CASE STUDY



Efficiency improvement of a **12MW turbine**

INTRODUCTION

The customer is a **copper manufacturing** Industry in **India**. The turbine was sent to Triveni Refurbishing for repair, modification and **efficiency improvement**. Client's turbine was an old running turbine sourced by them in **1983**, which was sent to us in **2016** for refurbishing.

CHALLENGE

The challenge was to modify the turbine in the existing turbine boundary conditions of the casing by redesigning it for higher efficiency which convert the low inlet steam parameters to high inlet steam parameters.

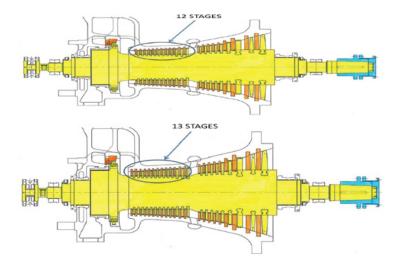
SOLUTION

Triveni Refurbishing redesigned the steam path within in the existing turbine boundary conditions of the casing. The efficiency of the turbine **improved by 16%** and the **payback period** was just **6 months.**

16 15 14 13 12 12 11 11 10 10	48.6 ty INLET INLET EXHAL SPEEL POWE SSC	PR TEI FLC	5% 11 P P OE ESS MPE	SUF	ATU		HAI SIG & AR E::	NG OP AM 27.4 410 58.3	E CH TIM ET 45 ° C 3 tp 67 0 r MW	N S AN HIZ ER bai bai	TE GE AT S ra	AN IN	Í -		INPROVEMENT:				/			t	I.8 /M I.0 /M	5
16 15 14 (4 13 12 1 11 1 10 5 12 1 1 1 1 1 1 1 1 1 1 1 1 1	48.6 tr INLET INLET INLET EXHAU SPEED POWE	PR TEI FLC	5% 11 P P OE ESS MPE	SUF			HAI SIG & AR E::	NG N, OP AM 27.4 410 58.3 0.10 650 12 1	E CH TIM ET 45 ° C 3 tp 67 0 r MW	N S AN HIZ ER bai bai	TE GE AT S ra	AN IN	Í -		IMPROVEMENT:				_			t	/M	5
16 15 14 (4 12 13 12 11 11 10 13 9 8 7 6	48.6 tr INLET INLET INLET EXHAU SPEED POWE	PR TEI FLC	5% 11 P P OE ESS MPE	SUF			HAI SIG & AR E::	NG N, OP AM 27.4 410 58.3 0.10 650 12 1	E CH TIM ET 45 ° C 3 tp 67 0 r MW	N S AN HIZ ER bai bai	TE GE AT S ra	AN IN	Í -						/			t	/M	5
14 (4 13 (12 12 11 11 11 10 5 9 8 8 7 7 6	INLET INLET EXHAU SPEED POWE	PR TEI FL(JST	0E ESS MPE	M I SUF			HAI SIG & AR E::	NG N, OP AM 27.4 410 58.3 0.10 650 12 1	E CH TIM ET 45 ° C 3 tp 67 0 r MW	N S AN HIZ ER bai bai	TE GE AT S ra	AN IN	Í -		IMPROVEMENT		/	/	/		/	t	/M	5
14 (4 13 (12 12 11 11 11 10 5 9 8 8 7 7 6	INLET INLET EXHAU SPEED POWE	PR TEI FL(JST	0E ESS MPE	M I SUF			HAI SIG & AR E::	NG N, OP AM 27.4 410 58.3 0.10 650 12 1	E CH TIM ET 45 ° C 3 tp 67 0 r MW	N S AN HIZ ER bai bai	TE GE AT S ra	AN IN	Í -	7	IMPROVEME			/	/				1.0	5
(4 13 12 12 11 11 10 5 7 7 6	INLET INLET EXHAU SPEED POWE	PR TEI FL(JST	PI OE ESS MPE OW			SS P/ SIG	& AR. E: E:	OP AM 27.4 410 58.3 0.10 650 12 1	111 145 1°C 3 tp 67 l 10 r	hiz ER bai bai	AT S ra			700	IMPROVE			/	/					
(4 13 12 12 11 11 10 5 7 7 6	INLET INLET EXHAU SPEED POWE	PR TEI FL(JST	OE ESS MPE OW	M I SUF		P/ ► SIG	AR. BN E: (AM 27.4 410 58.3 0.16 650 12 1	ЕТ 45 °С 3 tр 67 l 0 r MW	ER bai bh pm	S ra a			7	IMPRO			/	/					
13 12 12 11 11 10 9 8 7 6	INLET INLET EXHAU SPEED POWE	PR TEI FL(JST	<u>OE</u> ESS MPE OW	M I SUF ER	DES RE ATU	► SIG	<u>SN</u> :: :: ::	27.4 410 58.3 0.10 650 12 1	45 °C 3 tp 67 l 10 r	bai oh pm	ra	/		.± 7			/	/	/					
12 11 10 9 8 7 6	INLET INLET EXHAU SPEEC POWE	TEI FL(JST	ESS MPE OW	SUF ER/	RE	IR	E: 4	410 58.3 0.10 650 12 1	°C 3tp 67i 67i 0r	oh bar pm	a	/	/	7	/	/	/	/						
I 11 I 10 S 9 S 8 7 6 S	INLET INLET EXHAU SPEEC POWE	TEI FL(JST	ESS MPE OW	SUF ER/	RE	IR	E: 4	410 58.3 0.10 650 12 1	°C 3tp 67i 67i 0r	oh bar pm	a	/		7										
I 11 I 10 S 9 S 8 7 6 S	INLET INLET EXHAU SPEEC POWE	TEI FL(JST	MPE OW	ER	ATU		E: (: (: (410 58.3 0.10 650 12 1	°C 3tp 67i 67i 0r	oh bar pm	a	/	/	7	/									
11 10 5 9 5 8 7 6	INLET EXHAU SPEED POWE	FL(JST	ow				: :	58.3 0.16 650 12	3 tp 67 1 0 r MW	oar pm		/	/	7	/									
10 1 10 1 9 5 8 7 6	EXHAU SPEEC POWE	JST)			SU	RE	: 1	0.10 650 12	67 0 r MW	oar pm		/	/	7								•		
10 5 9 5 8 7 6	SPEEC POWE)	PR	RES	SU	RE	: (650 12 I	0 r MW	pm /		/	/	/	/							•		
10 9 8 7 6	POWE						:	12	MM			/										•		
9 \$ 8 7 6		ĸ									/	/												
9 8 7 6								4.01	0 0		/													
7																								
7														-										
6										/-														
6									/															
																						-		
5																								
5						4																-		
											_											-		
								_				יוא				SIG	N							
4												ES					60					-		
-												MP		AT	UR									
3												ow							tph			-		
												Р	RE	ss	UR				bar			-		
2									PE								650 12		rpm	1				
1									sc		×.								/MV	v				
1								3								Ľ	T. 0	5 1		Ĺ				
0	1		2	_	3		4		5		6		7		8		9		10		11	12		1:

POWER OUTPUT AT GENERATOR TERMINAL (MW)

Parameter	Unit	Withoute	extraction	With ex	traction
		Original design	Modified design	Original design	Modified design
Inlet steam pressure	bar (a)	27.45	60	27.45	60
Inlet steam temperature	°C	410	495	410	495
Inlet enthalpy	kJ/kg	3259.5	3410.4	3259.5	3410.4
Exhaust pressure (vacuum)	bar(a)	0.17	0.17	0.17	0.17
Inlet Steam Flow	tph	58.8	49.2	68.4	57.6
Extraction steam pressure (Uncontrolled)	bar (a)			6.8	6
Extraction steam flow	tph	0	0	20	13
Exhaust steam flow	tph	58.8	49.2	48.4	44.6
Speed	rpm	6500	6500	6500	6500
Power	MW	12	12	12	12
Specific Steam Consumption	t/MW	4.9	4.1	5.7	4.8
No. of stages		1+21	1+22	1+21	1+22



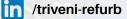
CUSTOMER SPEAK

"The TG has been rolled successfully at 12 MW Power & RUNNING SUCCESSFULLY . Thanks to your entire team for relentless efforts."



Embracing cultures. Enhancing the future

/TriveniRefurb







VISIT WEBSITE



Global Network

INDIA

SALES, SERVICE AND MANUFACTURING FACILITY

Triveni Turbine Limited

12-A, Peenya Industrial Area, Bengaluru-560 058, Karnataka, India. Phone: +91 80 22164000 Fax :+91 80 22164100

UAE

SALES AND SERVICE OFFICE

Triveni Turbines DMCC

4502-14 & 4502-15, 45th Floor, Al Mazaya Business Avenue - Tower BB2, Jumeirah Lake Towers, Dubai, United Arab Emirates, P.O. Box 393509 Phone: +971-4 5670752 Fax :+971-4432 8232

SOUTH AFRICA

SALES, SERVICE AND

Triveni Turbine Limited

Plot No.491, Sompura

Nelamangala Taluk,

Industrial Area

2nd Stage, KIADB Sompura

Bengaluru Rural - 562 123

MANUFACTURING FACILITY

MARKETING AND SERVICE OFFICE

Triveni Turbines Africa (Pty) Ltd.

AMR Building, 3 Concorde East Road, Bedfordview, 2007, South Africa Phone: +27 10 007 5245 / 5246

Email: customercare@triveniturbines.com

www.triveniturbines.com

THAILAND

MARKETING AND SERVICE OFFICE

Triveni Turbines DMCC

571 RSU Tower, Unit 903, 9th Floor, Sukhumvit 31 Road, Klong Ton Nua, Wattana, Bangkok 10110, Thailand Phone: +66 2 117 9575, Fax : +66 2 662 3416

INDONESIA

MARKETING AND SERVICE OFFICE

Triveni Turbines DMCC

Suite No. 56, 23rd Floor, ANZ Tower, Jl. Jend. Sudirman, Jakarta Pusat - 10220, Indonesia Phone : +62-21-29546888 Fax : +62-21-29546889