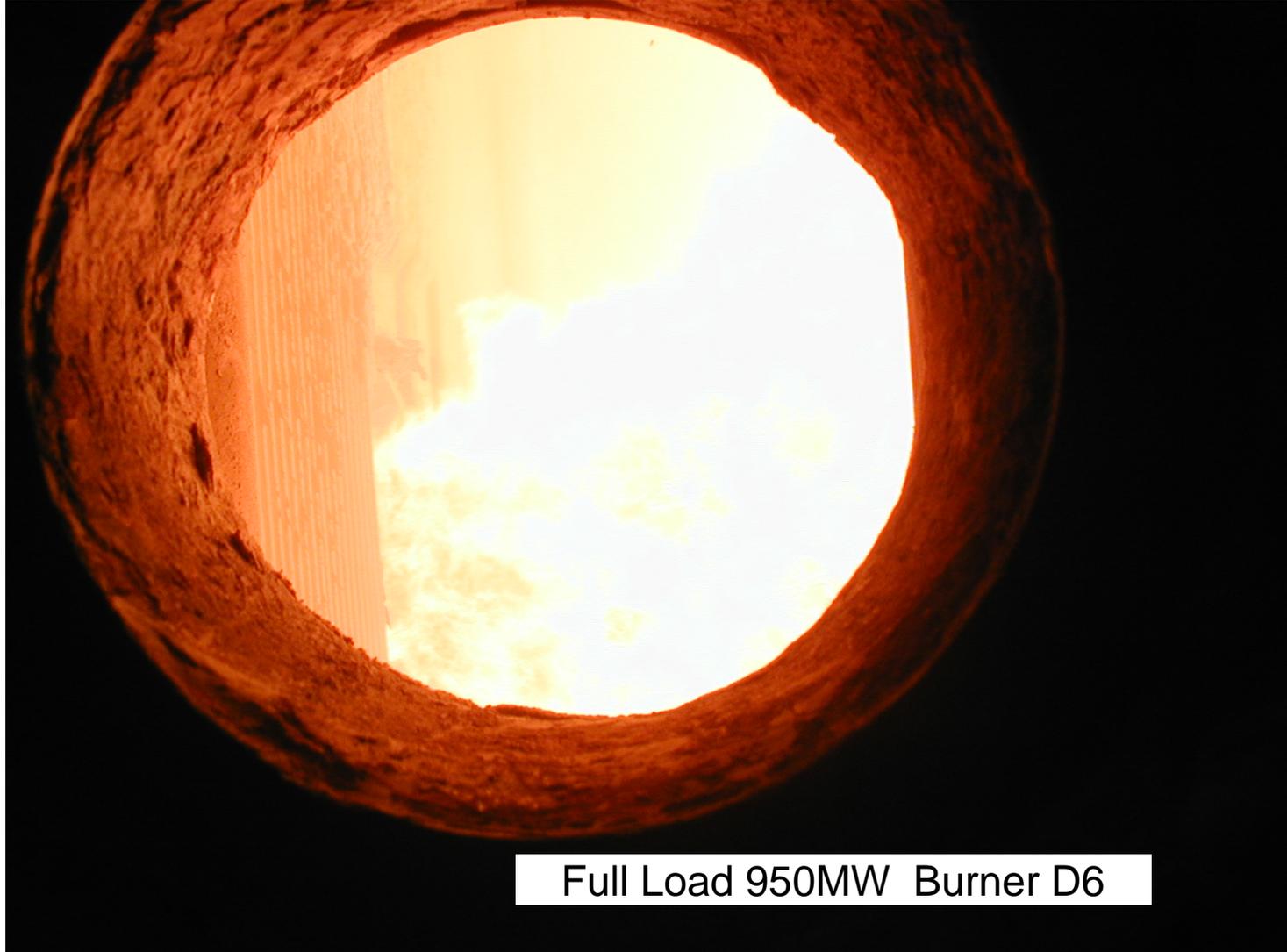




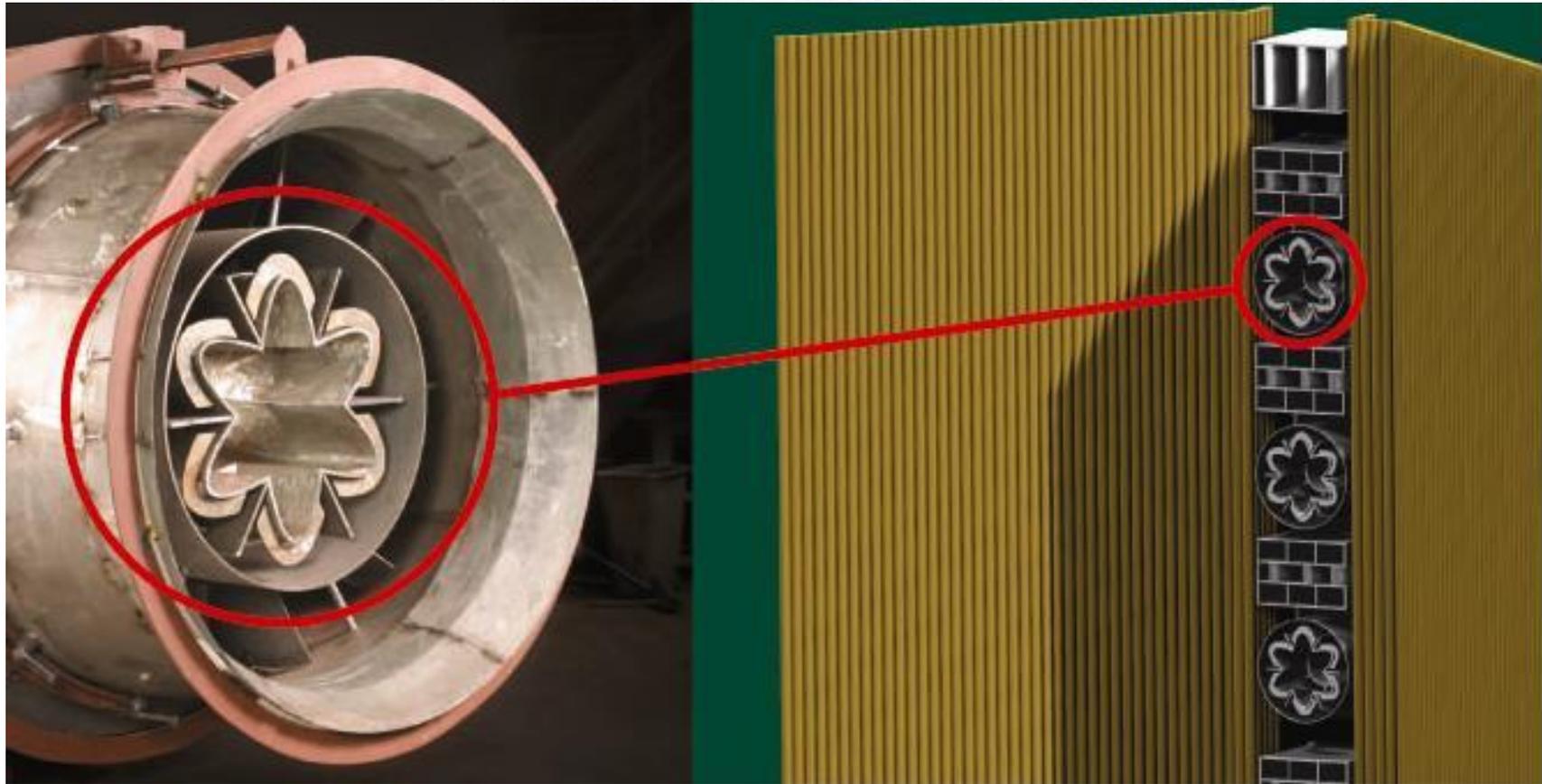
95万千瓦B&W锅炉燃烧器 Burner for 950 MW B&W Boiler



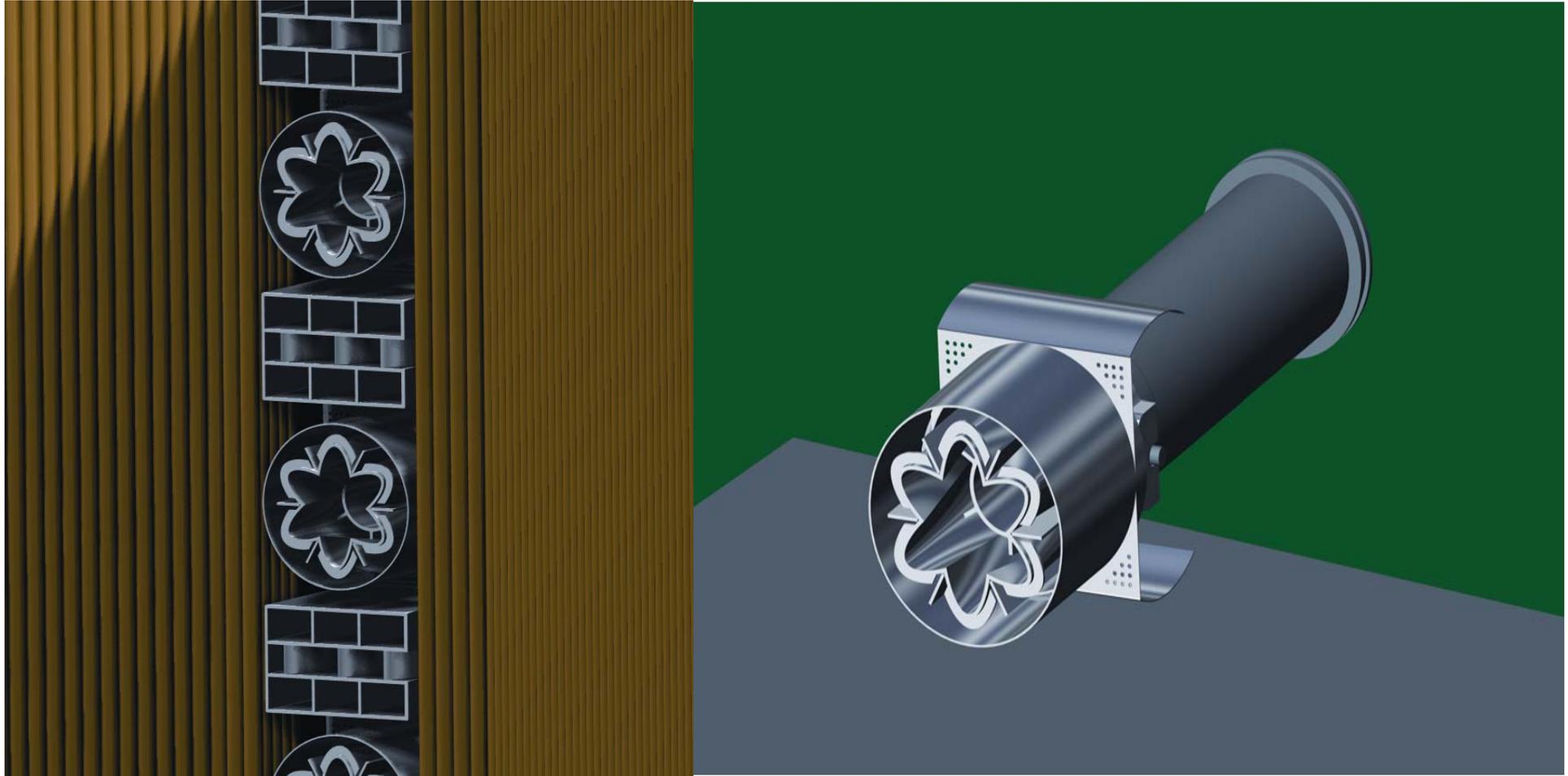
95万千瓦B&W锅炉满负荷的火焰 Flame of Burner D6 with 950MW Load



