

Best Practices on Energy Efficiency in Iron and Steel Sector:-

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HIGHLIGHTS:-

- 1. Replacement of Old Oversized Pumps by New Pump.**
- 2. Installation of VFD on BFP and MCW in Power Plant.**
- 3. Discontinuation of Water injection in ABC of DRI Kiln.**
- 4. Dust injection in ABC of DRI Kiln.**
- 5. Replacement of Old compressors with VFD driven Compressors.**

1. Replacement of Old Oversized Pumps by New Pump:-

Kiln # 1 Hot Well Pumps - Performance Measurement Data:-



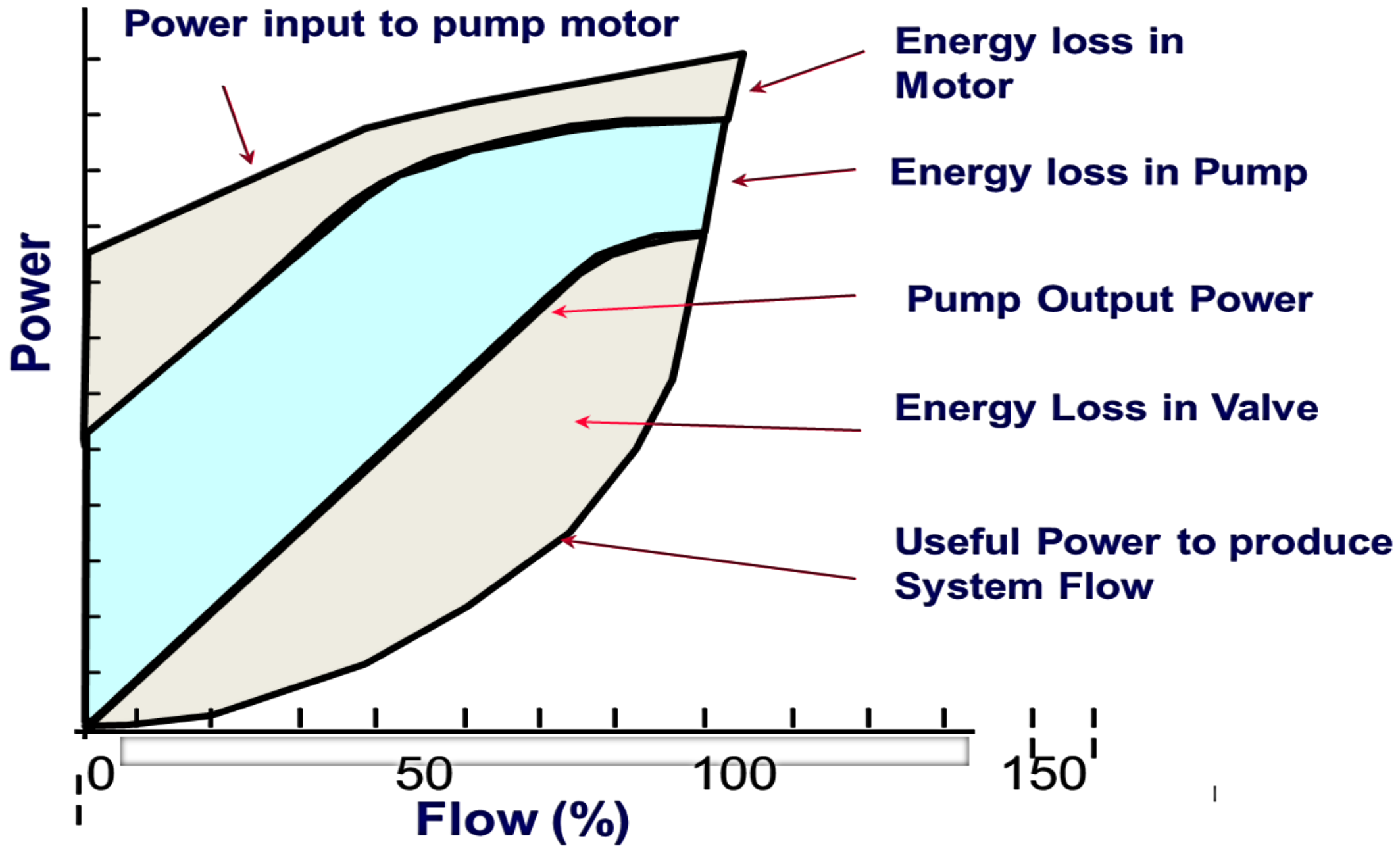
Sl. No.	Parameters	Hot well Pump # 1	Hot well Pump # 2 (New Pump)	
1	Location	DRI (Kiln # 1)	DRI (Kiln # 1)	
2	Make	Kirloskar Brother	Kirloskar Brother	
3	Rated Capacity M ³ /H	475	300	
4	Head – M	25	18	
5	Rated Motor – KW	45	22	
6	Voltage	397	401	
7	Current	70.5	37.8	
8	Power (KW)	45.2	22.5	
9	P.F.	0.92	0.86	
10	Discharge Pressure (Kg/cm ²)	2	1	
11	Suction Head - M	(+) 4 M	(+) 4 M	
12	Throttling	Discharge	50 % Throttle	20 % Throttle
13		Suction	40 % Throttle	Nil
14	Flow – M ³ /H	271	280	
14	Velocity (m/s)	0.98	1.37	
15	Signal (%)	78	70	
16	Total Head - (M)	16	6	
17	Hydraulic Power (KW)	12	6	
18	Motor Efficiency %	89 %	89 %	

