

ANNEXURE R/23
PAGE 477

GOVERNMENT OF MEGHALAYA
DIRECTORATE OF MINERAL RESOURCES
SHILLONG

No.DMR/MM/768/2018/Pt-II/ Vol-IV/204

Dated Shillong, the 19.02.2020.

To,

Shyam Century Ferrous Ltd.
Export Promotion Industrial Park (EPIP)
Byrnihat, Ri-Bhoi District.

Sub:- Payment of Royalty, MEPRF on illegally source coal.

Sir/Madam,

In inviting a reference to the subject cited above, please find enclosed herewith Para-3.1.4 of the Fifth Interim Report of the Independent Committee on Resource (Coal) Audit of Cement Industries and Thermal Power Plants in Meghalaya submitted to the Hon'ble National Green Tribunal, Principal Bench, New Delhi on 02.12.2019. In this matter, you are directed to make the necessary payment as per the table enclose herewith within a month of issuance of this letter failing which necessary action as per law will be initiated.

Submitted for your information and necessary action.

Encl: As above

Yours faithfully

(Arunkumar Chhavi, IAS)
Director of Mineral Resources
Meghalaya ::: Shillong.

No.DMR/MM/768/2018/Pt-II/ Vol-IV/

Dated Shillong, the 19.02.2020.

Copy to:-

1. The Chief Secretary to the Govt. of Meghalaya, Mining & Geology Department for kind information.
2. The Member Secretary, Hon'ble NGT Committee for kind information of the Hon'ble Chairman and Hon'ble Members of the NGT Committee.
3. The Secretary to the Govt. of Meghalaya, Mining & Geology Department for kind information.



Director of Mineral Resources
Meghalaya ::: Shillong.

Serial No.01
Regular List

ANNEXURE R/24

HIGH COURT OF MEGHALAYA
AT SHILLONG

WP(C). No. 189 of 2020

Date of Order: 15.09.2020

Shri. Shyam Century Ferrous
Limited.

Vs. State of Meghalaya & 7 Ors.

Coram:

Hon'ble Mr. Justice Ranjit More, Judge.

Appearance:

For the Petitioner/Appellant(s) : Dr. A.Saraf, Sr. Adv.

For the Respondent(s) : Mr. A.Kumar AG with
Mr. S.Sen, Sr. GA and
Mr. A.Kharwanlang, GA.

1. Heard Dr. A.Saraf, learned Sr. counsel for the petitioner and Mr. S.Sen, learned Sr. GA for the respondents.
2. Petition is filed invoking the jurisdiction of Article 226 of the Constitution of India challenging the Notice dated 19-02-2020 issued by the Director of Mineral Resources, Meghalaya, Shillong. Said notice is issued in pursuant to the recommendation of the Monitoring Committee of the National Green Tribunal submitted in its 5th Interim Report dated 02-12-2019 and the order dated 17-01-2020 passed by the National Green Tribunal, Principal Bench, New Delhi (in short "NGT"). The impugned notice was issued in pursuant of the NGT's order, which order is also challenged by filing this petition.
3. Petitioner has approached this Court under Article 226 of the Constitution on the ground that NGT has no jurisdiction to pass the order impugned in the petition as well as recommendation of the Monitoring Committee are made without following the principle of natural justice.

4. Learned Sr. GA invited my attention to provision 19 and 22 of the NGT Act, 2010. He submitted that under Section 19 (4) (f) (h), petitioner has remedy to approach the NGT. He also submitted that under Section 22 of the said Act, statutory appeal to the Hon'ble Supreme Court is provided.

5. In the light of above, I am not inclined to interfere in the writ petition. At this stage, Dr. Saraf, learned Sr. counsel for the petitioner submitted that he may be allowed to withdraw the petition with liberty to approach the NGT or the Hon'ble Supreme Court under Section 19 or Section 22 respectively.

6. Learned Sr. GA has no objection.

7. In the above circumstances, I grant leave to the petitioner to withdraw this petition with liberty to approach the NGT or the Hon'ble Supreme Court challenging the impugned order/notice, under Section 19 or 22 of the NGT Act, 2010. It is expressly made clear that I have not gone into the merits of the matter and all points and contentions of the parties kept open.

8. Petition is dismissed as withdrawn.



Judge

Meghalaya
15.09.2020
"Samantha PS"

ITEM NO.12

Court 8 (Video Conferencing)

SECTION XVII

S U P R E M E C O U R T O F I N D I A
R E C O R D O F P R O C E E D I N G S

CIVIL APPEAL Diary No(s). 23948/2020

(Arising out of impugned final judgment and order dated 17-01-2020
in OA No. 110/2012 passed by the National Green Tribunal)

SHYAM CENTURY FERROUS LIMITED

Petitioner(s)

VERSUS

THE STATE OF MEGHALAYA & ORS.

Respondent(s)

(IA No.120344/2020-EXEMPTION FROM FILING C/C OF THE IMPUGNED
JUDGMENT and IA No.120345/2020-EX-PARTE STAY and IA No.120343/2020-
PERMISSION TO FILE APPEAL)

Date : 16-12-2020 This petition was called on for hearing today.

CORAM :

HON'BLE MR. JUSTICE L. NAGESWARA RAO
HON'BLE MR. JUSTICE HEMANT GUPTA
HON'BLE MR. JUSTICE AJAY RASTOGIFor Petitioner(s) Mr. Arvind P. Datar, Sr. Adv.,
Mr. Mahesh Agarwal, Adv.,
Ms. Parul Shukla, Adv.,
Mr. Rohan Talwar, Adv.,
Mr. E. C. Agrawala, AOR

For Respondent(s)

UPON hearing the counsel the Court made the following
O R D E R

Permission to file appeal is granted.

Issue notice on the appeal as well as on the prayer for
interim relief.

List along with Civil Appeal No.3280/2020.

Signature Not Verified

Digitally signed by
GEETA AHUJA
Date: 2020.12.17
18:08:55 IST
Reason:(Geeta Ahuja)
Court Master(Beena Jolly)
Court Master

ANNEXURE R/26

AUDIT REPORT: VERIFICATION OF SFC IN CPP

Prepared for

SHYAM CENTURY FERROUS LTD.EPIP, RAJBAGHAN, BYRNIHAT
Meghalaya (India)

*Prepared By:-***ZING ENTERPRISES****Auditor, Consultant & Trainer (Energy & Safety)**L-15/ 860, ASHIANA AANGAN
ALWAR BY-PASS ROAD, BHIWADI - 301019
Mob: 0-9783694136**DECEMBER 2020**

CPP'S SPECIFIC FUEL CONSUMPTION AUDIT REPORT, SHYAM CENTURY FERROUS LTD,
 BYRNIHAT, MEGHALAYA

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Acknowledgements

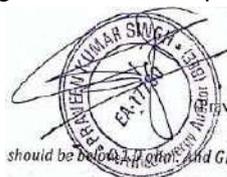
Zing Enterprises is grateful to M/s Shyam Century Ferrous Ltd for giving us an opportunity to conduct the Audit of their Captive Power Plant, situated at Byrnihat (Meghalaya), in order to verify its Specific Fuel Consumption.

M/s Zing Enterprises' team had carried out Detailed Audit during December 2020.

We are thankful to all the officials from M/s Shyam Century Ferrous Ltd, for their assistance and guidance during the execution of the Audit, particularly :-

Mr M V K Nageswara Rao	-	CEO
Mr Arvind Rai	-	Energy Manager
Mr Sumanta Kumar Patra	-	GM (Works)
Mr Pinak Bhushan Deb Roy	-	HOD (Electrical), CPP

and all other supporting staff who have given full cooperation & support. They took keen interest and gave valuable inputs during the course of study.



(Praveen Kumar Singh)
Certified Energy Auditor (BEE)
Certified Energy Manager (AEE, USA)

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Executive summary

OBJECTIVE

- The main objective of this exercise is to study and critically analyze the Specific Fuel Consumption of Captive Power Plant in order to assess its actual operating condition and if require, take further action for reduction in Fuel Consumption in Boiler.
- The data provided by the concerned personnel has been used for the analysis.

SCOPE OF WORK

The scopes of works for this Energy Audit are as follows:

- Review of Historical Operational Performance of CPP.
- Review of Historical Power Consumption of Auxiliary Equipments.
- Assessment of SCFL's Plant Heat Rate as per Technical Design.
- Review with Heat Rate as per Industry Standard of same type of Plant.
- Preparation of Audit Report containing the Detailed Study





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CPP'S SPECIFIC FUEL CONSUMPTION AUDIT REPORT, SHYAM CENTURY FERROUS LTD,
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COMPANY'S PROFILE

The Shyam Century Ferrous Ltd is one of the front runners in the Ferro Alloy sector in the Eastern Region and features amongst the largest manufacturers of Ferro Alloys in the country.