From Wall-Fired to T-fired System



T-Fired Opti-Flow™ 四角燃烧系统



燃烬风系统

墙式燃烧和四角燃烧锅炉

OPTI-FLOW™ OFA System

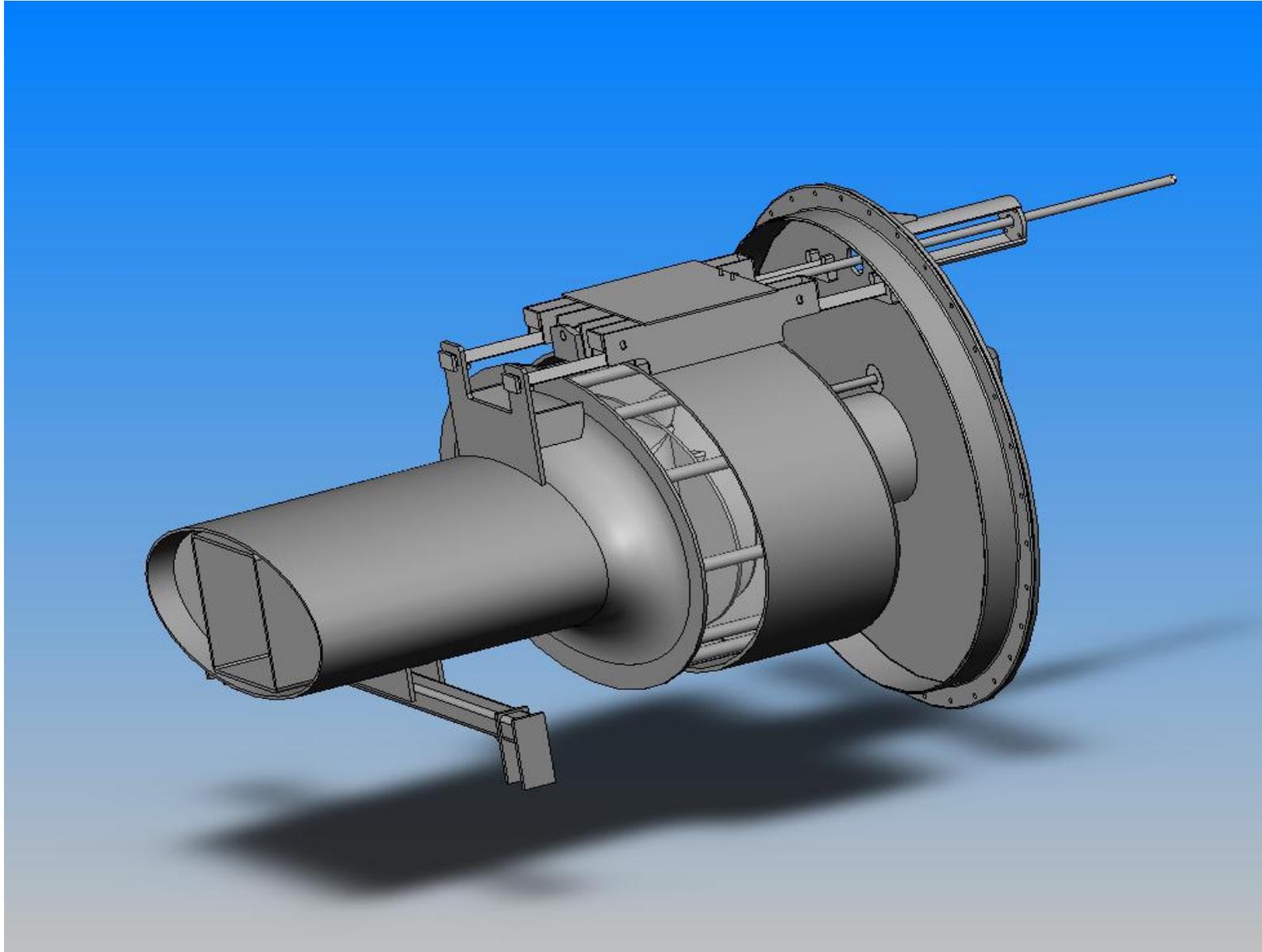
T-Fired Boiler

- Minimize Sub-Stoichiometric Burner Operation 尽量减少燃烧器区域的低当量比燃烧
- Utilize Wing Ports to Blanket the Upper Furnace Sidewalls and Control CO 使用侧翼喷口产生氧化性气氛来保护炉膛上方侧墙
- Practical Optimize the Following:
 - » De-NOx Zone Residence Time
 - » Residence Time in the Burnout Zone优化以下两个停留时间
 - » a) 燃烧器区域停留时间（从燃烧器的中心位置到燃烬风喷口）
 - » b) 燃烬区停留时间（从燃烬风喷口到炉膛折焰角）



OPTI-FLOW™ OFA Aerodynamic Port

燃烬风系统





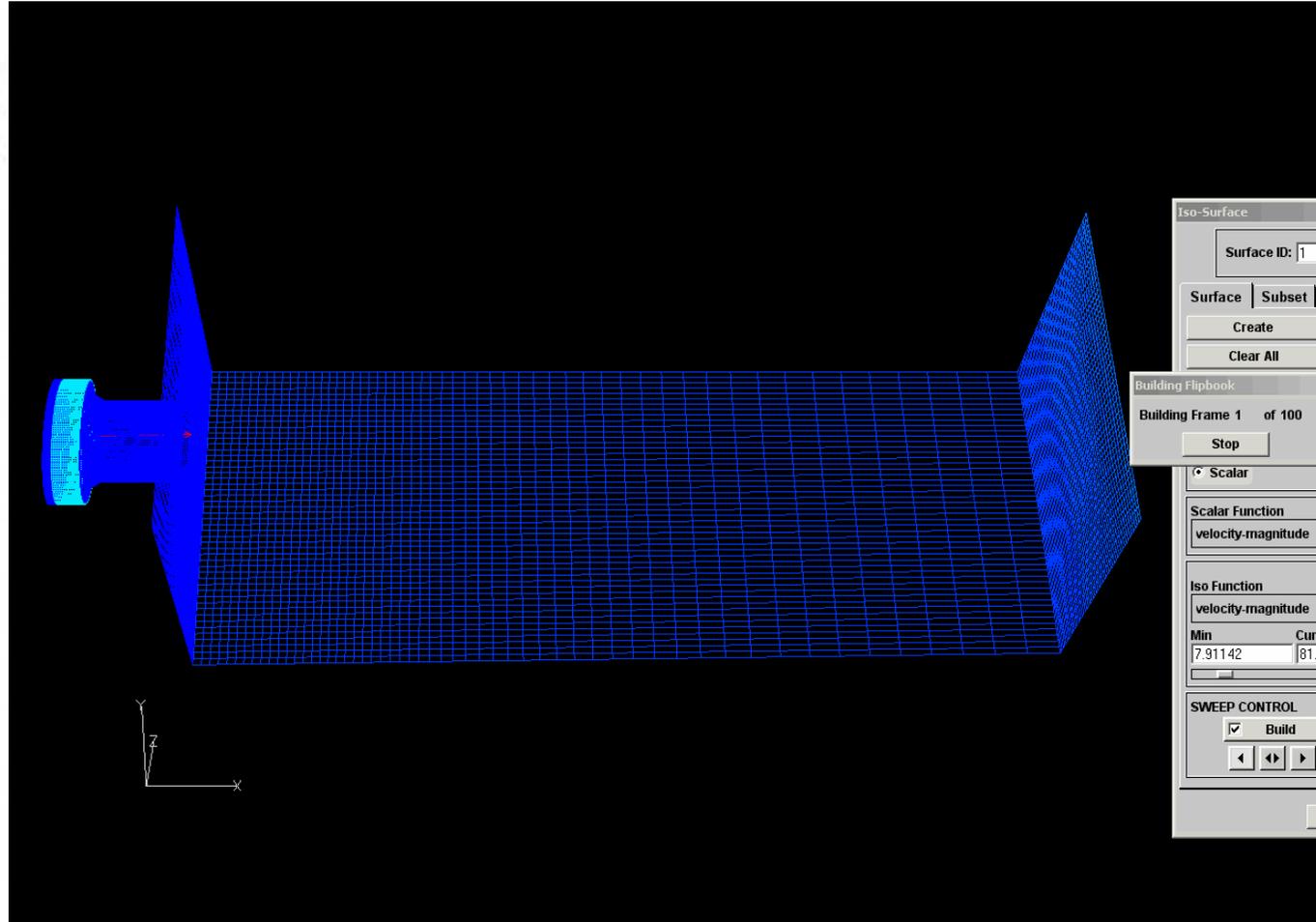
Features of OPTI-FLOW™ OFA Aerodynamic Port 燃烬风系统空气动力学喷口

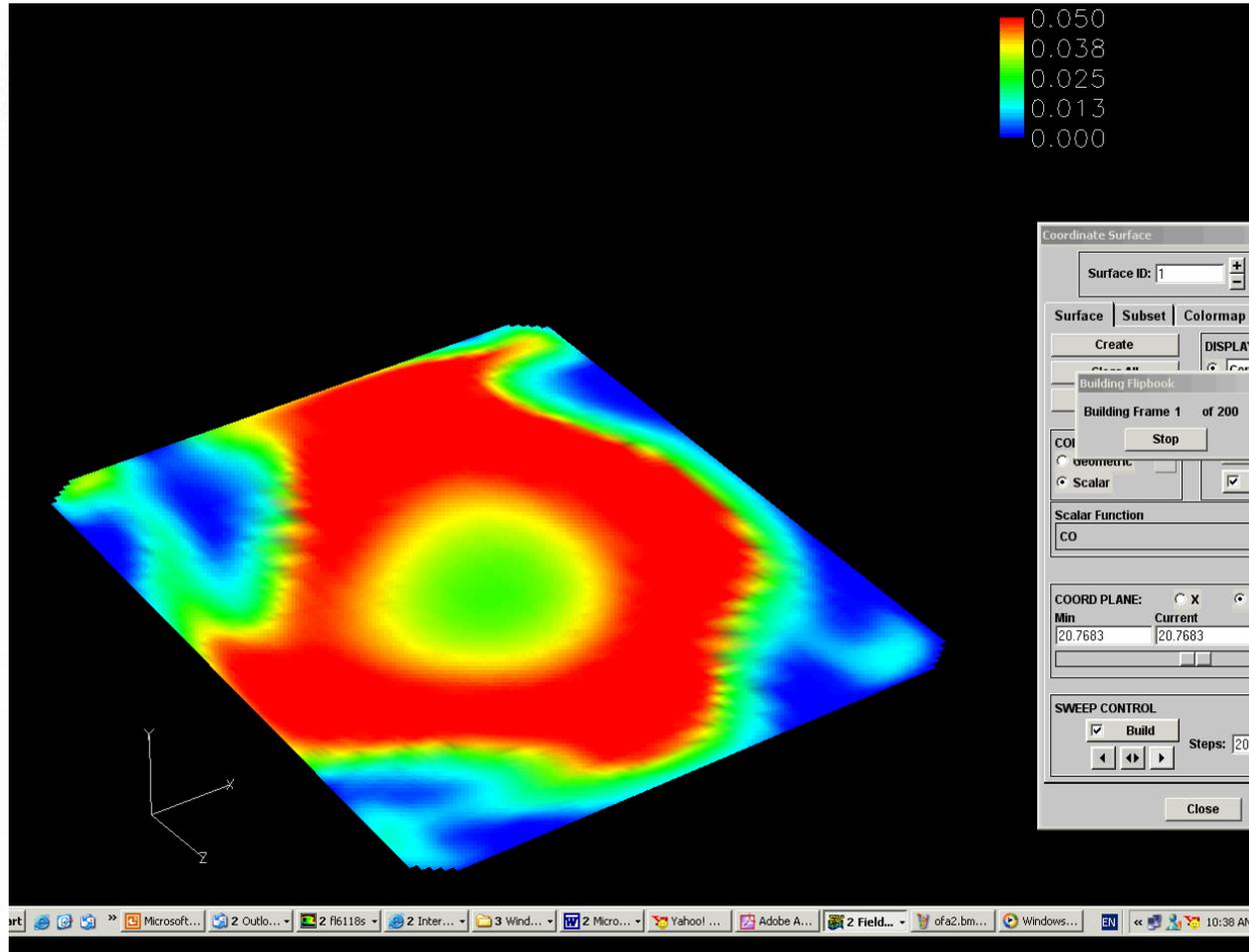
- No Swirl 没有旋流
- Deep Penetration 强大的穿透力
- Excellent Horizontal Mixing 充分的水平方向混合
- High Reliability 高度可靠性