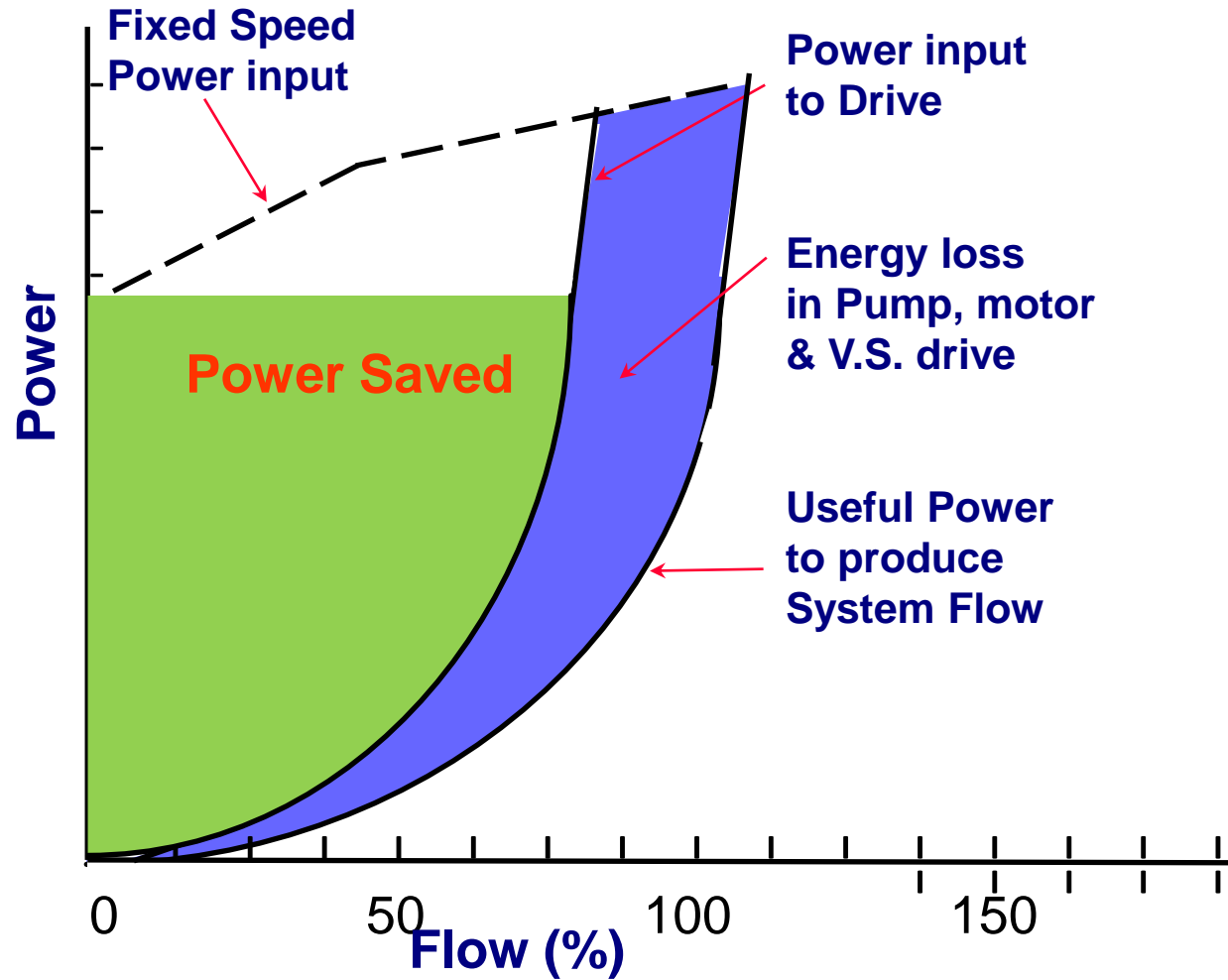
Kiln # 1 Cold Well Pumps Performance Measurement Data:-