- The plant was commissioned in December 2001 with installed capacity of 14400 MT per year but now the capacity is increased from 14400 MT to 21600 MT.
- The major product is Ferro Silicon. At present plant has three (3) submerged arc furnace with capacity of 9 MVA each.
- Main Energy Source of the Plant is 13.8 MW coal based captive power plant.



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 BYRNIHAT, MEGHALAYA

CHAPTER 1 : INTRODUCTION ABOUT THE PLANT

1.1 General Plant / establishment details and descriptions

- Shyam Century Ferrous Ltd was commissioned in December 2001 with installed capacity of 14400 MT per year. But now, Capacity is increased from 14400 MT per year to 21600 MT per year. The major product is Ferro silicon. The plant has three submerged electric arc furnaces of rated capacity 20 TPD each. The furnace transformer rating is 9 MVA each with on load tap changer.
- Energy source of plant is 13.8 MW coal based captive power plant. The energy input of the plant is coal, chocolate coal & char coal respectively. Sometimes the plant is using saw dust & bamboo dust as a fuel in boiler as per availability in the market. The raw material of the plant are quartz, dolomite etc.
- Captive Power Plant is equipped with one Boiler and one Condensing Turbine.

1.2 Energy Audit Team

Audit team for this assignment comprises of Energy Auditor namely,

Table 1: Energy Audit Team

S. No.	Name of team member	Qualification	Designation
1	Prabhat Saraswat	B.E (Mechanical), MBA	Accredited Energy Auditor
2	Praveen Kumar Singh	B.E (Mechanical), MBA(Fin.)	Certified Energy Auditor





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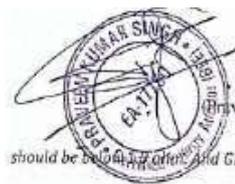
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1.3 Methodology Adopted for Audit

A detailed energy audit was conducted during December 2020. The energy audit team comprised of thermal and electrical energy experts. Design and operational data were collected from Plant. Additionally, copies of Baseline Audit Report, Mandatory Energy Audit Report and Monitoring & Verification Audit (PAT Scheme) Report, submitted to Bureau of Energy Efficiency, were collected from the Plant.

Additionally, Copies of Form-1 submitted to BEE, Coal Audit Report were also referred & Reviewed for verification.

Since, CPP is not in operation for last one year, it was decided to conduct the Audit through virtual mode by analysing and verifying design data, all the previous datas and Audit Report.



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CHAPTER 2 : CAPTIVE POWER PLANT- REVIEW OF DESIGN DETAILS

2.1 Technical Design Details

Major components of CPP at SCFL's Plant are

- Boiler
- Steam Turbine.

2.2 Brief description of each Component

2.2.1 Boiler

- Atmospheric Fluidized Bed Combustion Boiler has been installed at CPP, to meet steam requirement of Power Plant.
- Fuel requirement of Boiler is met from Meghalaya Coal.

Rated Specification of the same are given below :

Table 2: Rated Specification of Boiler

S. No	DESCRIPTION	UNIT	BOILER
1	Type	N.A	Single Drum Water Tube AFBC
2	Make	N.A	Cethar Vessels (P) Ltd
3	Serial No	N.A	BE007
4	Capacity	TPH	54.0
5	Pressure	ata	67.00
6	Temperature	°C	490.0 (+/- 5.0)
7	Fuel Used	N.A	Meghalaya Coal
8	Furnace Heat Input	Kcal/Hr	44716729



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2.2.2 Steam Turbine

- One condensing Turbine has been installed.

Table 3: Rated Specification of Turbine

S. No	DESCRIPTION	UNIT	TURBINE
1	Type	N.A	Condensing Turbine
2	Make	N.A	M/s Hangzou Turbine Company, China
3	Serial No	N.A	NK 40/56
4	Design Output	KW	13800
5	Pressure	ata	67.00
6	Temperature	°C	490.0 (+/- 5.0)



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2.3 Assessment of Heat Rate as per Design Details
2.3.1 Boiler – Fuel Consumption & Efficiency Assessment

- Boiler's Efficiency and Fuel Consumption rate has been assessed considering rated parameters and Heat Mass Balance Diagram.

Details are given below-

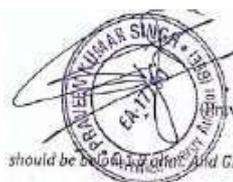
Table 4: Assessment of Boiler

Boiler's Assessment			
S.No	Particular	UOM	Value
Rated & Design Parameters			
1	Boiler Furnace Heat Input	Kcal/Hr	44716729
2	GCV of Fuel**	Kcal/Kg	5500
3	Steam Flow	TPH	54
4	Output Steam Temperature	°C	490+/-5
5	Feed Water Temperature	°C	120.38
Assessment			
6	Fuel Flow Rate	Kg/Hr	8130.31
7	Output Steam Inlet Enthalpy	Kcal/Kg	811.23
8	Net Enthalpy Used	Kcal/Kg	690.85
9	Boiler Efficiency	%	83.43%

** - GCV of 5500 Kcal/Kg has been considered for Meghalaya Coal

Conclusion 1:

- As per design data provided by Manufacturer and HMBD documents, it has been assessed that –
 - Average Coal Consumption of Boiler would be around @ 8130 Kg/Hr; when Meghalaya Coal of GCV -5500 Kcal/Kg is being used.
 - Under normal operating condition, Boiler's Efficiency would be around 83.5 %.



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2.3.2 Turbine Assessment

- Turbine Design Rate has been assessed considering rated parameters and Heat Mass Balance Diagram.

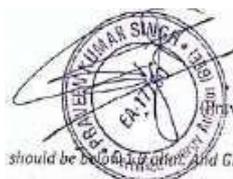
Details are given below-

Table 5: Assessment of Turbine

Turbine Assessment			
S.No	Particular	UOM	Value
Rated & Design Parameters			
1	Design Out Put	KW	13800
2	Steam Inlet Enthalpy	Kcal/Kg	811.23
3	Steam Flow	TPH	54
4	Output Steam Temperature	°C	490+/-5
5	Feed Water Temperature	°C	120.38
6	De-Aerator Extraction Pressure	ATA	2.55
7	De-Aerator Extraction Temperature	°C	130.52
8	De-Aerator Extraction Steam Flow	TPH	6.9
9	Exhaust Steam Pressure from Turbine	ATA	0.1
10	Exhaust Steam Temperature from Turbine	°C	45.8
11	Exhaust Steam Temperature flow	TPH	47.10
Assessment			
12	Turbine Design Heat rate	Kcal/KWH	2703.33

Conclusions 2:

- As per design data provided by Manufacturer and HMBD documents, it has been assessed that –
 - Under the normal operating condition Turbine's Design Heat Rate would be around @ 2703 Kcal/KWH.



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 BYRNIHAT, MEGHALAYA

2.3.3 CPP – Gross Heat Rate & Specific Fuel Consumption Assessment

- CPP's Gross Heat Rate and Specific Fuel Consumption has been assessed considering rated design parameters, Heat Mass Balance Diagram and from outcome of Assessment done earlier in item 2.3.1 & 2.3.2 respectively.

Details are given below-

Table 6: Assessment of Gross Heat Rate & Specific Fuel Consumption

Performance assessment of CPP			
S.No	Particular	UOM	Value
Rated Parameters			
1	Boiler Furnace Heat Input	Kcal/Kg	44716729
2	Boiler Efficiency	%	83.43%
3	Design Out Put	KW	13800
4	GCV of Fuel**	Kcal/Kg	5500
Assessment			
4	Turbine Design Heat rate	Kcal/KWH	2703.33
5	CPP Gross Heat Rate	Kcal/KWH	3240.34
6	Specific Fuel Consumption	Kg/KWH	0.589

** - GCV of 5500 Kcal/Kg has been considered for Meghalaya Coal

Conclusions 3:

1. As per design data provided by Manufacturer, HMBD documents and from outcome of Assessment done earlier in item 2.3.1 & 2.3.2 respectively, it has been assessed that –
 - a) CPP's Gross Heat Rate, under the normal operating conditions, would be around @ 3240 Kcal/KWH.
 - b) Specific Fuel Consumption of CPP would be around @ 0.59 Kg/ KWH.



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 BYRNIHAT, MEGHALAYA

CHAPTER 3 : CAPTIVE POWER PLANT- REVIEW OF HISTORICAL OPERATIONAL PERFORMANCE

3.1 Review of Performance during Financial Year from 2013-14 to 2018-19

- M/s Shyam Century Ferrous Ltd, Byrnihat, Meghalaya's Plant has categorized as "Designated Consumer" (DC) by Bureau of Energy Efficiency (BEE) through Gazette notifications of PAT Scheme.
- Under this scheme, every DCs have to prepare and maintain performance of Plant, in prescribed format, for onward submission in BEE annually.
- Under this Audit, Historical Performance of Plant has been assessed on the basis of Annual information submitted to BEE through Form-1 and sector specific proforma.