OPTI-FLOW™ OFA Penetration Animation 燃烬风的动画穿透效果

的动画穿透效果





OFA for 300 MW T-Fired Boiler

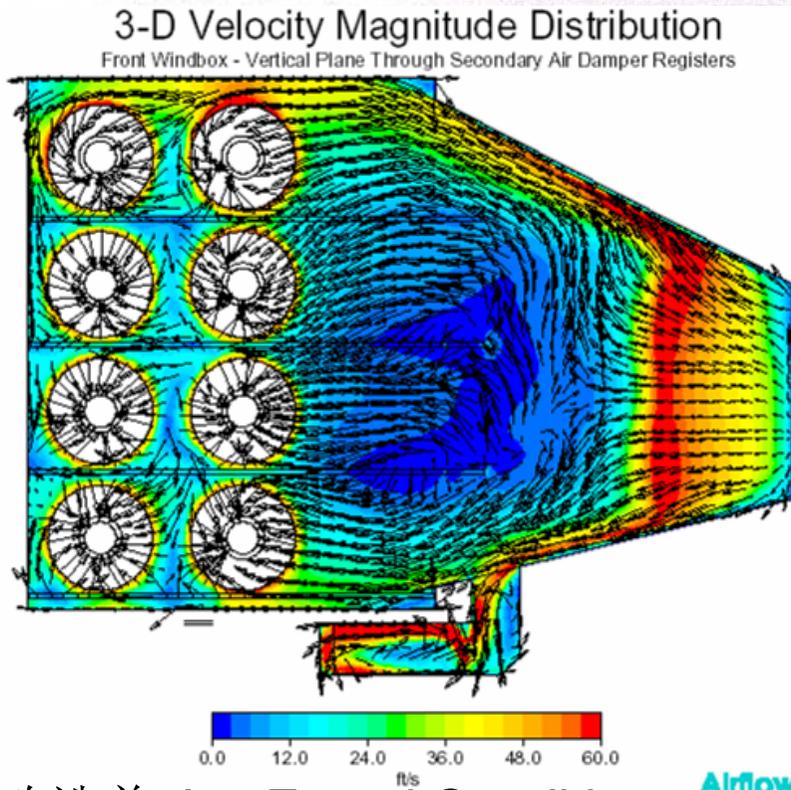
燃烧器之间的煤粉和空气的平衡

Fuel and Air Balancing between Burners

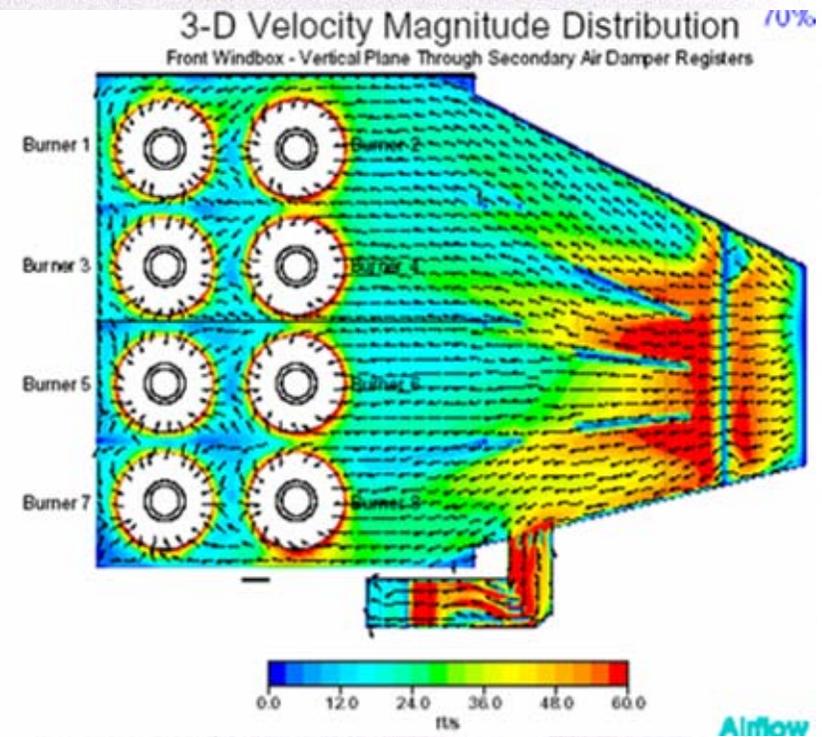
目的 Purpose:

- » 控制煤粉管道间以及不同燃烧器之间煤粉和空气的分布
Control Fuel and Air Distribution between Burners
- » 降低氮氧化物和未燃烬炭
Control both NOx and Unburned Carbon
- » 消除煤粉富集区域（产生很高的一氧化碳和未燃尽炭）
Eliminate zones of very high coal flow (low stoichiometry) that generate high CO and UBC
- » 消除煤粉不足的区域（由于强氧化性气氛导致很高的氮氧化物）
Eliminate zones of very low coal flow (high stoichiometry, high excess air) that generate high NOx
- » 消除严重的烟气温度的不平衡，解决高温过热器烟气偏差问题
Eliminates severe gas temperature imbalances entering the super heater

控制不同燃烧器之间二次风的分布 Improve Secondary Air Distribution



改造前 As- Found Condition

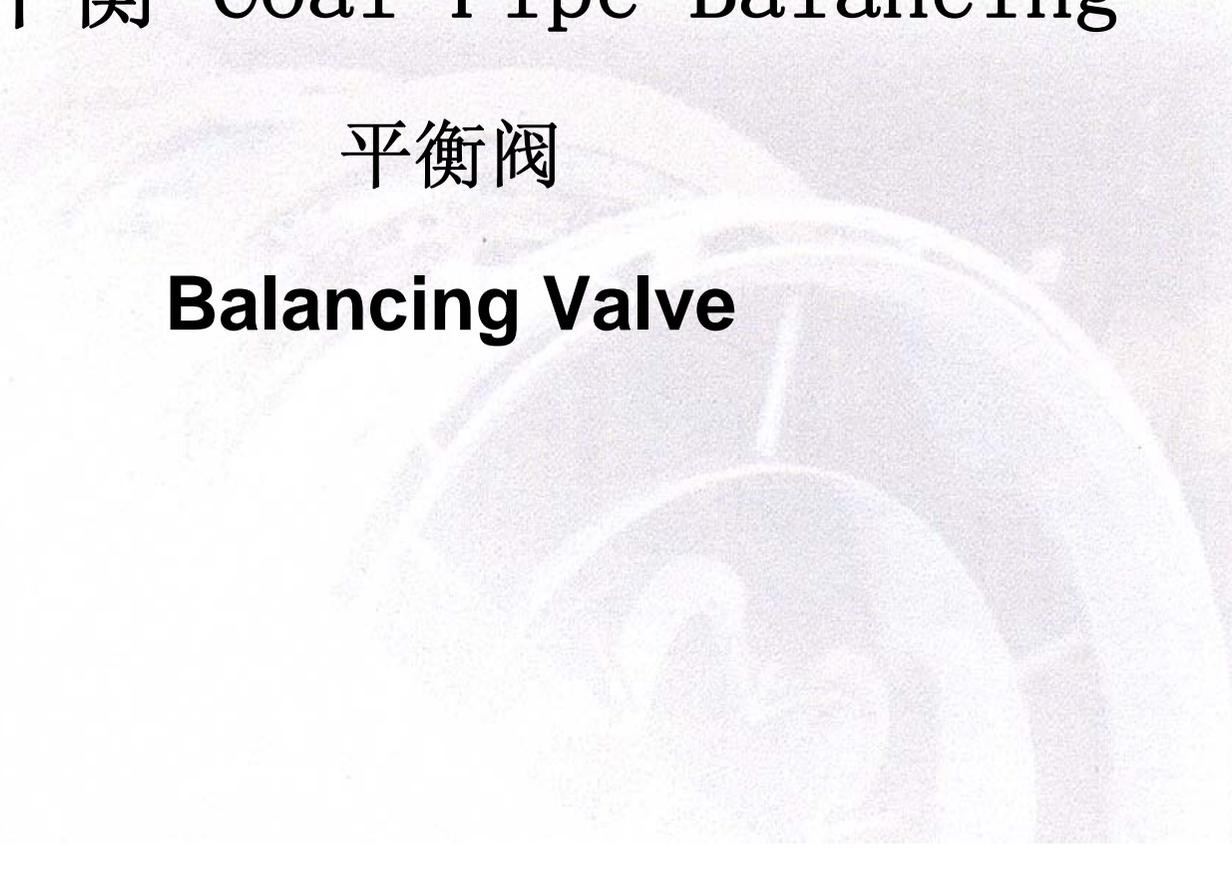


改造后ABT Remedy

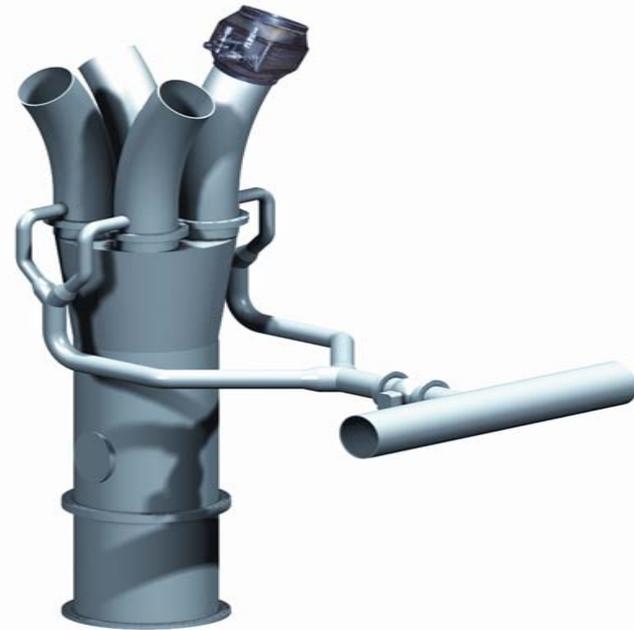
煤粉平衡 Coal Pipe Balancing

平衡阀

Balancing Valve



Balancing Valve平衡阀



平衡阀的优点 Major Advantages for Balancing Valve

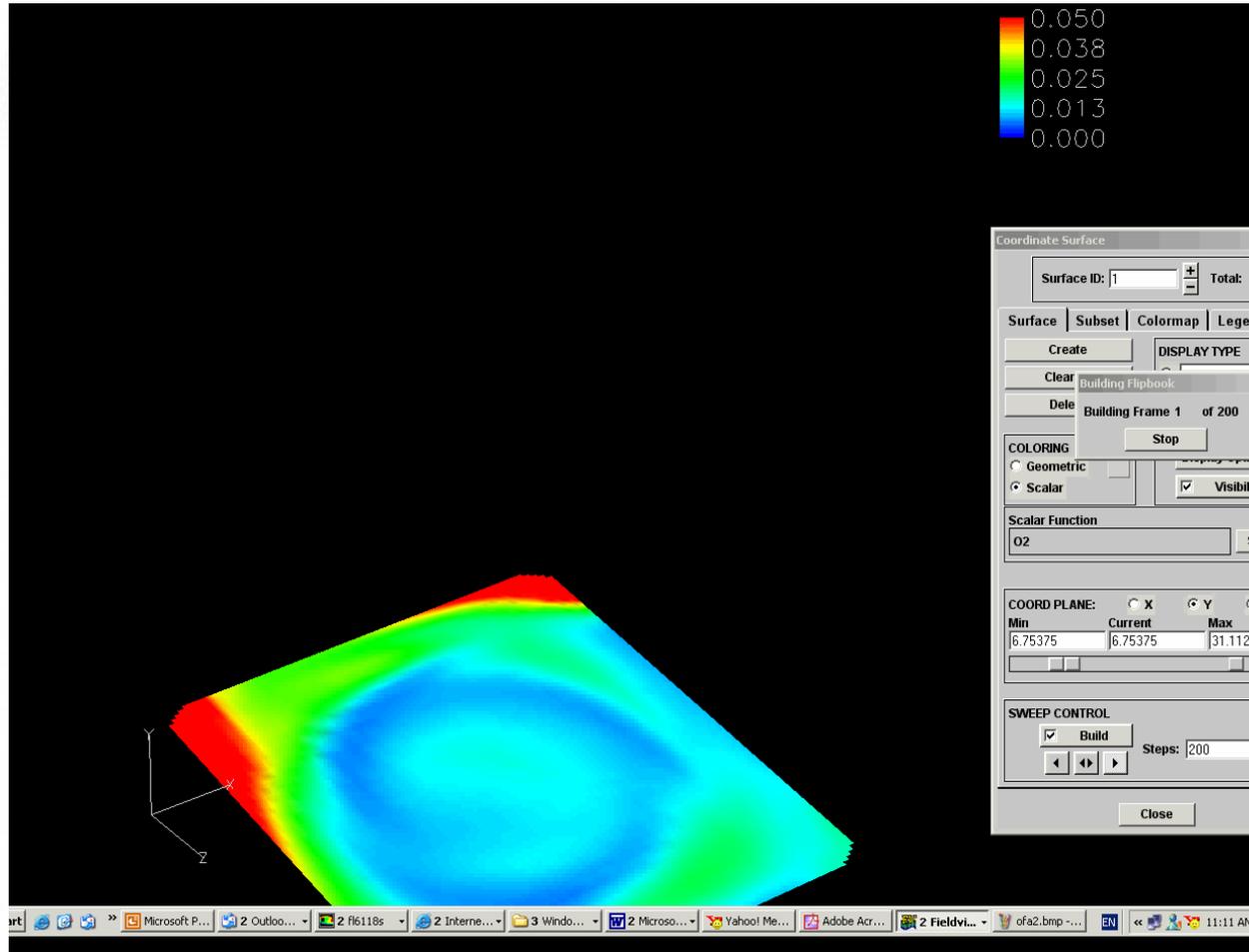
- Equalize Pressure between Coal Pipes from the Same Mill 均衡煤粉管道的压力
- 对于不能安装塔式分配器垂直正压磨最有效 Most Useful with Vertical Pressurized Pulverizers where Tower Distributor Can Not Be Applied
- 安装灵活方便，可在线控制 Oriented in the Horizontal as well as the Vertical Direction without Forming Coal Piles Downstream
- 不存在煤粉回流区，避免磨损 No Coal Eddies along the Pipe