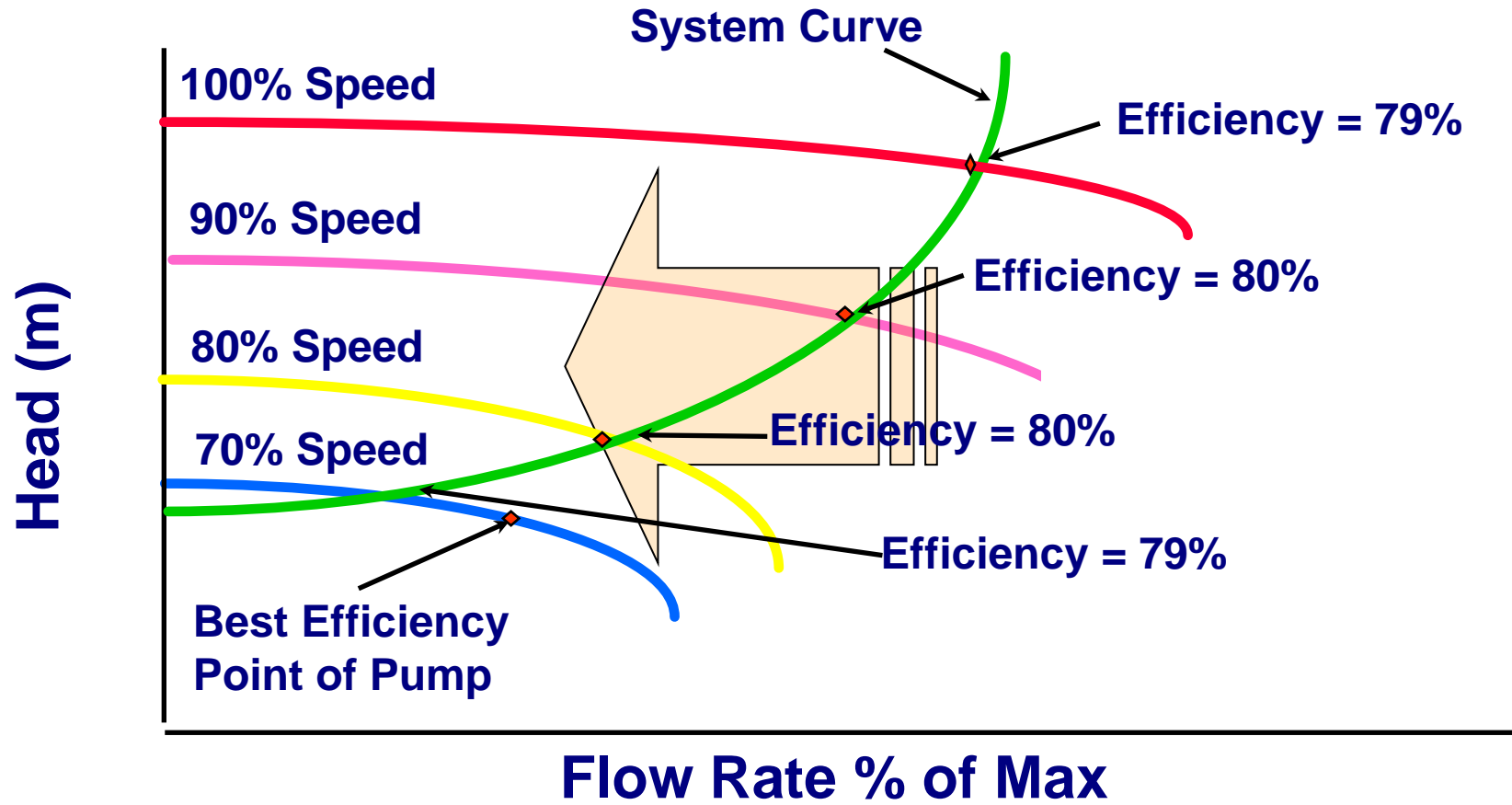
Sl. No.	Parameters		Cold well Pump # 1	Cold well Pump # 2
			New Pump	Old Pump
1	Location		DRI (Kiln # 1)	DRI (Kiln # 1)
2	Make		Kirloskar Brother	Kirloskar Brother
3	Rated Capacity M ³ /H		630	780
4	Head – M		12	22
5	Rated Motor – KW		30	75
6	Voltage		401	392
7	Current		53.8	115.3
8	Power (KW)		31.4	72.2
9	P.F.		0.85	0.928
10	Discharge Pressure (Kg/cm ²)		1.1	2.0
11	Suction Head - M		(+) 4 M	(+) 4 M
12	Throttling	Discharge	Nil	40 % Throttled
13		Suction	Nil	Nil
14	Flow – M ³ /H		423	437
14	Velocity (m/s)		0.97	0.97
15	Signal (%)		65	68
16	Total Head - (M)		12	16
17	Hydraulic Power (KW)		14	19

2. Installation of VFD on BFP, MCW and Fans in Power Plant:-





Small decreases in speed or flow can significantly reduce energy use.