Assessment Details are given below-

Table 7: Review of Historical Operational Performance

S.NO	PARTICULAR	UOM	SE-2 FORM SUBMITTED TO BEE					Average	
			2013-14	2014-15	2015-16	2016-17	2017-18		2018-19
1	Total Coal Consumption	Tonne	60315	37,781	34,143	54825	42595	18310	41328
2	Annual Gross Power Generation	Lakh KWH	1,036	641	552	1044	689	347	718
3	Specific Fuel Consumption	Kg/KWH	0.582	0.589	0.618	0.525	0.618	0.528	0.58

Conclusions 4:

1. Review of Historical Operational Performance for the period April 1, 2013 to March 31, 2019 revealed that –
 - a) Specific Fuel Consumption was noted to be in the range of 0.525 Kg/ KWH to 0.618 Kg/ KWH.

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 BYRNIHAT, MEGHALAYA

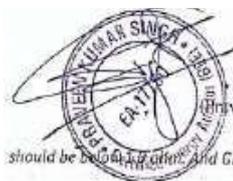
3.2 Review of Baseline Audit Report (2010-11)

- Under PAT Scheme, Baseline Audit was conducted under the guidance of Bureau of Energy Efficiency & EESL, during June 2011, to establish the Benchmark for Savings Potential.
- BEE deputed M/s Schneider Electric to conduct this Audit on its behalf.
- Review of Baseline Audit Report was also done and accordingly following operational performances were identified

Table 8: Historical Operational Performance- Baseline Audit Report

Baseline Audit Report (2011)*			
S.NO	PARTICULAR	UOM	Values
2	Turbine Heat Rate	Kcal/KWH	2713.93
3	Boiler Efficiency (Indirect Method)	%	86.41%
4	Gross Heat Rate	Kcal/KWH	3140.8
5	GCV of Fuel	Kcal/Kg	5032.0
6	Specific Fuel Consumption	Kg/KWH	0.624

*Note- Assessment Period is for One Hour



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 BYRNIHAT, MEGHALAYA

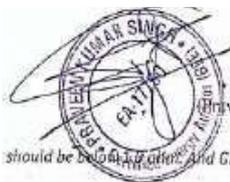
3.3 Review of Monitoring & Verification Audit Report

- Under PAT Cycle-2 , 3rd Party Monitoring & Verification Audit of the Plant was conducted by M/s Bhagwat Technologies & Energy Conservation Pvt Ltd during August 19-20,2019.
- Review of Monitoring & Verification Audit submitted by M/s Bhagwat Technologies & Energy Conservation Pvt Ltd revealed following operational performance.

Table 9: Historical Operational Performance- Monitoring & verification Report

			M&V REPORT
S.NO	PARTICULAR	UOM	2018-19
1	Total Coal Consumption	Tonne	18310.26
2	GCV of Fuel	Kcal/Kg	5336
3	Annual Gross Power Generation	Lakh KWH	347.016
4	Gross Heat Rate	Kcal/KWH	2815.53
5	Specific Fuel Consumption	Kg/KWH	0.528

This Report validated & confirmed the data of Plant for the Financial Year 2018-19.



CPP'S SPECIFIC FUEL CONSUMPTION AUDIT REPORT, SHYAM CENTURY FERROUS LTD,
 BYRNIHAT, MEGHALAYA

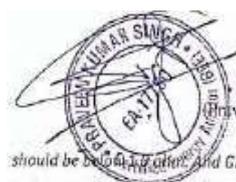
3.4 Review of Mandatory Energy Audit

- Under the Gazette notification, dated 28.04.2010, of Bureau of Energy Efficiency, every DCs shall have its Plant's Energy Audit conducted by Accredited Energy Auditor within three years from the first Mandatory Energy Audit.
- Accordingly, M/s Shyam Century Ferrous Ltd, Byrnihat, Meghalaya's Plant got its Mandatory Audit as per following details-
 - I. 1st Mandatory Audit conducted by M/s MITCON Consultancy & Engineering Services Ltd, during November 2015.
 - II. 2nd Mandatory Audit conducted by M/s MITCON Consultancy & Engineering Services Ltd, during September 2018.

 Table 10: Historical Operational Performance- 1st Mandatory Energy Audit Report

Mandatory Audit Report (2015)*			
S.NO	PARTICULAR	UOM	2015
1	Coal Consumption	Kg/Hr	7500
2	Turbine Heat Rate	Kcal/KWH	2746.7
3	Boiler Efficiency (Indirect Method)	%	84.31%
4	Gross Heat Rate	Kcal/KWH	3257.9
5	GCV of Fuel	Kcal/Kg	5719.02
6	Specific Fuel Consumption	Kg/KWH	0.570

*Note- Assessment Period is for One Hour



**CPP'S SPECIFIC FUEL CONSUMPTION AUDIT REPORT, SHYAM CENTURY FERROUS LTD,
 BYRNIHAT, MEGHALAYA**

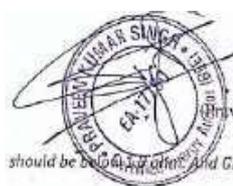
Table 11: Historical Operational Performance- 2nd Mandatory Energy Audit Report

Mandatory Audit Report (2018)*			
S.NO	PARTICULAR	UOM	2018
1	Coal Consumption	Kg/Hr	7500
2	Turbine Heat Rate	Kcal/KWH	2917.2
3	Boiler Efficiency (Indirect Method)	%	84.31%
4	Gross Heat Rate	Kcal/KWH	3460.1
5	GCV of Fuel	Kcal/Kg	5846.5
6	Specific Fuel Consumption	Kg/KWH	0.592

**Note- Assessment Period is for One Hour*

Conclusions 5:

1. **1st MEA Report-** Review of Historical Operational Performance on the basis of Mandatory Energy Audit conducted during November 2015 revealed that –
 - a) CPP operated at Gross Heat Rate was 3257.9 Kcal/KWH.
 - b) Specific Fuel Consumption was noted to be around 0.57 Kg / KWH at fuel's GCV of 5719.02 Kcal/KWH.
2. **2nd MEA Report-** Review of Historical Operational Performance on the basis of Mandatory Energy Audit conducted during September 2018 revealed that –
 - a) CPP operated at Gross Heat Rate was 3460 Kcal/KWH.
 - b) Specific Fuel Consumption was noted to be around 0.592 Kg / KWH at fuel's GCV of 5846.5 Kcal/KWH.



CPP'S SPECIFIC FUEL CONSUMPTION AUDIT REPORT, SHYAM CENTURY FERROUS LTD,
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3.5 Review of Comparative Performance

- Assessment of Operating Performances from different Sources has been tabulated below.

Table 12: Comparative Review of Operating Performances during different Assessments

S.NO	PARTICULAR	UOM	VALUE
1	As Per Technical Design (Considering GCV -5500)	Kg/KWH	0.589
2	As Per SE-2 Form submitted to BEE(2013-14)	Kg/KWH	0.582
3	As Per SE-2 Form submitted to BEE(2014-15)	Kg/KWH	0.589
4	As Per SE-2 Form submitted to BEE(2015-16)	Kg/KWH	0.618
5	As Per SE-2 Form submitted to BEE(2016-17)	Kg/KWH	0.525
6	As Per SE-2 Form submitted to BEE(2017-18)	Kg/KWH	0.618
7	As Per SE-2 Form submitted to BEE(2018-19)	Kg/KWH	0.528
8	As Per Baseline Report (2011)	Kg/KWH	0.624
9	As Per Mandatory Audit Report (2015)	Kg/KWH	0.570
10	As Per Mandatory Audit Report (2019)	Kg/KWH	0.592
11	As Per M&V Report (2018-19)	Kg/KWH	0.528
	Average	Kg/KWH	0.578
	Maximum	Kg/KWH	0.624
	Minimum	Kg/KWH	0.525

Conclusions 6:

- SFC assessed from different sources was found to be inline with Rated Parameters of the Power Plant.



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CHAPTER 4 : CPP- REVIEW OF HEAT RATE AS PER INDUSTRY STANDARD

4.1 AFBC Boiler

- M/s Thermax is leader in supplying small size AFBC Boiler.
- Review of Specification details and other features of Thermax's AFBC Boiler revealed its operating efficiency around 83.5 % to 86.0 %. Details are mentioned in Annexure-1.