ABT 防止高温腐蚀和结渣系统

ABT's Anti-Corrosion & Slagging System

目的 Purpose: 产生氧化性气氛来保护炉墙

Blanket the Furnace Sidewalls with an Oxidizing Atmosphere to Prevent Corrosion and Slagging



Clean Wall for 300 MW T-Fired Boiler (The Same Unit Shown Before)

Mechanisms of Slagging

Mineral 矿物质

Ash 灰

Melting Pt, C 熔点

U.S. coals 美国煤



Chinese coals 中国煤

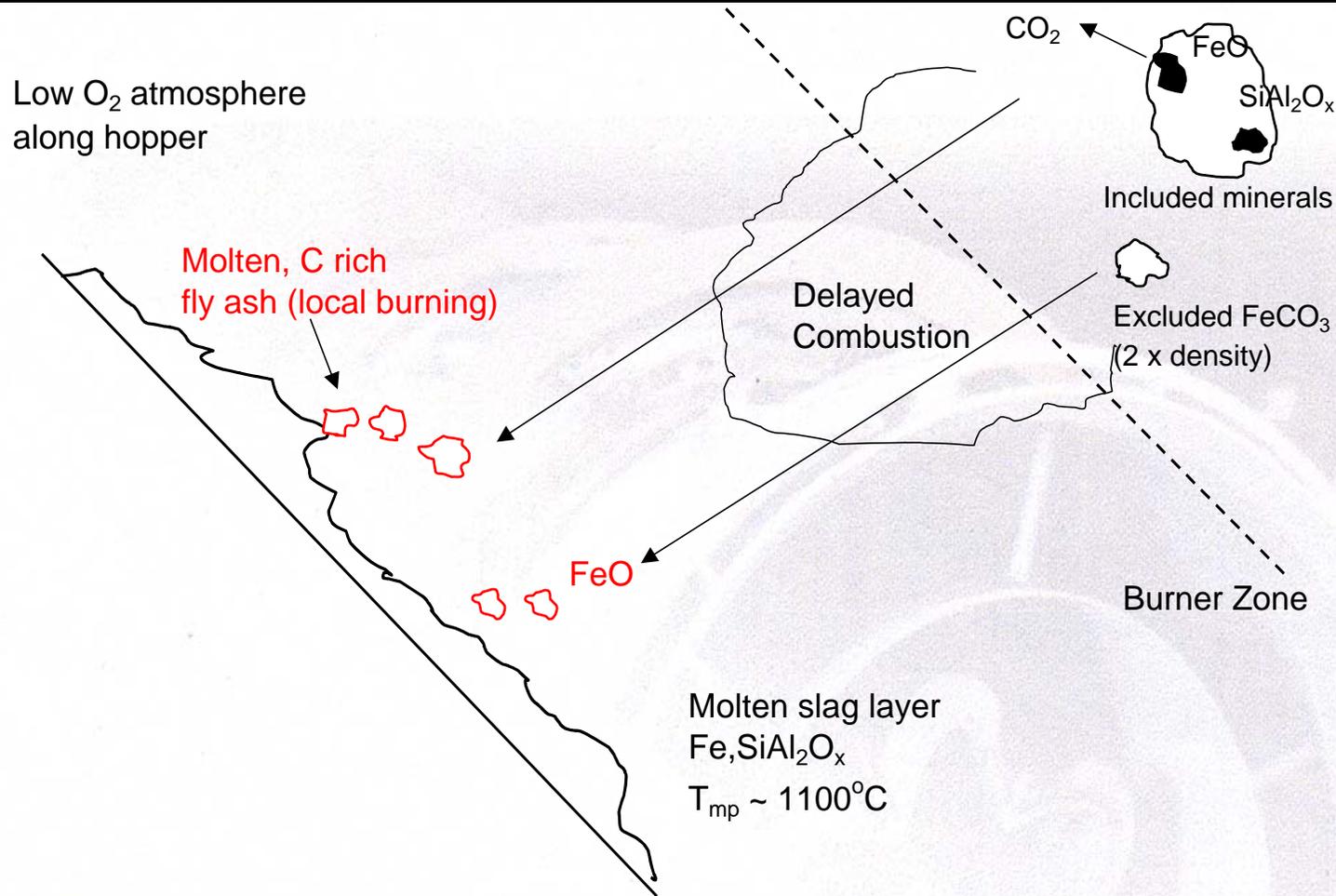


Note: Complete oxidation of iron species results in much higher melting point! 铁的完全氧化可以提高灰熔点。

- Slagging is due to both poor burner performance and poor secondary air distribution to the burners. 从燃烧角度来讲结渣由于燃烧器性能不好和二次风的分布不均造成。
- Highly reducing regions from carbon in fly ash and low O₂ yield low melting ash on furnace tubes. 强还原性气氛导致低灰熔点灰渣。
- Liquid surface of ash captures impacting fly ash. Viscosity of deposit is high enough that it remains in place and does not flow freely from surface. 灰渣粘性强将使结渣加剧。
- For highly slagging coal: advanced low NO_x burner must minimize the length of the fuel rich core, while attaining minimum NO_x.
(Burner must not only combust carbon, but also oxidize iron within flame). 对于易结渣煤，燃烧器必须快速着火，缩短煤粉富集区域，并且降低氮氧化物。

Slagging Mechanism for Chinese Coals

结渣机理



1. **Molten fly ash is transported to the hopper surface**
融化的飞灰沉积到水冷壁表面
2. **Low O₂ along hopper maintains ash in molten state**
局部的低氧区域使之保持在融化状态。

- First generation LNB: Delayed combustion flame and very rich core transports fly ash high in unburned carbon and partially oxidized iron to tube surfaces. 早期低氮氧化物燃烧器采用延迟的燃烧火焰，由于煤粉富集区域飞灰含炭量高，铁不完全氧化，沉积到水冷壁上。
- Poor secondary air mixing further delays combustion promoting carbon in ash impingement on hopper slopes.
二次风分布不均匀使灰中炭含量增加，进而加剧结渣。
- Poor secondary air balance worsens burner performance.
二次风分布不均匀使得燃烧器性能恶化。
 - » Mixing of secondary air with coal stream
 - » Reducing regions in hopper slope

IMPROVE COMBUSTION PERFORMANCE:改善燃烧性能

- Install ABT fuel injectors and modify existing register by installing ABT's inner air damper and fixed swirler.新的煤粉喷嘴。
- Add coal line balance valves to improve fuel distribution between burners.煤粉平衡装置
- Improve secondary air distribution to the burners with modifications to the windboxes and secondary air ducts.风箱中二次风平衡。

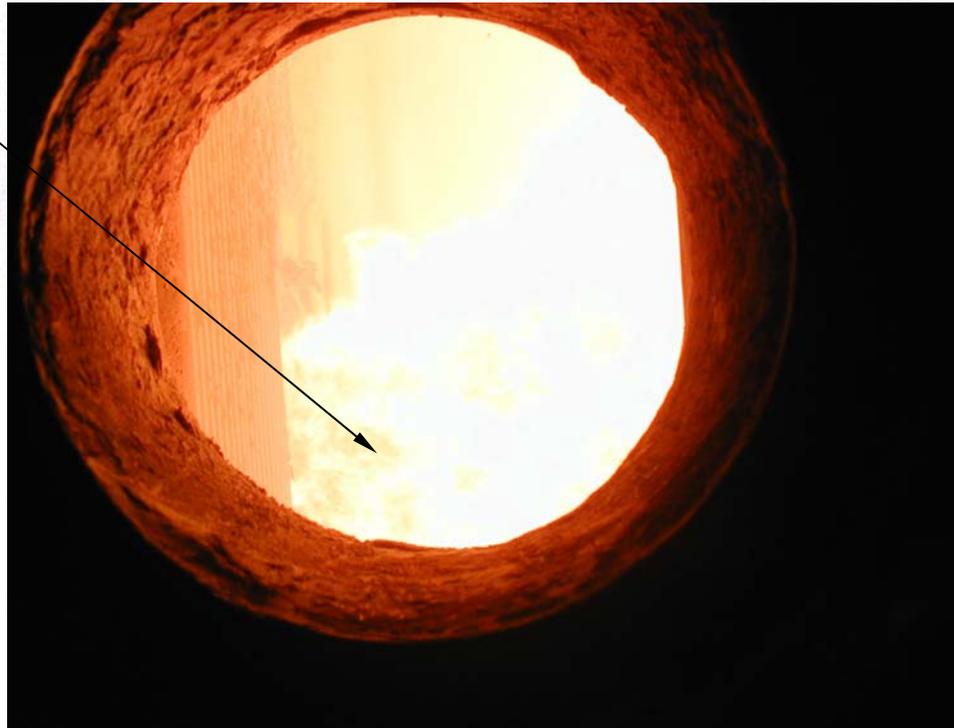
RESULTS:结果

- Improved control of air/coal distribution and mixing 风粉均匀充分混合。
- Stable flames in throat 喉部稳定的火焰。
- Early combustion = reduced NO_x, UBC and slagging 快速点火，降低氮氧化物，未燃烬炭和结渣。
- Close or minimize use of OFA ports to further aid slag control by raising furnace stoichiometry 尽量降低或关闭燃烬风