Some examples of Pumps and Fans with VFD:-

- Drum level control of CFBC Boiler and WHRB-II is shifted from CV to VFD.
- CFBC Boiler pressure control with ID Fan VFD.
- Kiln -2 pressure control with WHRB-II ID fan VFD in place of Damper Control.
- SA Fan speed of CFBC linked with O₂ level. Energy saving, better control of O₂ level, better coal combustion & control of excess air.
- CFBC MCW speed linked with Vacuum.

3. Discontinuation of Water injection in ABC of DRI Kiln:-

- CO & CO₂ from DRI kiln is being converted to CO₂ by injecting air in After Burning Chamber (ABC). During this process the temp. of flue gases rises. We have to limit this temp. below 950 Deg C. To control the temp. water guns were being taken into line. The heat absorbed by water was a direct loss so we have increased the volume of air to cool the flue gases in place of water. This has resulted increased volume of flue gases and increase of steam from Waste Heat Recovery Boiler (WHRB).

S.No.	Before Modification	After Modification	Remarks
1.	2 Blowers of 14000 m ³ /hrs running and one standby	Air injection points increased and 3 Blowers of 14000 m ³ /hr running	
2.	Upto 8 water guns of 16 LPM capacity in operation depending upon ABC temp.	Only 1-2 water guns of 16 LPM in operation depending upon ABC temp.	
3.	35 TPH steam being generated	37 TPH steam being generated at same feed rate	Gain of 2 TPH steam in each Kiln without any investment

4. Dust injection in ABC of DRI Kiln:-

- Daily @ 70 MT of carbon dust being collected in bag filters for 2 X 500 TPH Kilns in operation
- Installed 2 X 2000 m³/hrs Lobe compressors on each kiln to convey dust to AB Chamber
- Additional ports created in AB Chamber for dust injection and additional air
- One Fan of 60,000 m³/hrs with VFD installed in place of 3X 14000 m³/hrs fans
- Injecting dust @ 1.5 MT/hrs and getting @ 2 TPH additional steam from each Kiln.

5. Replacement of Old compressors with VFD driven Compressors:-

PERFORMANCE DATA of DRI COMPRESSORS				
Parameters	DRI # 1		DRI # 2	
	Comp # 1	Comp #2	Comp # 1	Comp # 2
Type of Cooling Water Air	Water		AIR	
Rated CFM	431	431	520	520
Rated KW	75	75	75	75
Power Consumption	68.1	69.3	68.1	68.3
Output (F.A.D) - CFM	488	474	455	419
Vol. Efficiency - %	93.9	91.2	87.5	80.6
Sp. Power Consumption (Watt/ CFM)	139.5	145.9	150	165

- Replaced Compressor No.4 with New Compressor of 500 CFM with VFD.
- Two compressor are running at a time with one compressor having VFD.
- One compressor remains loaded always and other compressor with VFD regulate the pressor by varying the VFD speed.
- Horizontally deployed in other sections.

SAVINGS:-



SI No.	Description of energy efficiency improvement measures	Category ¹	Investment (Rupees in lacs)	Verified savings ² (Rupees)	Verified energy savings (2021-22)	Units ³	Fuel
1	Coldwell pump-01 of Kiln-01 (75 KW) replaced with 30 KW high efficiency pump	Elect	2.50045	1015038	253759.41	KWH	Electricity
2	Hotwell pump-01 of kiln-01 replaced with high efficiency pump with matching flow & High pumping head.	Elect	1.55	634829	158707.16	KWH	Electricity
3	Utility water pump-02 of kiln-01 replaced with high efficiency pump.	Elect	0.63671	412897	103224.17	KWH	Electricity
4	Air coompressor -04 provided with VFD drive	Elect	11.2	476836	119209	KWH	Electricity
5	LRF-Y # Water Pump replacement	Elect	0.485	116560	29140	KWH	Electricity
6	Coldwell pump of Kiln-02 replaced with high efficiency pump	Elect	269495	403982	100995.61	KWH	Electricity
7	Hotwell pump of kiln-02 replaced with high efficiency pump with matching flow & pumping head.	Elect	269495	370317	92579.30	KWH	Electricity
8	Utility water pump of kiln-02 replaced with high efficiency pump with matching flow & pumping head	Elect	63671	488145	122036.36	KWH	Electricity

ACHIEVEMENTS:-

PAT CYCLE-1

- Target SEC: 0.79 toe/ton
- Achieved SEC: 0.743 toe/ton
- No. of ESCERTS ISSUED: 2915

PAT CYCLE – 2

- Target SEC: 0.6671 toe/ton
- Achieved SEC: 0.6038 toe/ton
- No. of ESCERTS ISSUED: 4486



THANK

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