4.2 Straight Condensing Turbines

- M/s Siemens & M/s Triveni are two major leaders, holding majority of share in Indian Turbines market.
- Review of Specification details of Small Turbines from these two companies revealed that
 - Average Turbine Heat is around 2400 Kcal/KWH to 2750 Kcal/KWH.
 - Specific Steam Consumption is around 4.05 t/MW.



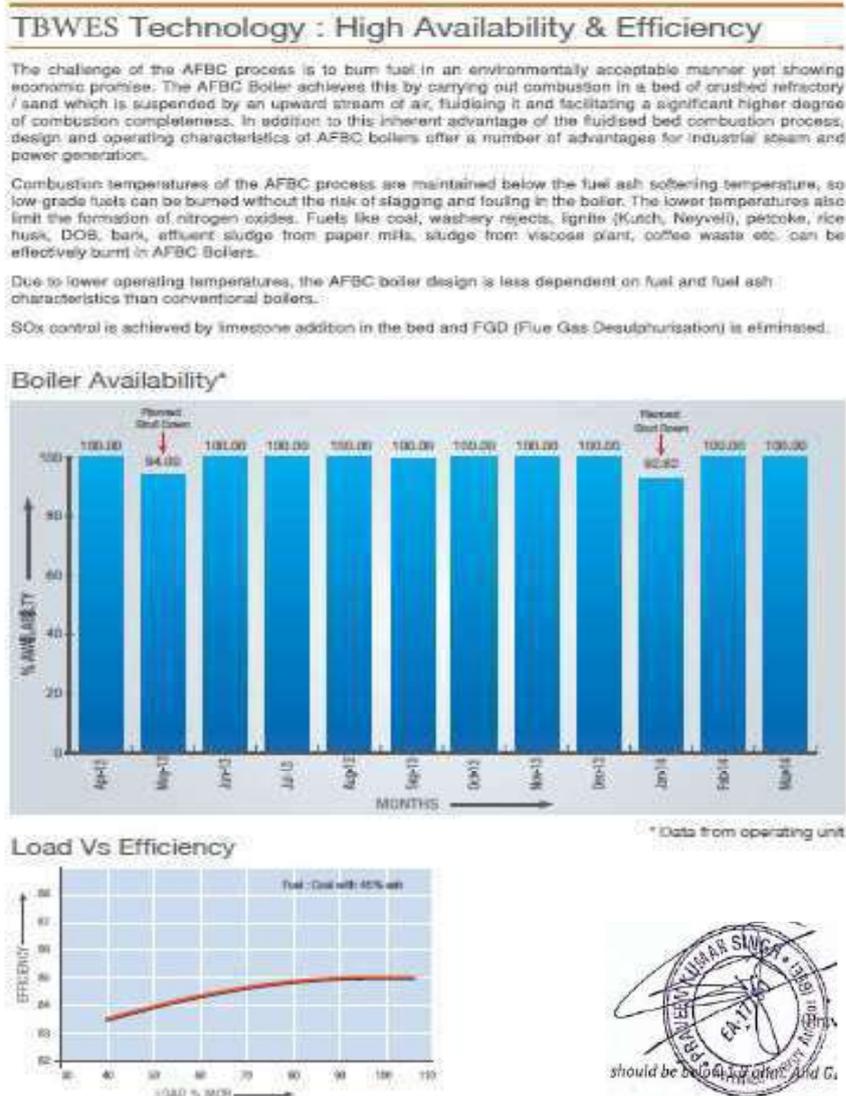
CHAPTER 5 : SUMMARY

Overall Summary of the Assessment is given below-

SCFL Turbine is designed to run at a heat rate of 2703.33 Kcal/Kwh and Gross Heat rate of CPP is estimated to be 3240.34 Kcal/Kwh. However +/- variance of 3-5% may be there depending upon the condition it operates, Quality of fuel etc. The GCV of the coal which the company is getting is varying as much as a low of 5500 to a high of 6000 Kcal. Accordingly Specific Fuel requirement can vary from a low of 0.513 to a high of 0.618 kg/KWH. The history of coal consumption from 2013-14 to 2018-19 shows that the coal consumption of the company is within the prescribed norms.



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 BYRNIHAT, MEGHALAYA

CHAPTER 6 : ANNEXURES
6.1 Annexure-1 : Thermax's AFBC Boilers operation efficiency trend


Source:- <https://www.thermaxglobal.com/boilers-heaters/fluidised-bed-combustion/solid-atmpsheric-fluidised-bed-combustion-boiler/>

6.2 Annexure-2 : Siemens's – SST 300 Design Details

SST-300
Industrial steam turbine

- All components and auxiliaries can be mounted on a common base frame or skid
- Short erection time as it is due to a "plug and play" system
- Fast, easy and flexible layout planning

The SST-300 is an optimised solution for a wide range of applications due to the implementation of the best technology combined with over 20 years of experience. In the last decade alone, this turbine has been installed in over 500 industrial and power applications by customers all over the world.

The flexible configuration of the SST-300 enables it to be used in diverse applications such as waste-to-energy, chemical processing, pulp and paper, cement and many more.

All components and auxiliaries including the fuel oil system are mounted on a common base frame. The turbine can be configured with either an upward, downward or axial exhaust orientation depending on the layout of the plant. The turbine casing accommodates multiple steam extraction/steam induction points as well. The compact design and simple layout of the turbine significantly reduce the cost and time associated with its construction, inspection and maintenance.

Waste-to-energy plant, Lincoln, UK
 In operation since 2014, the Lincolnshire Waste-to-energy facility provides a safe, sustainable and efficient waste management solution to dispose of household waste, with a cost-effective and profitable by-product electricity. It burns 100,000 t of waste a year.
Power output:
 25.15 MW
Speed:
 5,200 rpm
Live steam pressure:
 58 bar (843 ps)
Live steam temperature:
 397°C (748°F)
Exhaust steam pressure:
 0.07 bar (1 psi)



Waste-to-energy plant, Lincoln, UK



ST-300	
Power output	up to 45 MW
Speed	up to 13,000 rpm
Live steam pressure	
Min pressure	142 bar (2,050 psi)
Max temperature	542°C (1,008°F)
Exhaust steam orientation	
Upward	up to 16 bar (232 psi)
Downward	up to 0.5 bar (7.25 psi)
Exhaust steam	up to 3,000/40 psi
Exhaust steam pressure (up to 0)	
Pressure	Single or double, single stage, reheat control, variable control
Pressure	up to 26 bar (374 psi)
Temperature	400°C (752°F)
Exhaust steam pressure (up to 0)	
Pressure	up to 0.45 bar (6.5 psi)

- Typical applications**
- Biomass plants
 - Chemical and petrochemical industry
 - Cement industry
 - Combined cycle power plants and combined heat and power plants
 - Concentrated solar power plants
 - District heating
 - Waste-to-energy plants (waste incineration)
 - Pulp and paper mills
 - Sugar industry
 - Steel works and mines



6.3 Annexure-3 : Triveni- Case Study

CASE STUDY



Efficiency improvement of a 12MW turbine

INTRODUCTION

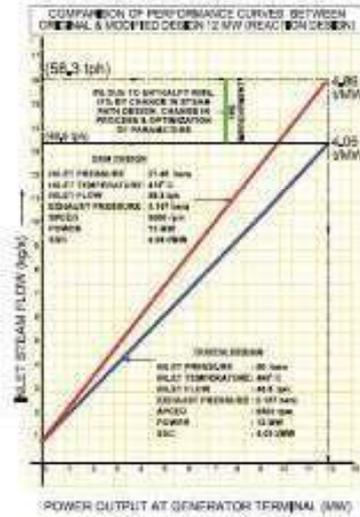
The customer is a copper manufacturing industry in India. The turbine was sent to Triveni Refurbishing for repair, modification and efficiency improvement. Client's turbine was an old running turbine sourced by them in 1983, which was sent to us in 2018 for refurbishing.

CHALLENGE

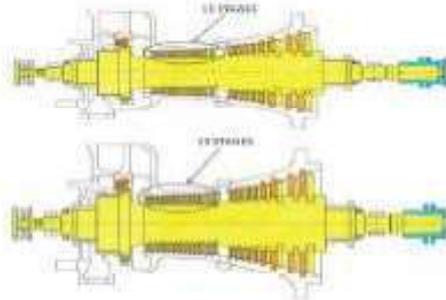
The challenge was to modify the turbine in the existing turbine boundary conditions of the casing by redesigning it for higher efficiency which convert the low inlet steam parameters to high inlet steam parameters.

SOLUTION

Triveni Refurbishing redesigned the steam path within in the existing turbine boundary conditions of the casing. The efficiency of the turbine improved by 58% and the payback period was just 8 months.