NOx Reduction
Zone

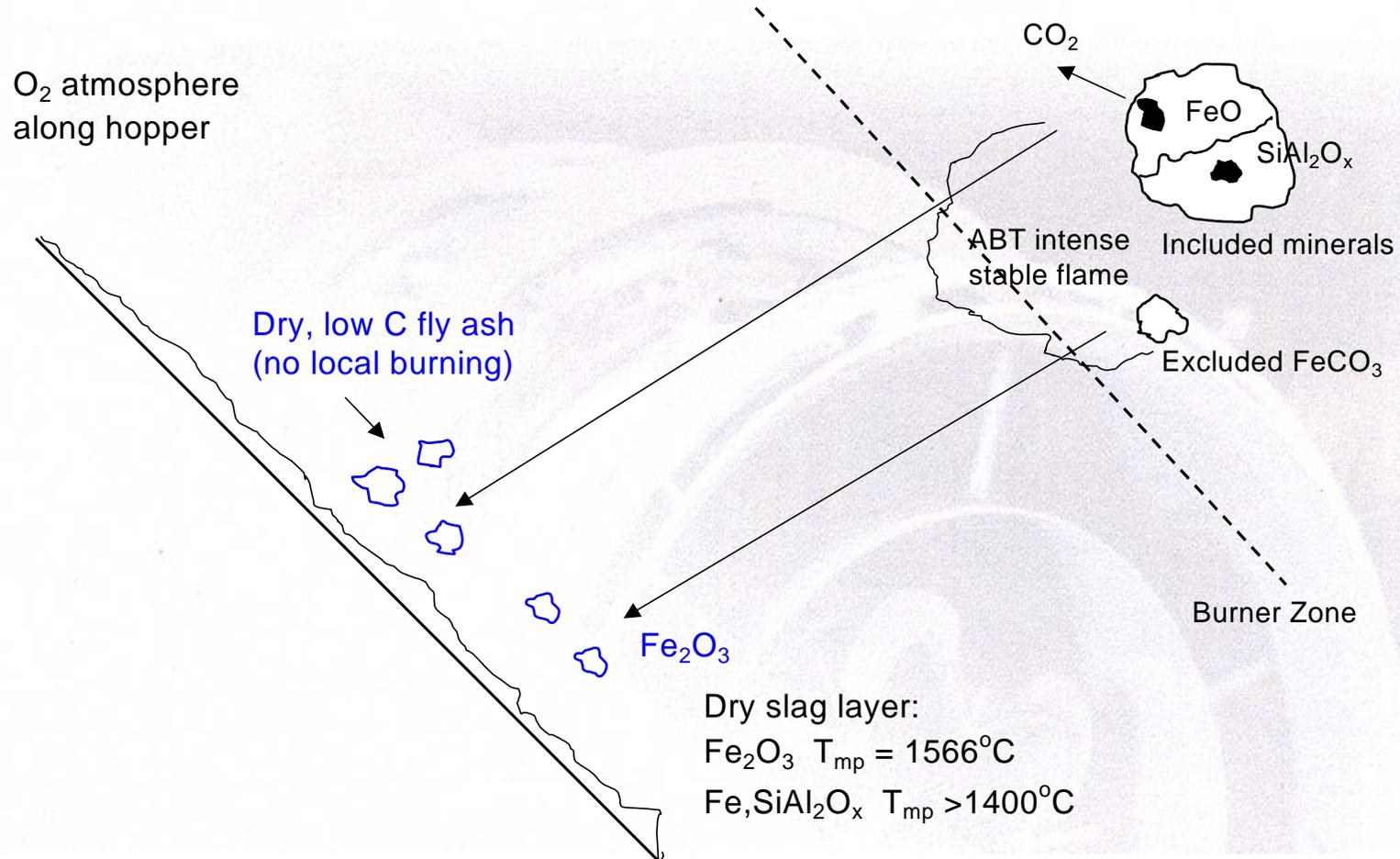
氮氧化物还原区域



**Bright Stable Flame for Bituminous Coal
without Extended Rich Core Region**

明亮稳定的烟煤火焰，不存在过长的煤粉富集区域

Reduced Slagging with ABT Improved Combustion Performance 改进的燃烧设备消除结渣



1. Dry fly ash is transported to the hopper surface
2. O₂ along hopper maintains ash in dry state



ABT Retrofits of Boilers Firing Slagging Coals: Boiler Data 结渣控制相关的改造项目

Station	<u>Harrison</u>	<u>Homer City</u>	<u>Owensboro</u>
Capacity, MW	3 x 660	2 x 660	1 x 300
Steam conditions	Supercritical	Supercritical	Controlled Circ.
Base burner	FW (CF/SF)	FW (CF/SF)	CE/CCOFA
No. Burners	24 opposed (6 rows of 4)	24 opposed (6 rows of 4)	20 Corner
Units converted	All 3	No. 1 – 24 No. 2 – 12/24	1



ABT Retrofits of Boilers Firing Slagging Coals: Slagging Data 结渣相关指数分析

Station	<u>Harrison</u>	<u>Owensboro</u>	<u>Homer City</u>
Fuel	E. bit	Midwest bit	E. bit
Fuel S content, %	3.5 – 4	>4	2
Fuel slagging Index	High	High	Moderate
Ash Fe ₂ O ₃ content, %	23.6	20 – 25	15 – 20
Slagging Regions			
Pre-retrofit	Side/Eyebrows	Furnace	Side/Eyebrows
Post-retrofit	Minimal	Minimal	Minimal

**SIMULTANEOUSLY REDUCING NO_x AND
SLAGGING ON A 290 MW T-FIRED BOILER**
在29万千瓦四角燃烧机组上同时降低氮氧化物和结渣
的应用

- Fuel: 煤种 Severely slagging
midwestern coal 非常容易
结渣的中西部烟煤
- Boiler Information: 锅炉配置 290 MW
Single furnace
Four burner levels
CCOFA
- Requirements: 改造要求
 - » NOx guarantee: 0.25 lb/10⁶ Btu
 - » CO: <100 ppm
 - » LOI: <Baseline
 - » Slagging: Reduced

- **16 New burners** 改造范围包括整个燃烧系统
- **SOFA system (one level only)** 燃烬风系统
- **Anti-corrosion system** 防高温腐蚀和结渣系统
- **Fuel balancing system** 煤粉平衡系统

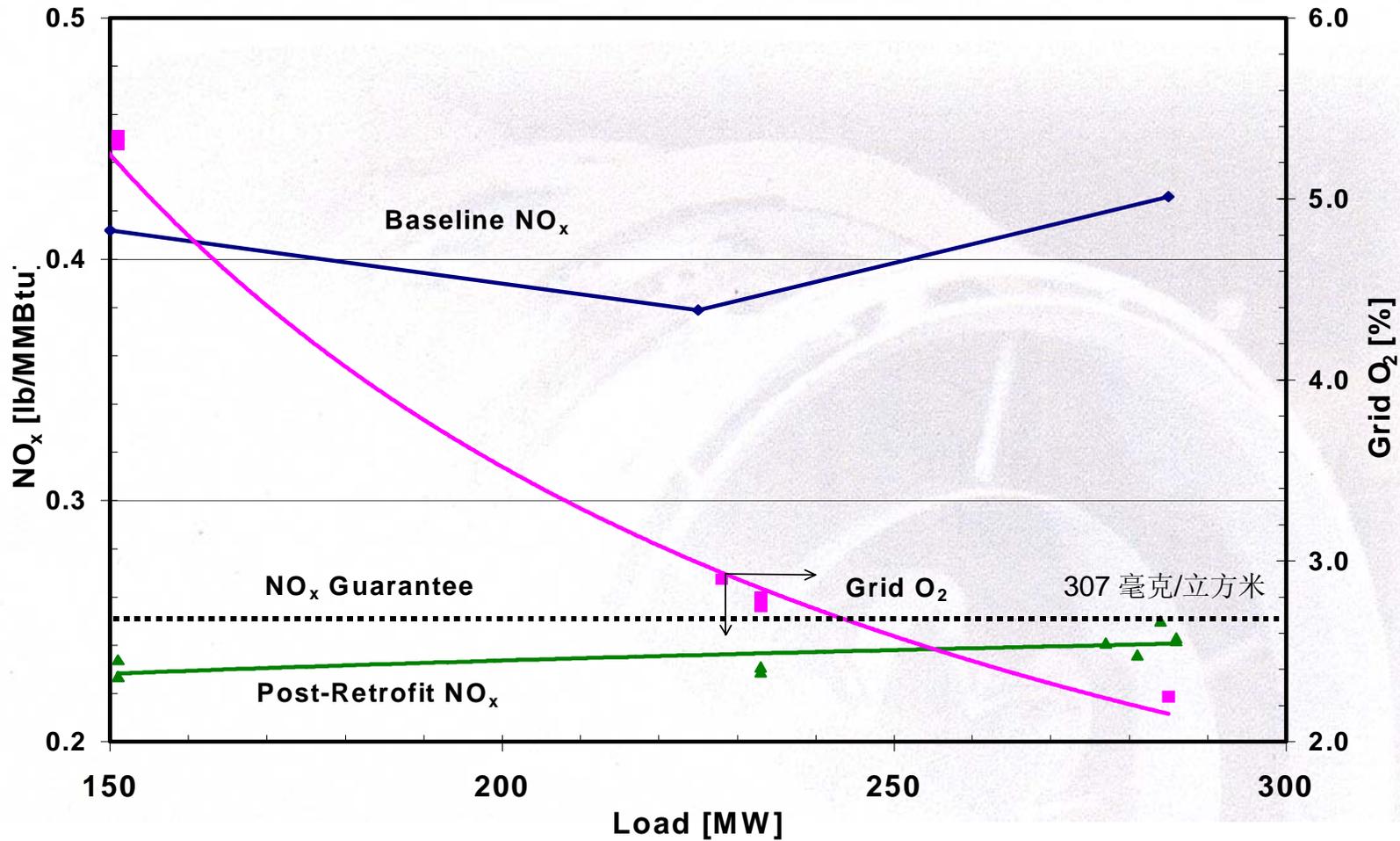
Opti-Flow Fuel Injector for OMU



- **All emissions guarantees easily met 所有排放保证值达标**
 - » **NO_x 50% Reduction 氮氧化物降低 50 %**
 - » **Co<100ppm**
 - » **LOI/UBC, Less than 1% Increased. 增加低于 1 %**
- **Severe slagging eliminated 彻底解决结渣问题**
- **Fuel and secondary air flows balanced 风煤得到平衡**
- **Running at 2% O₂ 机组可以在低氧量下运行，提高机组效率**

NOx Emissions vs Load:

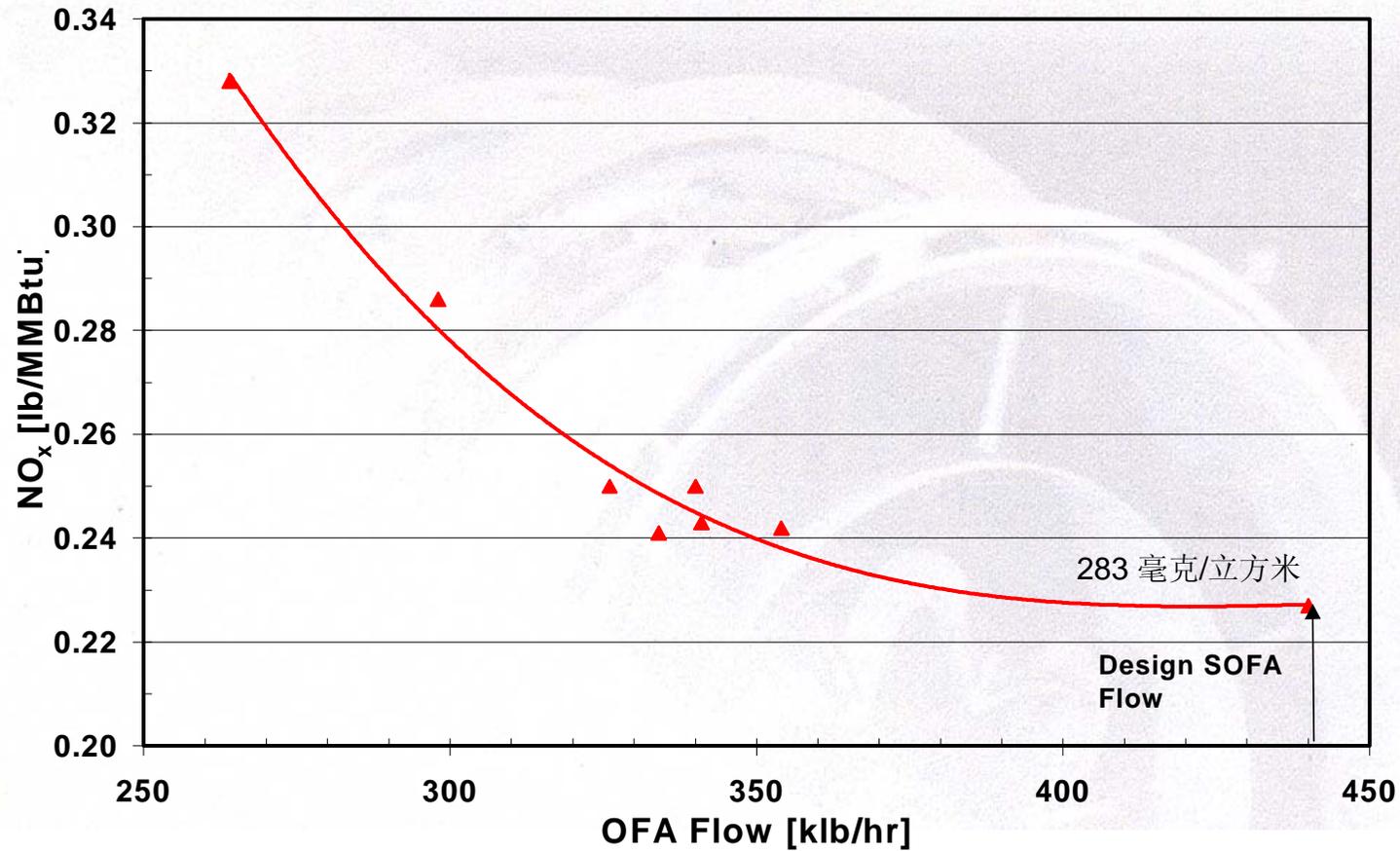
Baseline and Post-Retrofit 氮氧化物排放对比





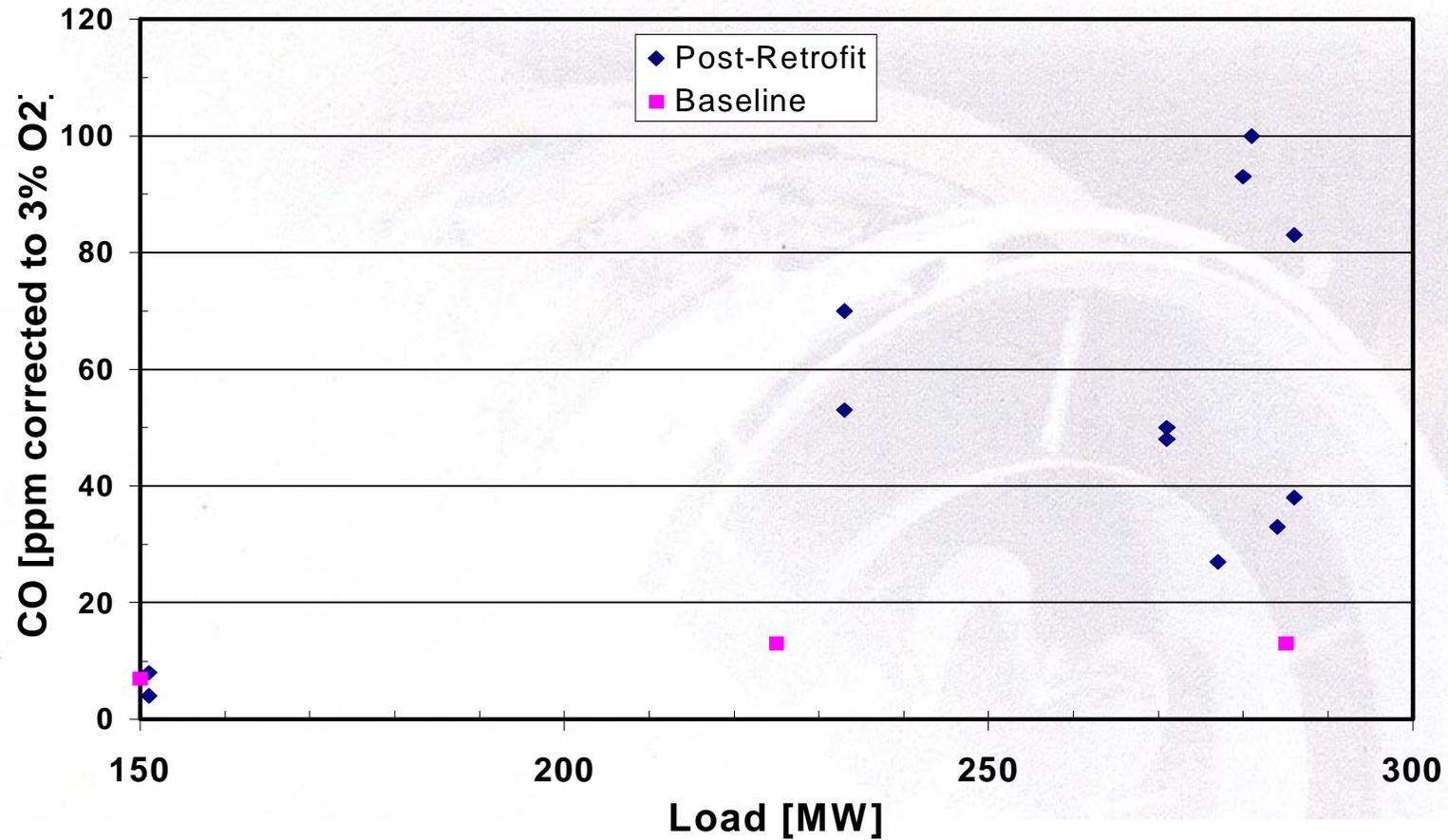
NOx Emissions OFA Flow at Full Load

燃烬风全开时的氮氧化物排放值



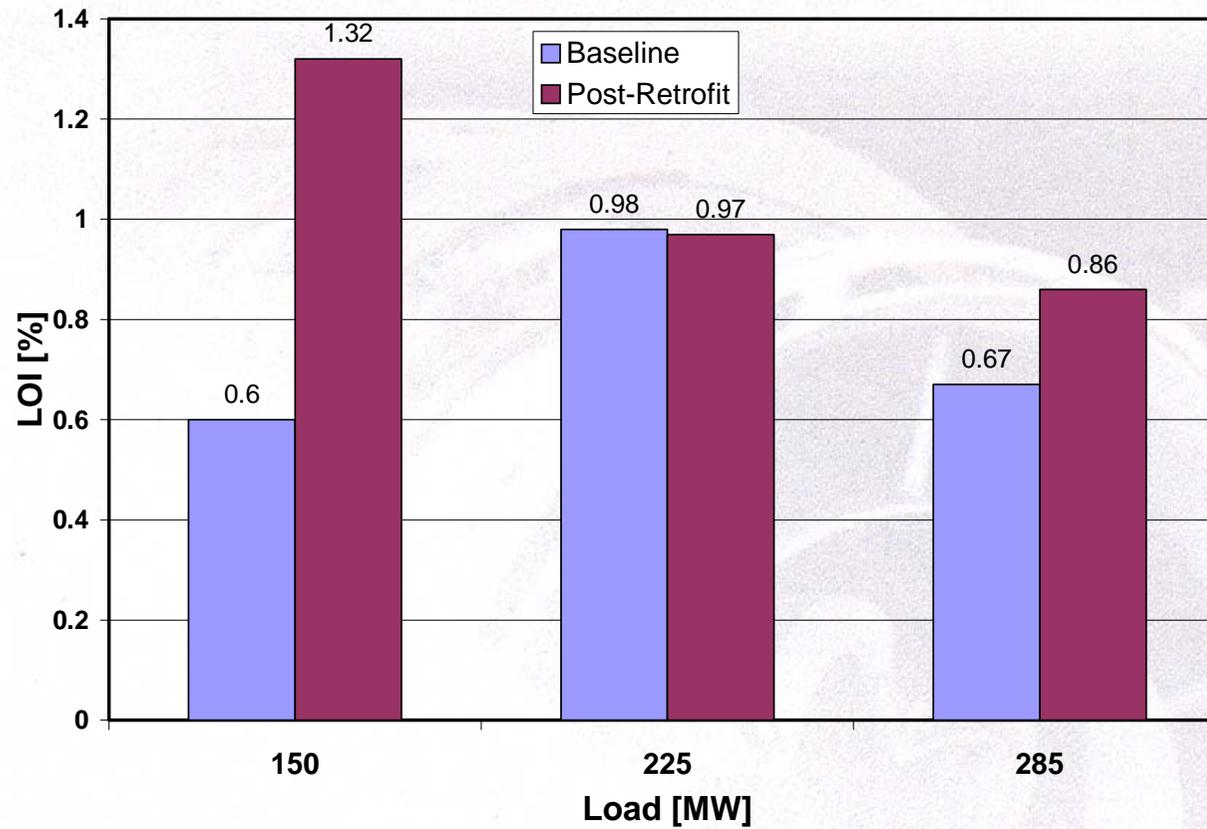
CO Emissions vs. Boiler Load

Baseline and Post-Retrofit 一氧化碳排放比较



OMU Fly Ash Unburned Carbon

飞灰含碳量



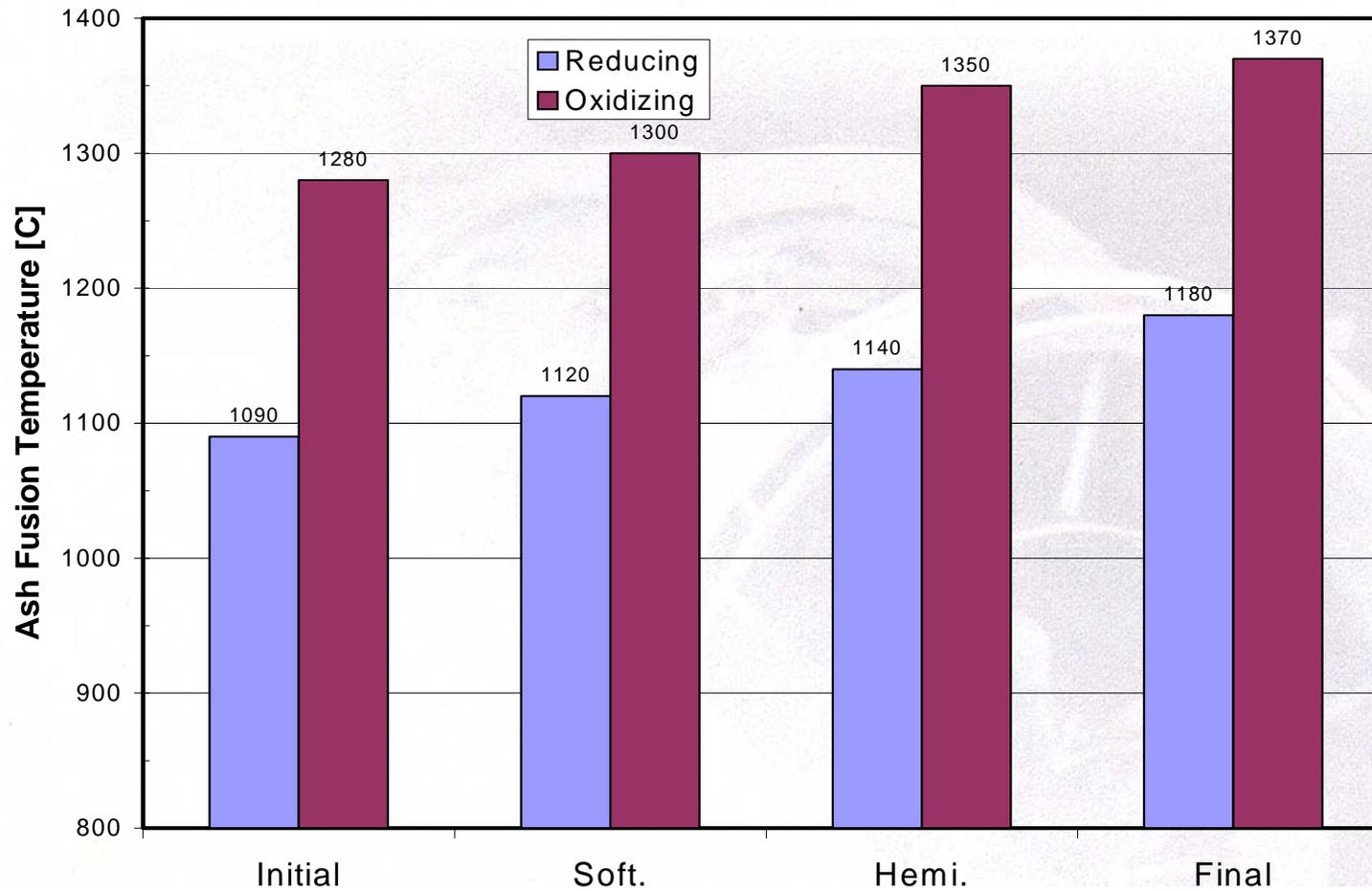
OMU Slagging Coal Analysis

煤种结渣程度分析

Sulfur, wt%	4.4
Ash, wt%	21.3
SiO ₂	40.6
Al ₂ O ₃	17.2
Fe ₂ O ₃	21.3
CaO	6.7
MgO	0.9
K ₂ O	1.9
Slagging Index	Severe

OMU Coal Ash Fusion Temperatures

煤种灰熔点



- Novel low NOx combustion system for corner-firing implemented by ABT with following constraints:
 - » High heat release furnace 高容积热负荷的炉膛
 - » High sulfur, severe slagging coal 高硫的极易结渣煤
- Post Retrofit Results:
 - » NOx emissions guarantee made at 50 to 100% MCR. Full load NOx less than 0.23 lb/10⁶ Btu (满负荷氮氧化物低于283毫克/立方米) .
 - » CO emissions less than 100 ppm over the load range. 所有工况下CO 小于100PPM
 - » Fly ash LOI less than 1% 飞灰含碳量小于1%
 - » Severe furnace slagging practically eliminated炉膛严重结焦彻底解决

