

Combustion of Washery Rejects
in
BFBC, CFBC Systems

AFBC Boilers Status

- **60 boilers (19 for Washery rejects) contracted so far**
- **Maximum capacity in Operation 165 tph**
- **Offer made for 345 t/h to Bhushan**
- **Design ready for 60 MW and 120 MW (Reheat)**

FBC test facilities at BHEL

Facility	in operation since
Prototype FBC boiler (10 T/H, 10 kg/cm²(g), Sat)	1977
0.5 M X 0.5 M test rig (4,00,000 Kcal/h)	1979
Prototype FBC shell boiler (7.5 T/H, Sat)	1982
BHEL/ USAID BFBC (90 T/H Hot water)	1986
Indo / Canadian CFBC (90 T/H Hot water)	1991

Rejects / Middlings Tested

Fuel	Moisture %	Ash %	HHV kcal/kg
Middlings / Rejects :			
Bhojudih	1.0	55.0	3100
Kathara*	1.0	73.0	1900
Jamadoba*	1.0	65.0	2100
Mill rejects	1.5	57.3	3300
West Bokaro*	8.0	67.6	1550

*** Units Contracted for burning these Rejects**

Low Volatile - Steel plant wastes

Fuel

**DRI
ash**

**Kiln ESP
dust**

Proximate analysis %

Moisture

5 - 12

4 - 8

Ash

50 - 70

70 - 80

Volatile

0.5 - 1

2 - 28

Fixed Carbon

20 - 25

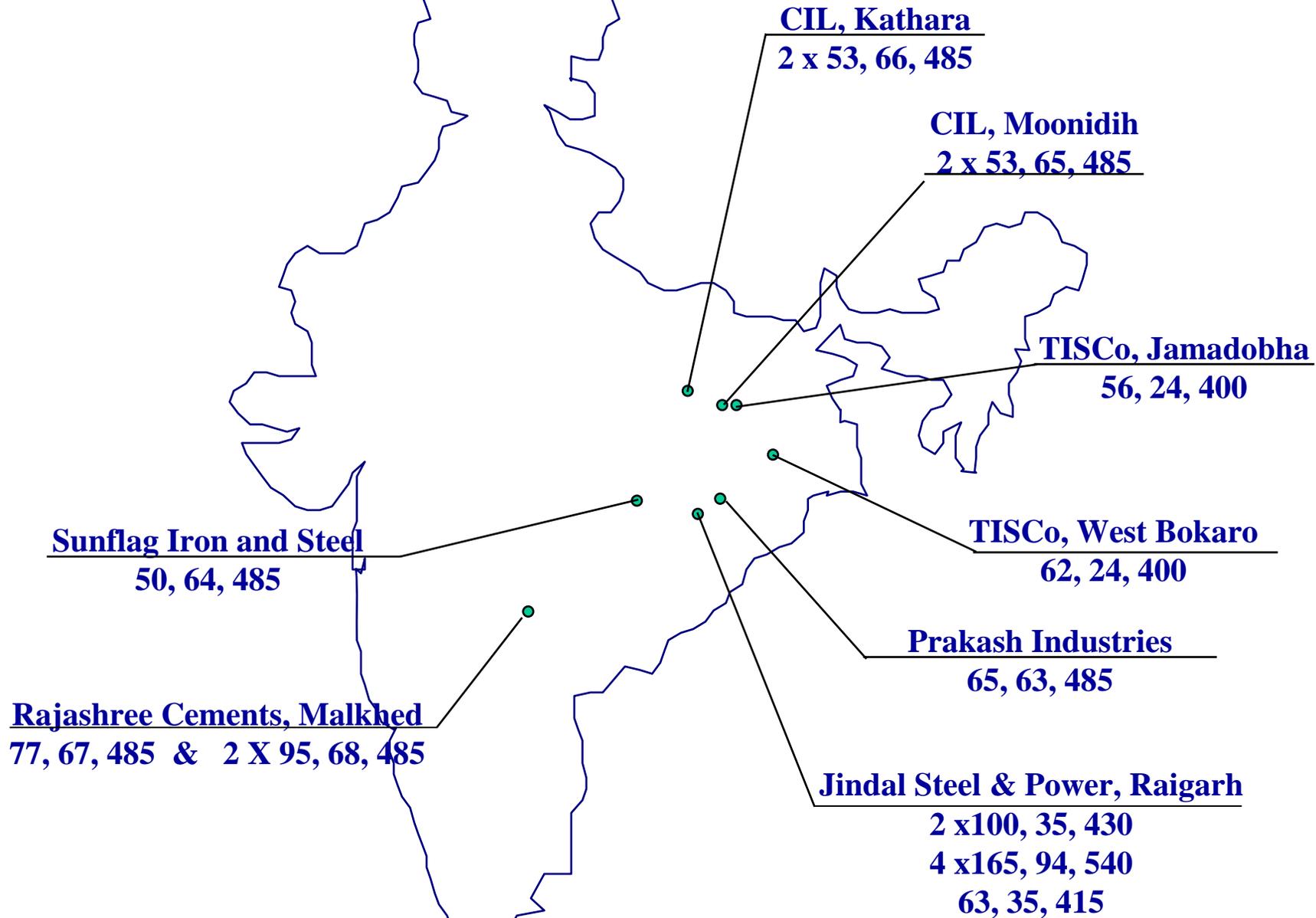
22 - 28

HHV

2400 - 2600

2600 - 2800

Washery Reject and Waste fuel Fired AFBC Installations



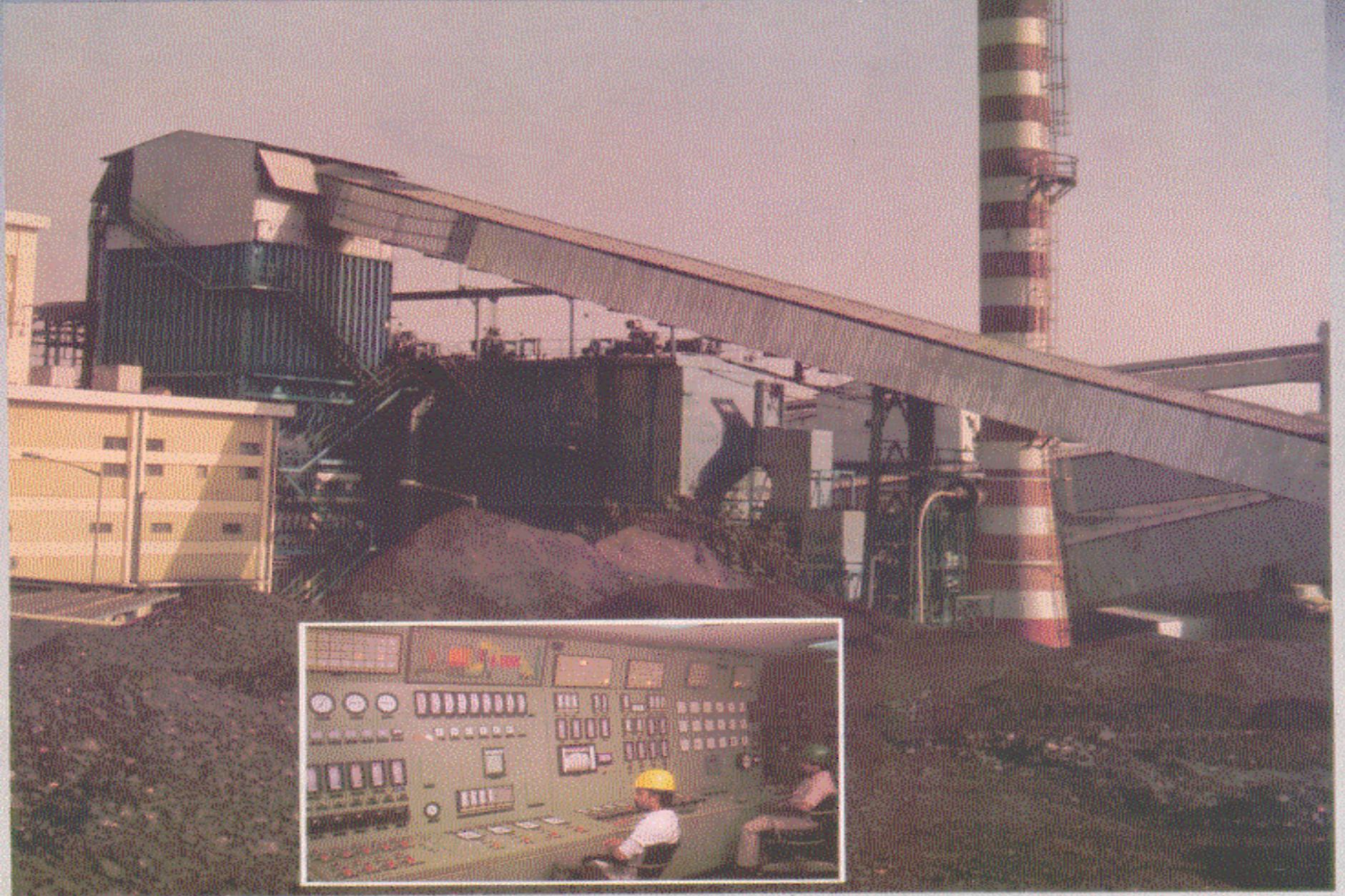
AFBC Boilers firing Washery Rejects

Sl.No	Customer	Parameter (t/h,kg/cm²,°C)	Synchronising Date
1.	TISCo. Jamadobha	56, 24, 400	03/87
2.	CIL, Kathara	2x53, 65, 485	02,03/93
3.	CIL, Moonidih	2x53, 65, 485	01,02/93
4.	TISCo. West Bokaro	2 x62,24,400	03/94, 02/95
5.	Jindal Strips Ltd.	2 x 100,35,430	01,06/96
6.	Jindal Steel & PowerLtd.*	2 x 165,94,540	9/2001
7.	Jindal Steel & Power Ltd.*	63, 35, 415	6/2003
8.	Jindal Steel & PowerLtd.*	2 x 165,94,540	6/2004
9.	Bhushan Steel & Strips Ltd*	1 x 120,94,540 2 x 75,67,485 2 x 180,94,540	