Parameter	Unit	WRAC extraction		WR extraction	
		Original design	Modified design	Original design	Modified design
Inlet steam pressure	bar (a)	10.2	30	10.2	30
Inlet steam temperature	°C	410	465	410	465
Inlet orifice	kg/hr	3250.5	3410.4	3250.5	3410.4
Exhaust pressure (WRAC)	bar(a)	1.07	1.07	1.07	1.07
Inlet Steam flow	kg	48.3	48.3	48.3	48.3
Exhaust steam pressure (WRAC)	bar (a)	—	—	1.07	1.07
Exhaust steam flow	kg	0	0	20	20
Exhaust steam flow	kg	48.3	48.3	48.3	48.3
Speed	rpm	8500	8500	8500	8500
Power	MW	12	12	12	12
Specific Steam Consumption	kg/MW	4.4	4.1	4.7	4.4
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."



should be submitted to the client and the

SHYAM CENTURY
FERROUS

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BYRNIHAT, MEGHALAYA**

6.4 Annexure-4 : Copy of Form-1 (2013-14)

Form-1				
Details of information regarding Total Energy Consumed and Specific Energy Consumption Per unit of Production				
A. General Details		Description		
1	Name of the Unit	Shyam Century Ferrous (A Division of STAR FERRO AND CEMENT LTD.)		
2	i) Year of Establishment	2000		
	ii) Date of Declaration as Designated consumer	30/03/2012		
3	Sector and Sub-Sector in which the Designated Consumers falls	Sector Iron & Steel	Sub-Sector Ferro Alloy	
4. (i)	Complete address of DC's Unit location (including Chief Executive's name & designation) with mobile, telephone, fax nos. & e-mail.	EPIP AREA, RAJABAGAN, BYRNIHAT, RI-BHOI DIST, MEGHALAYA-793101, Mr.M.V.K NAGESWARA RAO (PRESIDENT), Phone No:-9485099191, Fax No. 03638200522, email: nageswararao@cmcl.co.in		
(ii)	Registered Office address with telephone, fax nos. & e-mail	VIII, Lumshnong, P.O.: Khallehniat, Meghalaya-793210. Tel. no: 03655-278215/18/18 Fax: 03655-278217.		
(iii)	Energy Manager's Name, designation, Registration No., Address, Mobile, Telephone, Fax nos. & e-mail	Mr. Arvind Rai, Energy Manager, Shyam Century Ferrous Division of STAR FERRO AND CEMENT LTD. Rajabagan Byrnihat, Meghalaya-793101. Phone No: 9862571299		
B. Production details				
5	Manufacturing Industries notified as Designated Consumers			
	Products	Unit	Current Year (2013-14)	Previous Year (2012-13)
(i)	Product 1 (FeSi)	Tonne	16164	9462.834
(ii)	Product 2	Tonne		
(iii)	Product 3	Tonne		
(iv)	Product (Please add extra rows in case of additional products)	Tonne		
(v)	Total Equivalent Product	Tonne	16164	9462.834
C. Energy Consumption Details of Manufacturing Industries notified as Designated Consumers				
6. (i)	Total Electricity Purchased from Grid/Other Source	Million kwh	43.4537	8.595
(ii)	Total Electricity Generated	Million kwh	103.64447	81.2469
(iii)	Total Electricity Exported	Million kwh	0	0
(iv)	Total Electrical Energy Consumption	Million kwh	147.09817	89.8419
(v)	Total Solid Fuel Consumption	Million kCal	348216.58	268114.4
(vi)	Total Liquid Fuel Consumption	Million kCal	20.62	15.2
(vii)	Total Gaseous Fuel Consumption	Million kCal	0	0
(viii)	Total Thermal Energy Consumption	Million kCal	348237.2	268129.6
(ix)	Total Normalized Energy Consumption (Thermal+Electrical)	TOE	38560.738	27562.13
D. Specific Energy Consumption Details				
7. i	Specific Energy Consumption (Without Normalization)	TOE/Tonne	2.386	2.912
ii	Specific Energy Consumption (Normalized)	TOE/Tonne		
E. Power Plants notified as Designated Consumer				
8. i	Total Capacity	MW	13.8	13.8
ii	Unit Configuration	No. of units with their capacity	1	1
iii	Annual Gross Generation	MU	103.6357	81.24
iv	Annual Plant Load Factor (PLF)	%	86.72	67.2
v	Station Gross Design Heat Rate	kcal/kWh	3250	3250
vi	Station Gross Operative Heat Rate	kcal/kWh	3360	3300.28
vii	Auxiliary Power Consumption	%	10.32	10.24
viii	Operative Net Heat Rate	kcal/kWh	3747	3676
ix	Operative Net Heat Rate (Normalized)	kcal/kWh		

For SHYAM CENTURY FERROUS
A Division of STAR FERRO AND CEMENT LIMITED

Arvind Rai
PRESIDENT



SHYAM CENTURY
FERROUS

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BYRNIHAT, MEGHALAYA**

6.5 Annexure-5 : Copy of Form-1 (2014-15)

Form 1

Details of information regarding Total Energy Consumed and Specific Energy Consumption Per unit of Production

A. General Details		Description	
1	Name of the unit	SHYAM CENTURY FERROUS (A Division of STAR FERRO AND CEMENT LTD.)	
2	(i) Year of Establishment	2001	
	(ii) Registration No. (As provided by BEE)	IKS0039M	
3	Sector and Sub-Sector in which the Designated Consumers falls	Sector: Iron & Steel (Sponge Iron)	Sub-Sector: Ferro Alloy
4 (i)	Complete address of DCS Unit location (including Chief Executive's name & designation) with mobile, telephone, fax nos. & e-mail	M. V. K. Nagaswara Rao, President, EPIP, Rajabagan, Byrnihat, Itanagar, Meghalaya, 793101, 948509191, 3628- 200522, 948509191, nageswararao@comcl.co.in	
(ii)	Registered Office address with telephone, fax nos. & e-mail	M. V. K. Nagaswara Rao, President, V/S: Lumshing, P.O: Khalehriat, Lumshing, Khalehriat, East Jaintia Hills, Meghalaya, 793210, 03656-278215/16/18, 03656- 278217	
(iii)	Energy Manager's Name, designation, Registration No., Address, Mobile, Telephone, Fax nos. & e-mail	Arvind Rai, Energy Manager, EA-8391, 9802571259, EA, 03655- 278217, 9862571259, arvindra@comcl.co.in	

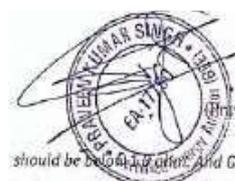
B. Production details				
5. Manufacturing Industries notified as Designated Consumers				
Sr No	Products	Unit	Previous Year	Current Year
(i)	Product 1: Sponge Iron Production	Tonne	0.00	0.00
(ii)	Product 2: Steel Melting Shop Production	Tonne	0.00	0.00
(iii)	Product 3: Ferro Chrome Production	Tonne	0.00	0.00
(iv)	Product 4: FIMN Production	Tonne	0.00	0.00
(v)	Product 5: SMMs Production	Tonne	563.83	0.00
(vi)	Product 6: Pig Iron Production	Tonne	0.00	0.00
(vii)	Product 7: Ferro Silicon Production	Tonne	9958.33	14835.00
(viii)	Product 8: Rolling Mill Production	Tonne	0.00	0.00
(ix)	Total Equivalent Product Si+SMMs+Others	Tonne	0.00	0.00
(x)	Total Equivalent Product SMM	Tonne	10207.52	14835.00
(xi)	Total Equivalent Product Ferro Chrome	Tonne	0.00	0.00
(xii)	Total Equivalent product Hot Metal/Pig Iron	Tonne	0.00	0.00
(xiii)	Total Equivalent Product SPU	Tonne	0.00	0.00

C. Energy Consumption Details of Manufacturing Industries notified as Designated Consumers				
Sr No	Item	Unit	Previous Year	Current Year
6-(i)	Total Electricity Purchased from Grid/Other Source	Million kWh	8.51	61.31
(ii)	Total Electricity Generated	Million kWh	105.91	64.21
(iii)	Total Electricity Exported	Million kWh	17.92	0.00
(iv)	Total Electrical Energy Consumption	Million kWh	94.60	125.51
(v)	Total Solid Fuel Consumption	Million kCal	422095.72	293069.07
(vi)	Total Liquid Fuel Consumption	Million kCal	150.38	156.55
(vii)	Total Gaseous Fuel Consumption	Million kCal	0.00	0.00
(viii)	Total Thermal Energy Consumption	Million kCal	423129.95	293225.62
(ix)	Total Normalized Energy Consumption (Thermal+Electrical)	TCE		

D. Specific Energy Consumption Details				
7-(i)	Specific Energy Consumption (Without Normalization)	TDE/T	3.726	3.595
(ii)	Specific Energy Consumption (Normalized)	TCE/T	43	1.104