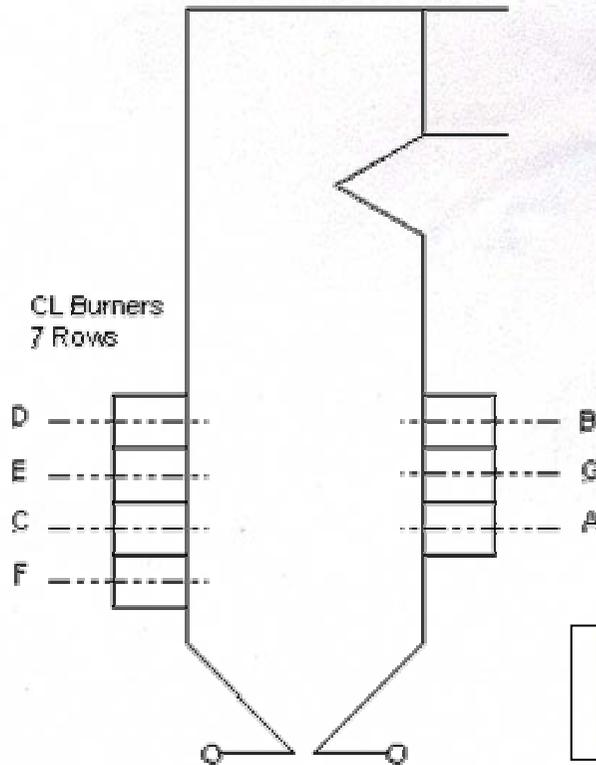
FIRING 100% PETCOKE IN LNB's AT ST. JOHNS RIVER POWER PARK

在JEA电厂的ABT低氮氧化物燃烧器上烧100%低
挥发份石油焦



St Johns Firing Configuration

改造前炉膛结构布置



- 28 OEM Dual Register Low NOx Burners
28个双调风第一代低氮氧化物燃烧器
- 7 Vertical Mills
- 22" O.D. Coal Pipes

**Normal operation with D-Mill out of service
and SA registers open for simulated OFA**

- Petroleum coke hard to ignite due to low volatile content (<10%) 挥发份低于10% 的石油焦很难着火。
- Colombian coal hard to burn out due to inert carbon material 哥伦比亚烟煤比较难烧
- Both fuels relatively high in N content 两种燃料的燃料氮比较高，而且多存在于焦炭中，难于还原为氮气。
- Both fuels relatively hard to grind (HGI <50) 两种燃料难磨，细度不好，未燃烬炭很难控制。



Fuel Blend Analyses 燃料混合物特性分析

	Coke	Coal	20/80 Blend
<i>Proximate Analysis (wt%, ar)</i>			
Fixed Carbon	83.92	47.60	54.87
Volatile Matter	8.50	33.40	28.42 1.93 FC/VM
Ash	0.52	7.40	6.02
Moisture	7.06	11.60	10.69
<i>Ultimate Analysis (wt%, ar)</i>			
Carbon	82.22	66.54	69.67
Hydrogen	3.35	4.50	4.28
Oxygen	0.00	7.99	6.40
Nitrogen	1.71	1.32	1.40 1.14 lb/10 ⁶
Sulfur	5.14	0.65	1.54
HHV, Btu/lb	14,200	11,800	12,280



St. Johns Unit 2 Pre-Retrofit Conditions

改造前情况:

Normal Operation with D-Mill Out of Service

NO _x , lb/10 ⁶ Btu	0.46 氮氧化物 566毫克/立方米
CO, ppm	>500 一氧化碳 高于500PPM
LOI, %	30 – 40 飞灰含碳量30%到40%

- SA maldistribution: Very high air flow to D-Mill row

二次风分布不均，D层风量过大

- Turndown: Limited to 30% with one mill out of service

低负荷稳燃能力差，不停磨只能降到70%的负荷。

- Sidewall corrosion: Localized reducing conditions侧墙高温腐蚀严重

- Slagging: Upper furnace slag falls damaged hopper结渣严重，砸坏灰斗

Conditions for Minimum NO_x/CO/LOI

同时降低氮氧化物和CO,未燃烬炭的条件

1. Minimize burner-to-burner stoichiometry imbalance by:
 - » Minimizing imbalances between coal pipes
 - » Equalizing secondary air distribution to burners减少风粉不平衡
2. Maintain good coal fineness for the specific fuel blend 保持好的煤粉细度
3. Prevent coal roping leaving the burner nozzle 消除煤粉在燃烧器出口分布不均现象，即绕绳现象
4. Burner must attain a stable, bright flame commencing in the throat.
燃烧器产生的火焰必须是高强度，异常明亮，稳定在喉部的火焰



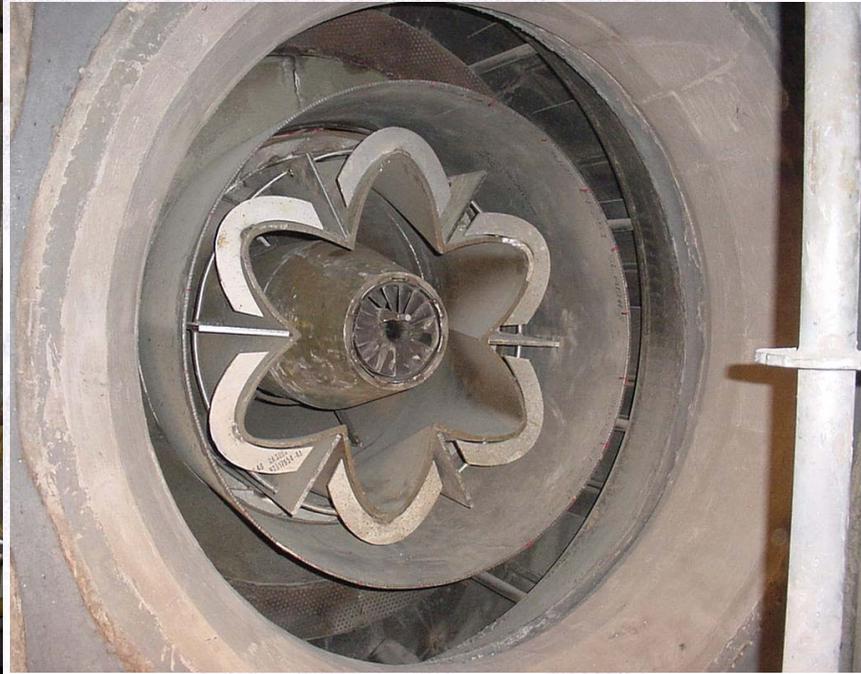
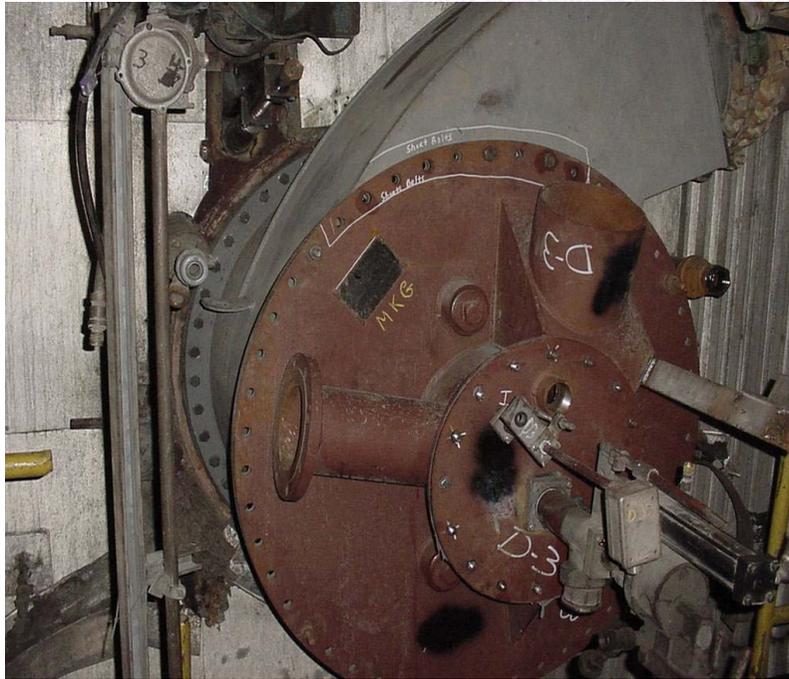
Low NOx Fuel Injector Scope of Supply

ABT改造范围

- “Plug-in” Fuel Injector assembly with **existing register used** 保留原有双调风器，替换原有煤粉喷嘴
- New secondary air flow dividers 新内外二次风分割板
- Existing coal feed scrolls modified to include ABT’s de-spin assembly 带有ABT消旋装置的蜗壳改造



St. Johns Unit 1 Burner 燃烧器照片



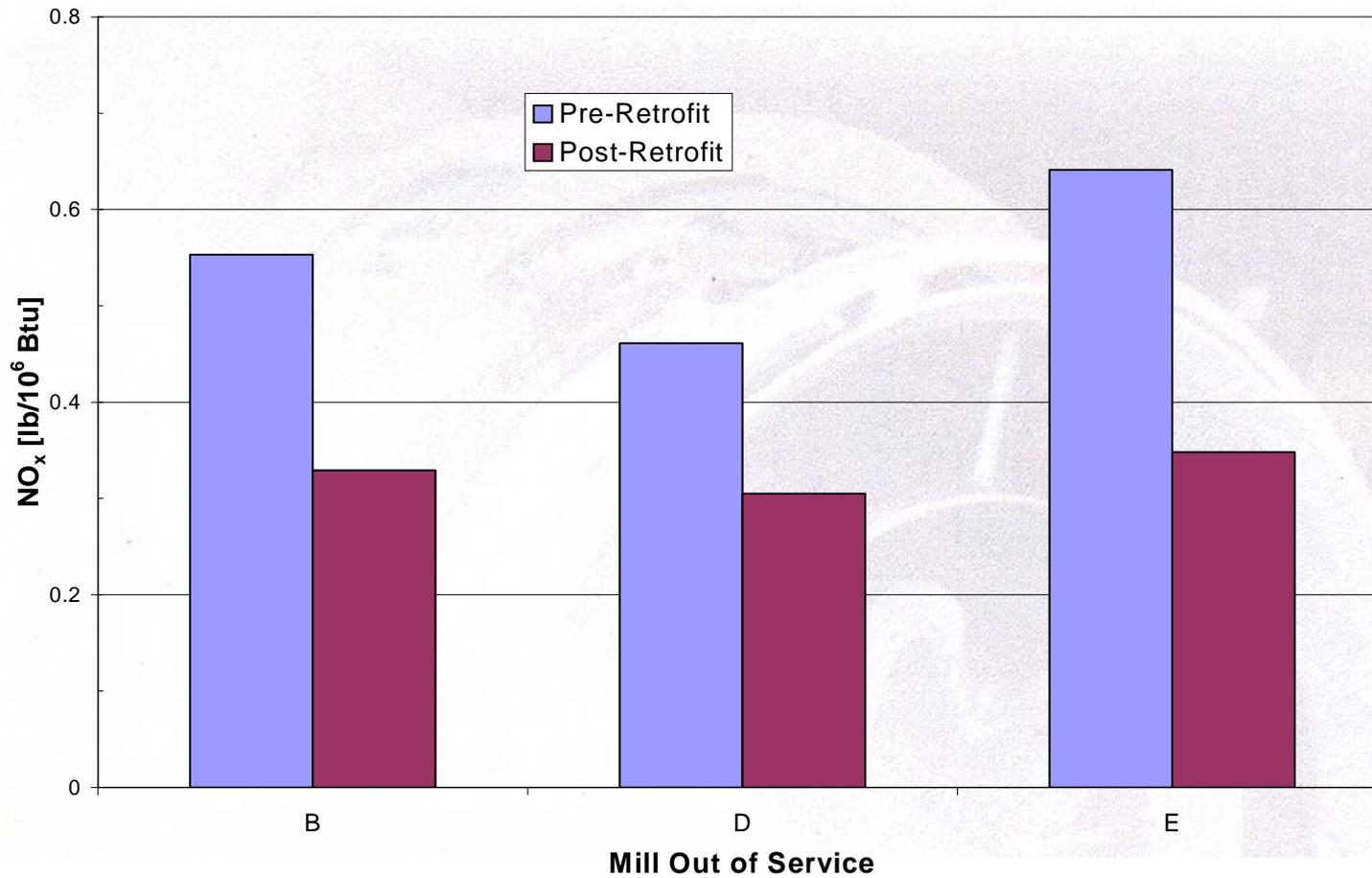
Results Summary with Fuel Blend

改造结果

- NOx reduced to 0.3 lb/10⁶ Btu with top mill out of service 顶层燃烧器停运 时氮氧化物为369毫克/立方米
- CO emissions less than 100 ppm CO低于100PPM
- LOI reduced by 50%. LOI still relatively high ~20%. 未燃烬炭降低了50%，但仍然高达20%。