* Rejects,Char, Coal

AFBC Boilers firing Low Rank Fuels

Sl.No	Customer	Parameter (t/h,kg/cm²,⁰C)	Synchronising Date	Remarks
1.	Sunflag Iron & Steel	50, 65, 485	2/97	CF,DRI ash,ESP dust
2.	Prakash Industries	65,63,485	03/99	CF,Kiln Waste,ESP dust
3.	Rajashree Cements	77, 67, 485	08/92	Coal, Wash. Rejects
4.	Rajashree Cements	2x95, 68, 485	09/95, 03/96	Coal, Wash. Rejects



56 t / h boiler at TISCo, Jamadoba

Experience in TISCO

- **Jamodoba 56 tph**
 - synchronised in March 1987
 - In operation for over 1,20,000 hours.

- **West Bokaro 2 x 62 tph**
 - first unit commissioned in April 1994,
 - the second in Feb. 1995.
 - The units have cumulatively logged about 70,000 hours
 - one of the units is generally standby.



77 t/h AFBC Boiler at Rajashree Cements

Experience in Rajashree Cements

- **77 tph**
 - synchronised in 1992
 - In operation for over 70,000 hours.

- **2 x 95 tph**
 - first unit commissioned in Sep 1995,
 - the second in March 1996.
 - The units have cumulatively logged about 70,000 hours
 - Although the units were not designed for firing Washery Rejects, the Customer fires a mixture of Coal and Rejects
 - After 1996, one of the units is standby.

Experience in Coal India Ltd.

2 x 10 MW (50 t/h) at Kathara

➤ **commissioned in 1993**

2 x 10MW (50 t/h) at Moonidih

➤ **commissioned in 1993**

Experience in Jindal Steel & Power

2 x 100 t/h

- **commissioned in 1996**
- **in operation for over 1,00,000 hours cumulatively with an availability of over 95%.**

2 x 165 t/h

- **commissioned in September 2001**
- **The customer placed a repeat order for another 2 x 165 t/h & commissioned in 2003**

63 t/h for BFG, Washery Rejects, Coal and Char

- **Ordered in 2002**
- **commissioned in 2004**

Overview of 165 t/h AFBC Boiler at Jindal Steel & Power



Experience in SISCo.

- **Sponge Iron Based Steel Plants have waste fuels like:**
 - **Char from the Kiln which has no volatiles**
 - **ESP Dust which is very fine (25 to 50 microns)**
- **These fuels were test fired, and FBC Boiler of 50t/h capacity was offered with a unique fuel mixing and feeding system.**
- **Commissioned in October 1997 and is in Operation for over 60,000 hours with availability of over 90%.**

Experience in Prakash Industries Limited

- **a 65 t/h unit to burn similar fuels as SISCo.**
- **unit commissioned in March 1999**
- **in operation for over 50,000 hours.**

CFBC Boilers

- **Three boilers in operation by BHEL for coal and lignite**
- **Twelve boilers contracted by BHEL for Coal & Various Lignites**
- **The fuel is expected to burn better in CFBC boiler with hot cyclone as compared to BFBC.**
- **Several CFB (based on LEE design and of others) units burning Washery Rejects are in operation**

CFBC Boilers of Lurgi Design firing Low Rank Fuels

Sl.No	Plant	Parameter (t/h,bar,°C)	Start-up	Remarks
1.	Chester,PA-USA	295, 100, 510	1986	Anthracite Culm, others
2.	Westwood,PA-USA	123, 64, 480	1987	Anthracite Culm
3.	Kline Township,USA	220, 125, 540	1989	Anthracite Culm
4.	North Mahogany, USA (100 MW)	375, 106, 513	1989	Anthracite Culm
5.	Carling, France (125 MW)	367, 134, 545/540	1990	CWS, Residues
6.	Lenzing, Austria	124, 83, 500	1998	Rejects, others
7.	Starobeshevo, Ukraine (200 MW)	670, 134, 545/542	2003	Anthracite Culm

Anthracite Culm

Ultimate Analysis	% by weight
Carbon	24.15 – 26.59
Hydrogen	0.89 – 1.04
Nitrogen	0.47 – 0.56
Oxygen	3.06 – 5.33
Sulphur	0.73 – 0.94
Ash	67.3 – 69.3
Moisture	----
HHV kcal/kg	2170 – 2310