 For Shyam Century Ferrous Ltd.
 Arvind Rai
 Energy Manager (EA-8391)

PRESIDENT

SHYAM CENTURY
FERROUS

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BYRNIHAT, MEGHALAYA

6.6 Annexure-6 : Copy of Form-1 (2015-16)

Form-1			
Details of information regarding Total Energy Consumed and Specific Energy Consumption Per unit of Production			
A. General Details		Description	
1	Name of the Unit	Shyam Century Ferrous Limited	
2	i) Year of Establishment	2000	
	ii) Registration No (As provided by BEE)	INS0039ML	
3	Sector and Sub-Sector in which the Designated Consumers falls	Sector Iron & Steel (Sponge Iron)	Sub-Sector Ferro Alloy
4. (i)	Complete address of DCs Unit location (including Chief Executive's name & designation) with mobile, telephone, fax nos. & e-mail.	Mr. MVK NAGESWARA RAO, CEO, EPIP, RAJABAGAN, BYRNIHAT, RI-BHOI, MEGHALAYA, 793101, 03638-200522, 9485099191, nageswararao@cmcl.co.in	
(ii)	Registered Office address with telephone, fax nos. & e-mail	LUMSHNONG, KHALIEHRIAT, EAST JAINTIA HILLS, MEGHALAYA, 793210, 03655-278215/16/18, 03655-278217	
(iii)	Energy Manager's Name, designation, Registration No., Address, Mobile, Telephone, Fax nos. & e-mail	Mr. Arvind Rai, ENERGY MANAGER, EA-8391, EA, 03638-200522, 9862571299, arvindrai@cmcl.co.in	
B. Production details			
5 Manufacturing Industries notified as Designated Consumers			
Sr No	Products	Unit	Current Year (2015-16)
		(1)	(3)
(i)	Product 1: Sponge Iron Production	Tonne	0.00
(ii)	Product 2: Steel Melting Shop Production	Tonne	0.00
(iii)	Product 3: Ferro Chrome Production	Tonne	0.00
(iv)	Product 4: FIMN Production	Tonne	0.00
(v)	Product 5: SiMn Production	Tonne	0.00
(vi)	Product 6: Pig Iron Production	Tonne	0.00
(vii)	Product 7: Ferro Silicon Production	Tonne	14835.00
(viii)	Product 8: Rolling Mill Production	Tonne	0.00
(ix)	Total Equivalent Product SI+SMS+Others	Tonne	0.00
(x)	Total Equivalent Product SiMn	Tonne	0.00
(xi)	Total Equivalent Product Ferro Chrome	Tonne	0.00
(xii)	Total Equivalent product Hot Metal/Pig Iron	Tonne	0.00
(xiii)	Total Equivalent Product SPU	Tonne	0.00
C. Energy Consumption Details of Manufacturing Industries notified as Designated Consumers			
Sr No	Item	Unit	Current Year (2015-16)
		(1)	(3)
6. (i)	Total Electricity Purchased from Grid/Other Source	Million kwh	66.43
(ii)	Total Electricity Generated	Million kwh	55.27
(iii)	Total Electricity Exported	Million kwh	0.00
(iv)	Total Electrical Energy Consumption	Million kwh	125.51
(v)	Total Solid Fuel Consumption	Million kCal	293069.07
(vi)	Total Liquid Fuel Consumption	Million kCal	40.76
(vii)	Total Gaseous Fuel Consumption	Million kCal	0.00
(viii)	Total Thermal Energy Consumption	Million kCal	293225.62
(ix)	Total Normalized Energy Consumption (Thermal+Electrical)	TOE	34595.22

For Shyam Century Ferrous Ltd.

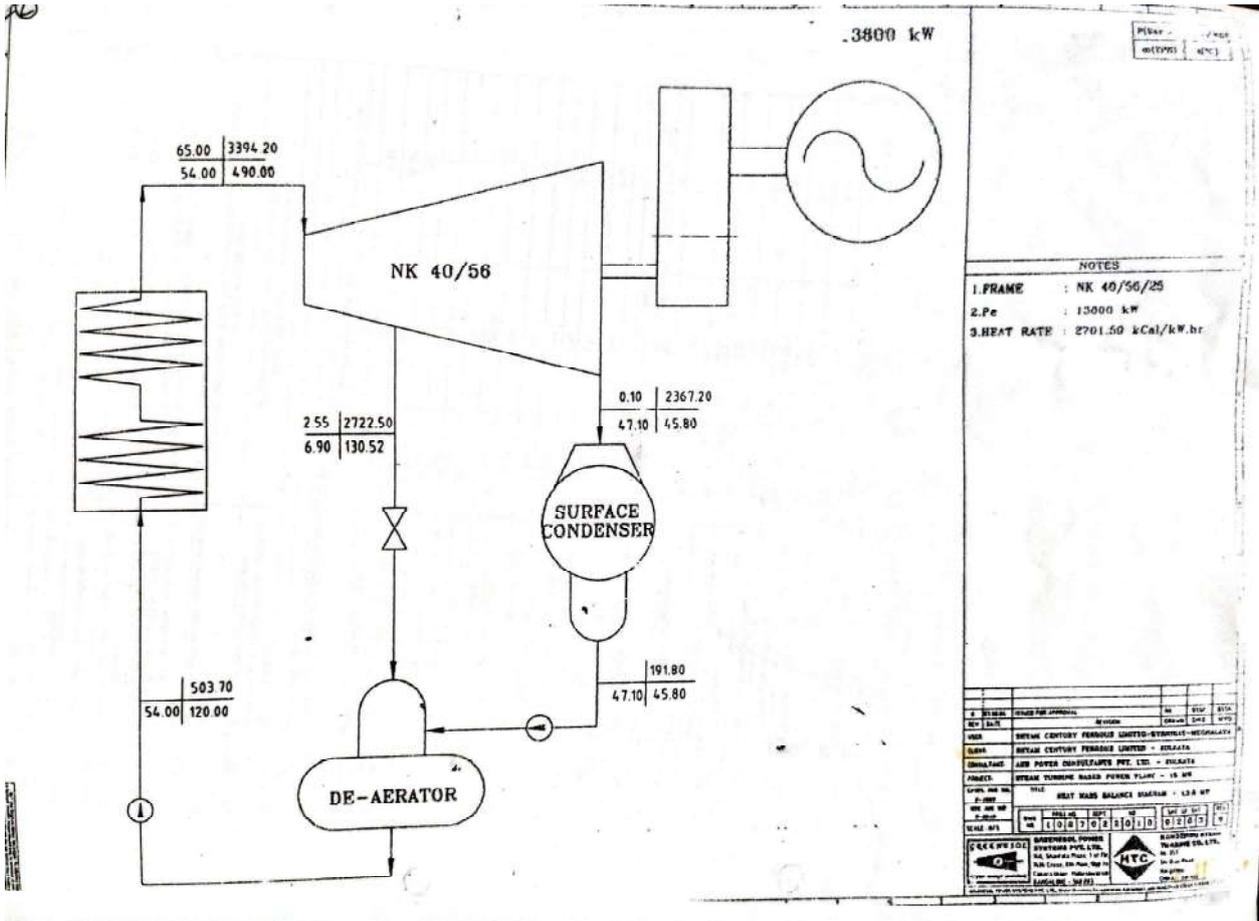
[Signature]
Chief Executive Officer

[Signature]
29/6/16



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BYRNIHAT, MEGHALAYA

6.7 Annexure-7 : HMBD Copy



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6.8 Annexure-8 : Baseline Audit Report- Reference Page

7.2.1.3 Boiler Efficiency Evaluation

The boiler efficiency is calculated by the indirect method and is as follows.

Table 7.2.4: Summary of Boiler losses

Description	Unit	Losses
Dry flue gas losses	%	5.73
Heat loss due to H ₂ in fuel	%	4.87
Loss due to moisture in fuel	%	1.29
Loss due to moisture in air	%	0.10
Loss due to CO present in flue gas	%	0.30
Radiation & unaccounted loss	%	1.00
Sensible heat loss from fly ash	%	0.06
Loss due to un-burnt in fly Ash	%	0.25
Total Losses	%	13.59
Boiler Efficiency by Indirect method	%	86.41

Table 7.3.1: Turbine Heat rate

Description	Unit	Turbine
Duration	hr	1
Avg. Unit load	MW	13.63
% of NCR	%	99%
Main steam flow		
Flow	tph	53.00
Temperature	°C	505.60
Pressure	bar(a)	65.50
Enthalpy	kJ/kg	3,430.14
Feed water		
Temperature	°C	121
Flow	tph	53.00
Enthalpy	kJ/kg	508.00
Turbine heat rate	kCal/kWh	2,713.93

CPP'S SPECIFIC FUEL CONSUMPTION AUDIT REPORT, SHYAM CENTURY FERROUS LTD,
 BYRNIHAT, MEGHALAYA

 6.9 Annexure-9 : 1st Mandatory Energy Audit Report – Reference Page

Mandatory Energy Audit (MEA) Report for SCFL (IN50039ML)

11	Heat Loss due to unburnt carbon in fly ash (%)	=	Fly Ash collected/ kg of fuel burnt x GCV of fly ash x 100 / GCV of fuel
	L7	=	2.582
12	Heat Loss due to unburnt carbon in bottom ash (%)	=	Bottom Ash collected/ kg of fuel burnt x GCV of bottom ash x 100 / GCV of fuel
	L8	=	0.130
13	Total losses (%)	=	L1 + L2 + L3 + L4 + L5 + L6 + L7 + L8 + L9 + L10
	L	=	15.69
14	Boiler efficiency by indirect method, %	=	100 - Total losses %
		=	84.31

Observation: Normally AFBC boilers can operate with overall efficiency of 85% (plus or minus 2%).