St. Johns Unit 2 NOx Emissions: Pre-Retrofit vs. Post-Retrofit for Fuel Blend 混烧石油焦的 氮氧化物排放对比



St. Johns Unit 2 Firing Configuration: Separate Fuel Firing 燃烧方式的改变, 单独烧石油焦

- 100% petcoke fired with C-row (second from bottom) burners on front wall 在前墙顶层下面的C层燃烧器烧100%的石油焦,
- Remaining burners firing 100% Colombian coal 其他燃烧器烧哥伦比亚烟煤
- Fuel flow to mills adjusted to ~18% petcoke input on a weight basis 大约质量为总燃料量18%石油焦在一台磨中使用

Separate Fuel Firing Results Summary

分烧石油焦的结果

- NOx only slightly higher than fuel blend. OFA reduced as a precaution and burners settings not optimized. 氮氧化物有所升高，可能由于燃烧器没有经过优化调整的原因。
- CO emissions less than 50 ppm CO小于50ppm
- Fly ash LOI from 18 to 25% to 12 to 15%, 飞灰含碳量进一步降低
- Stable flames in throat for petcoke even with above row of burners out of service 100%石油焦的火焰稳定在喉部着火，即使没有上层燃烧器的支持
- Improvement in flue gas scrubber operation due to less fluctuation in flue gas SO₂ concentration 脱硫装置的进口含硫量稳定。



Petcoke and Colombian Coal Flames

石油焦和哥伦比亚烟煤的火焰对比



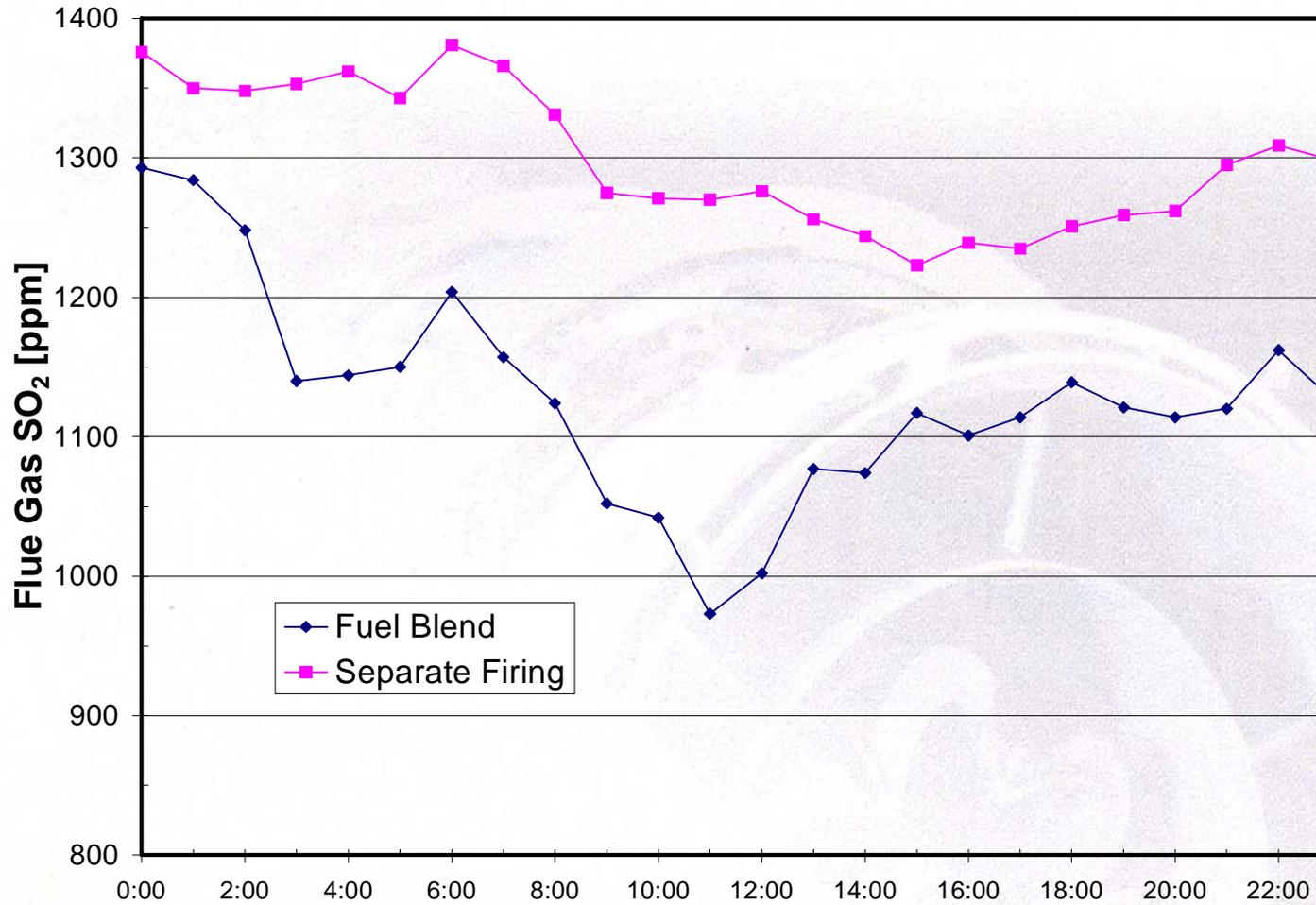
100% Petcoke



100% Colombian Coal

Variation of SO₂ Content Due to Fuel Blending

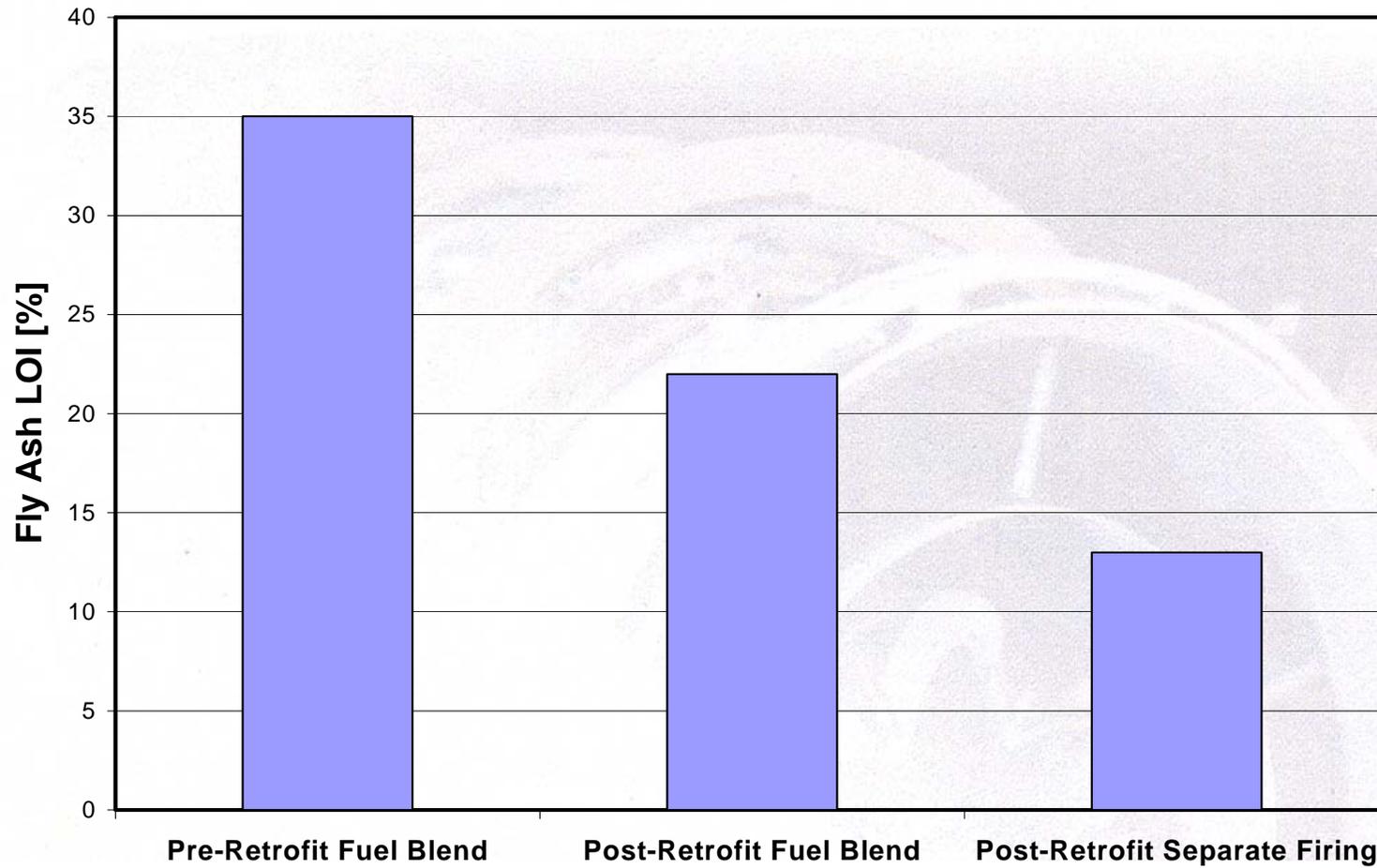
脱硫装置进口so2曲线





St. Johns Unit 2 LOI:

Fuel Blend vs Separate Firing 未燃烬炭的改善过程



Summary for Case Study 2

工程案例分析2总结

- Retrofit of ABT low NO_x combustion system reduced NO_x to 0.3 lb/10⁶ Btu when firing fuel blend with top mill out of service 改造后掺烧石油焦顶层燃烧器停运时为 3 6 9 毫克 / 立方米
- CO reduced from 300 - 500 ppm to less than 100 ppm while firing fuel blend and separate fuels. 掺烧和分烧石油焦是CO降低到 1 0 0 PPM以下
- LOI reduced from 35 to 40% to 18 to 25% range when firing fuel blend. Reduced to 12 to 15% when fuel fired separately due to better mill fineness, 分烧时由于煤粉细度得到改善, 因此未燃烬炭降低为原先的一半。粗颗粒是过去高的未燃烬炭的主要原因
- Firing fuels separately results in better scrubber operation due to less fluctuations in SO₂ concentration. 由于分烧, SO₂比较稳定, 改善了脱硫装置的运行。

- ABT提供新一代的高效低污染的燃烧器，磨煤机煤粉平衡系统，燃烬风系统，涉及墙式燃烧锅炉，四角切园燃烧锅炉等所有现存的系统。ABT provides engineering for complete combustion system from the mills to the furnace: coal line balancing, windbox air distribution, burners, OFA and furnace sidewall anti-corrosion.
- 煤种涉及烟煤，褐煤等主要电力用煤和石油焦。ABT Opti-Flow™ low NOx burner has flexibility to burn difficult fuels including lignite and petroleum coke blends
- 自从1997年五月改造第一台锅炉以来，Advanced Burner Technologies 已经在1200万千瓦机组容量的锅炉上安装了Opti-Flow™ 低 NOx 燃烧系统 ABT has supplied low NOx combustion equipment with proven results in over 12,000 MW of boiler capacity

- » **ABT 为中国提供全套的燃烧系统解决方案 ABT Can Supply the Most Modern Combustion System for Chinese Power Industry.**
- » 优化整个锅炉燃烧系统，包括风箱改造，煤粉和燃烧空气的平衡，优化锅炉运行参数，流体力学模拟，升级燃烧器和燃烬风系统 **ABT Utilizes a System's Approach to Develop the Whole Combustion System.**
 - 采用剧烈燃烧火焰来降低氮氧化物 **NOx control from Intensive Combustion**
 - 降低CO和未燃烬炭UBC,消除水冷壁附近的CO,提高燃烧效率 **Combustion Efficiency Improvement, Elimination of CO along Furnace Sidewalls**
 - 控制炉膛结渣 **Slagging Control**
 - 提高火焰稳定性和低负荷稳燃 **Combustion Stability Improvement**
 - 控制高硫份煤种水冷壁高温腐蚀 **Corrosion Control**
 - 平衡煤粉管道 **Coal Pipe Balance**