A detail analysis of turbine heat rate has been carried out by measuring the following parameters. Flow, Pressure and temperature of Main steam, Feed water flow, pressure, temperature, Power output of generator.

The turbine heat rate is computed as:

$$\text{Turbine Heat Rate} = (\text{Gms} \times \text{ims} - \text{Gfw} \times \text{ifw}) / \text{Pe}$$

Gms - Main steam flow rate, kg/hr

ims - Feed water flow, kg/hr

Gfw - Feed water enthalpy, kJ/kg

ifw - Power output

Description	Unit	Design	Actual
Duration	hr	1	1
Avg. Unit load	MW	13.8	13.12
Main steam flow			
Flow	tph	54	52.06
Temperature	°C	400	485
Pressure	bar(a)	65	61.78
Enthalpy	kJ/kg	3394.2	3385
Feed water			
Temperature	°C	130	115
Flow	tph	54	52.06
Enthalpy	kJ/kg	503.7	486.83
Turbine heat rate	kJ/kWh	2701.5	2746.7

Observation:

- The turbine heat rate of this turbine is on higher side.
- The parameters which have an impact on the heat rate are Main steam pressure & temperature, Condenser vacuum, feed water temperature, Air heater outlet temperature, Makeup water, unburnt carbon in fly ash, Excess air, and Cylinder efficiency. In order to achieve minimum heat rate, the operating parameters must be kept close to the design parameters.

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6.10 Annexure-10 : Copy of Form-1 (2016-17)

Form-1 Details of information regarding Total Energy Consumed and Specific Energy Consumption Per unit of Production (See Rule 3)				
A.	General Details	Description		
1	Name of the Unit	Shyam Century Ferrous Limited		
2	i) Year of Establishment	2000		
	ii) Registration No (As provided by BEE)	INS0039ML		
3	Sector and Sub-Sector in which the Designated Consumers falls	Sector Iron & Steel (Sponge Iron)	Sub-Sector Ferro Alloy	
4. (i)	Complete address of DCs Unit location (including Chief Executive's name & designation) with mobile, telephone, fax nos. & e-mail.	Mr. MVK NAGESWARA RAO, CEO, EPIP, RAJABAGAN, BYRNIHAT, RI-BHOL, MEGHALAYA, 793101. 03638-200522, 9485099191, nageswararao@starcement.co.in		
(ii)	Registered Office address with telephone, fax nos. & e-mail	LUMSHNONG, KHALIEHRIAT, EAST JAINTIA HILLS, MEGHALAYA, 793210, 03655-278215/16/18, 03655-278217		
(iii)	Energy Manager's Name, designation, Registration No., Address, Mobile, Telephone, Fax nos. & e-mail	Mr. Arvind Rai, ENERGY MANAGER, EA-8391, EA, 03638-200522, 9852571299, arvindra@starcement.co.in		
B.	Production details			
5	Manufacturing Industries notified as Designated Consumers			
Sr No	Products	Unit	Previous Year (2015-16)	Current Year (2016-17)
		(1)	(2)	(3)
(i)	Product 1: Sponge Iron Production	Tonne	0.00	0.00
(ii)	Product 2: Steel Melting Shop Production	Tonne	0.00	0.00
(iii)	Product 3: Ferro Chrome Production	Tonne	0.00	0.00
(iv)	Product 4: FIMN Production	Tonne	0.00	0.00
(v)	Product 5: SiMn Production	Tonne	0.00	0.00
(vi)	Product 6: Pig Iron Production	Tonne	0.00	0.00
(vii)	Product 7: Ferro Silicon Production	Tonne	15104.00	12605.00
(viii)	Product 8: Rolling Mill Production	Tonne	0.00	0.00
(ix)	Total Equivalent Product Si+SMS+Others	Tonne	0.00	0.00
(x)	Total Equivalent Product SiMn	Tonne	0.00	0.00
(xi)	Total Equivalent Product Ferro Chrome	Tonne	0.00	0.00
(xii)	Total Equivalent product Hot Metal/Pig Iron	Tonne	0.00	0.00
(xiii)	Total Equivalent Product SPU	Tonne	0.00	0.00
C.	Energy Consumption Details of Manufacturing Industries notified as Designated Consumers			
Sr No	Item	Unit	Previous Year (2015-16)	Current Year (2016-17)
		(1)	(2)	(3)
6. (i)	Total Electricity Purchased from Grid/Other Source	Million kwh	85.43	1.22
(ii)	Total Electricity Generated	Million kwh	55.27	104.54
(iii)	Total Electricity Exported	Million kwh	0.00	0.00
(iv)	Total Electrical Energy Consumption	Million kwh	120.48	105.59
(v)	Total Solid Fuel Consumption	Million kCal	293786.46	362571.09
(vi)	Total Liquid Fuel Consumption	Million kCal	40.76	282.77
(vii)	Total Gaseous Fuel Consumption	Million kCal	0.00	0.00
(viii)	Total Thermal Energy Consumption	Million kCal	293827.22	362853.86
(ix)	Total Normalized Energy Consumption (Thermal+Electrical)	TOE	34991.47	27320.57

For Shyam Century Ferrous Ltd.
Praveen Kumar Singh
Chief Executive Officer

For, Shyam Century Ferrous Ltd.
Arvind Rai
Energy Manager (EA-8391)



SHYAM CENTURY
FERROUS

ZING ENTERPRISES

**CPP'S SPECIFIC FUEL CONSUMPTION AUDIT REPORT, SHYAM CENTURY FERROUS LTD,
BYRNIHAT, MEGHALAYA**

6.11 Annexure-11 : Copy of Form-1 (2017-18)

(ii)	Total Electricity Generated	Million kwh	104.54	68.91
(iii)	Total Electricity Exported	Million kwh	0.00	0.00
(iv)	Total Electrical Energy Consumption	Million kwh	105.59	117.99
(v)	Total Solid Fuel Consumption	Million kCal	362571.09	312721.87
(vi)	Total Liquid Fuel Consumption	Million kCal	282.77	25.89
(vii)	Total Gaseous Fuel Consumption	Million kCal	0.00	0.00
(viii)	Total Thermal Energy Consumption	Million kCal	362853.86	312747.76
(ix)	Total Normalized Energy Consumption (Thermal+Electrical)	TOE	36375.63	46694.79
D Specific Energy Consumption Details				
7. i	Specific Energy Consumption(Without Normalization)	TOE/T	2.89	3.30
ii	Specific Energy Consumption (Normalized)	TOE/T	NA	NA
E Power Plants notified as Designated Consumer				
8. i.	Total Capacity	MW		
ii	Unit Configuration	No. of units with their capacity		
iii	Annual Gross Generation	MU		
iv	Annual Plant Load Factor (PLF)	%		
v	Station Gross Design Heat Rate	kcal/kWh		
vi	Station Gross Operative Heat Rate	kcal/kWh		
vii	Auxiliary Power Consumption	%		
viii	Operative Net Heat Rate	kcal/kWh		
ix	Operative Net Heat Rate (Normalized)	kcal/kWh		
F Sector-Wise Details				
S.No	Name of the Sector	Sub-Sector	Pro-forma in which the details to be furnished	
a	Aluminium	Refinery/Smelter	Sa ₁	
		Cold Rolling Sheet	Sa ₂	
b	Cement	Cement	Sb	
c	Chlor-Alkali	Chlor-Alkali	Sc	
d	Fertilizer	Fertilizer	Sd	
e	Iron and Steel	Integrated Steel	Se ₁	
		Sponge Iron	Se ₂	
f	Pulp and Paper	Pulp and Paper	Sf	
		Composite	Sg ₁	
		Fiber	Sg ₂	
		Spinning	Sg ₃	
		Processing	Sg ₄	
h	Thermal Power Plant	Thermal Power Plant	Sh	



SHYAM CENTURY
FERROUS

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6.12 Annexure-12 : Copy of Form-1 (2018-19)

Form-1 Details of information regarding Total Energy Consumed and Specific Energy Consumption Per unit of Production (See Rule 3)				
A.	General Details	Description		
1	Name of the Unit	Shyam Century Ferrous Limited		
2	i) Year of Establishment	2000		
	ii) Registration No. (As provided by BEE)	INS0039ML		
3	Sector and Sub-Sector in which the Designated Consumers falls	Sector Iron & Steel (Sponge Iron)	Sub-Sector Ferro Alloy	
4. (i)	Complete address of DCs Unit location (including Chief Executive's name & designation) with mobile, telephone, fax nos. & e-mail.	Mr. MVK NAGESWARA RAO, CEO, EPIP, RAJABAGAN, BYRNIHAT, RI-BHOI, MEGHALAYA, 793101., 03638-200522, 9485099191, nageswararao@starcement.co.in		
(ii)	Registered Office address with telephone, fax nos. & e-mail	LUMSHNONG, KHALIEHRIAT EAST JAINTIA HILLS, MEGHALAYA, 793210, 03655-278215/16/18, 03655-278217		
(iii)	Energy Manager's Name, designation, Registration No., Address, Mobile, Telephone, Fax nos. & e-mail	Mr. Arvind Rai, ENERGY MANAGER, EA-8391, EA, 03638-200522, 9862571299, arvindrai@starcement.co.in		
B.	Production details			
5	Manufacturing Industries notified as Designated Consumers			
Sr No	Products	Unit (1)	Previous Year (2)	Current Year (3)
(i)	Product 1: Sponge Iron Production	Tonne	0.00	0.00
(ii)	Product 2: Steel Melting Shop Production	Tonne	0.00	0.00
(iii)	Product 3: Ferro Chrome Production	Tonne	0.00	0.00
(iv)	Product 4: FiMN Production	Tonne	0.00	0.00
(v)	Product 5: SiMn Production	Tonne	0.00	0.00
(vi)	Product 6: Pig Iron Production	Tonne	0.00	0.00
(vii)	Product 7: Ferro Silicon Production	Tonne	14835.00	15219.00
(viii)	Product 8: Rolling Mill Production	Tonne	0.00	0.00
(ix)	Total Equivalent Product Si+SMS+Others	Tonne	0.00	0.00
(x)	Total Equivalent Product SiMn	Tonne	0.00	0.00
(xi)	Total Equivalent Product Ferro Chrome	Tonne	0.00	0.00
(xii)	Total Equivalent product Hot Metal/Pig Iron	Tonne	0.00	0.00
(xiii)	Total Equivalent Product SPU	Tonne	0.00	0.00
C.	Energy Consumption Details of Manufacturing Industries notified as Designated Consumers			
Sr No	Item	Unit (1)	Previous Year (2)	Current Year (3)
6. (i)	Total Electricity Purchased from Grid/Other Source	Million kwh	61.31	86.87
(ii)	Total Electricity Generated	Million kwh	61.21	34.71
(iii)	Total Electricity Exported	Million kwh	0.00	0.00
(iv)	Total Electrical Energy Consumption	Million kwh	125.51	121.42
(v)	Total Solid Fuel Consumption	Million kCal	293069.07	169487.77
(vi)	Total Liquid Fuel Consumption	Million kCal	156.55	33.96
(vii)	Total Gaseous Fuel Consumption	Million kCal	0.00	0.00
(viii)	Total Thermal Energy Consumption	Million kCal	293225.62	169521.74
(ix)	Total Normalized Energy Consumption (Thermal+Electrical)	TOE	34594.85	29770.89

For SHYAM CENTURY FERROUS LTD.
Arvind Rai
Authorised Signatory

Arvind Rai
(Arvind Rai - EA-8391)



CPP'S SPECIFIC FUEL CONSUMPTION AUDIT REPORT, SHYAM CENTURY FERROUS LTD,
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6.13 Annexure-13 : Monitoring & Verification Audit Report- Reference Page

M/s Shyam Century Ferrous Ltd. (Sector -Iron & Steel)
8.0 ENERGY SCENARIO IN ASSESSMENT YEAR
8.1. Brief write-up on Energy Scenario of Plant

The primary fuels input to the plant during the assessment year 2018-19 were Purchased Power, Coal &HSD. The quantities of these fuels consumed have been given below:-

As per s. no. 5.3

8.2. Generation
8.2.1. CPP/Co-Gen/DG generation & Utilization with Heat Rate calculation
Gross Heat Rate of DG Set

Quantity of HSD used for power generation (DG Set)	kilo Liter	3.8622
Gross calorific value	kcal/ kg	11840
Average Density	kg/ltr	0.84
Thermal Energy Used in Power Generation (DG Set)	Million kcal	37.79
Own Generation through DG Set	Lakh kWh	0.1191
Gross Heat Rate of DG Set	kcal/kWh	3172.96

Gross Heat Rate of CPP

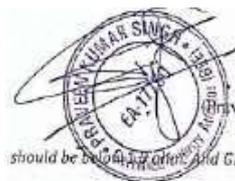
Quantity of coal used for power generation (CPP)	Tonnes	18310.26
Gross calorific value	kcal/ kg	5336
Thermal Energy Used in Power Generation (CPP)	Million kcal	97703.55
Gross Power Generation through CPP	Lakh kWh	347.016
Gross Heat Rate of CPP	kcal/kWh	2815.53

8.2.2. Write up on type of WHR and generation

NA

8.3. Process Thermal Energy System & Utilization:

Steam is used for power generation.



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6.14 Annexure-14 : 2nd Mandatory Energy Audit Report – Reference Page

A detail analysis of turbine heatrate has been carried out by measuring the following parameters. Flow, Pressure and temperature of Mainsteam, Feedwater flow, pressure, temperature, Power output of generator.

The turbine heat rate is computed as:

$$\text{Turbine Heat Rate} = (\text{Gms} \times \text{ims} - \text{Gfw} \times \text{ifw}) / \text{Pe}$$

Gms - Main steam flow rate, kg/hr

ims - Feed water flow, kg/hr

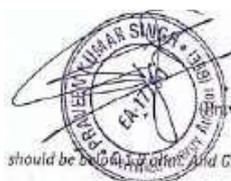
Gfw - Feed water enthalpy, kj/kg

ifw - Power output

Description	Unit	Design	Actual
Duration	hr	1	1
Avg. Unit load	MW	13.8	14.15
Main steam flow			
Flow	tph	54	59.64
Temperature	oC	490	500.64
Pressure	bar(a)	65	59.32
Enthalpy	kJ/kg	3394.2	3424.1
Feed water			
Temperature	oC	120	125
Flow	tph	54	59.64
Enthalpy	kJ/kg	503.7	531.0
Turbine heat rate	kCal/kWh	2701.5	2917.2

Observation:

- The turbine heat rate of this turbine is on higher side.
- The parameters which have an impact on the heat rate are Main steam pressure & temperature, Condenser vacuum, feed water temperature, Air heater outlet temperature, Makeup water, unburnt carbon in fly ash, Excess air, and Cylinder efficiency. In order to achieve minimum heat rate, the operating parameters must be kept close to the design parameters.



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CHAPTER 7 : LIST OF ABBREVIATIONS

A	Ampere
AC	Alternating Current
Avg.	Average
BEE	Bureau of Energy Efficiency
COP	Coefficient of Performance
Cr.	Crore
CT	Cooling Tower
CPP	Captive Power Plant
°C	Degree Centigrade
DC	Designated Consumer
DG	Diesel Generating
Ft. or ft	Feet
GHR	Gross Heat Rate
hr.	Hour
HPMV	High Pressure Mercury Vapor
HSD	High Speed Diesel
Kcal	Kilo Calories
Kg.	Kilogram
KL	Kilo Liter
KV	Kilo Volt
KVA	Kilo Volt Ampere
KVAr	Kilo Volt Ampere Reactive
KW	Kilo Watts



**CPP'S SPECIFIC FUEL CONSUMPTION AUDIT REPORT, SHYAM CENTURY FERROUS LTD,
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KWh	Kilo Watt Hour
Lit	Liters
M or m	Meter
Max.	Maximum
MD	Maximum Demand
Min.	Minimum
MT	Metric Ton
No.	Number
p.a.	Per Annum
PF	Power Factor
PHE	Plate Heat Exchangers
RPC	Reactive Power Compensation
Rpm	Revolutions per minute
TR	Tons of Refrigeration
V	Voltage
VFD	Variable Frequency Drive
yr.	Year
ECOs	Energy Conservation Opportunities
SEC	Specific Energy Consumption
SEGR	Specific Energy Generation Ratio

