ATTAIN ENGINEERING & ENERGY CO,.LTD

95/43 Tiwanon Road Pakkred Nonthaburi Thailand
Tel: 662-5837526 , Fax: 662-5837527
E-mail: info@attainengineering.com Website: www.attainengineering.com

"AEE is Energy Service Company"

Sahaviriya Steel Industries PCL

September 16, 2010

Kind Attn Mr**. Atapon Nanakhon**

Dear Sir,

Sub: Recuperator for 275 Tons/hr Furnace.

Please find attached the offer for one recuperator out of three for 275 ton/hr furnace. With the following Parameters

Air Volume to be heated: 225,500 m^3/hr
Inlet Temperature: 30 ^oC
Outlet Temperature: 460 ^oC

Flue Gas Volume: 239,500 m^3/hr
Inlet Temperature: 790 ^oC
Outlet Temperature: 450 ^oC

Should you require any further clarification / information, please feel free to contact us.

With best regards,

Mr. Attaporn Rojanarak
Managing Director

ATTAIN ENGINEERING & ENERGY CO,.LTD
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Tel: 662-5837526 , Fax: 662-5837527
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Website: www.attainengineering.com

SCOPE OF SUPPLY:

The scope will cover manufacturing, supply, erection and commissioning of the recuperator.

GENERAL DESCRIPTION:

Recuperator will be of Convective type having two passes for air and single passes for flue gas. The flue gas will pass over the bank of the tubes while air will pass through the tubes. The first pass for air will be made of plain steel tubes covered with high temperature resistance alloyed fins and second pass will be plain steel tubes. Outer body of the recuperator shall be fabricated from MS plates of suitable thickness so that it may sustain thermal stresses developed during its working.

SALIENT FEATURES OF ENCON'S RECUPERATOR:

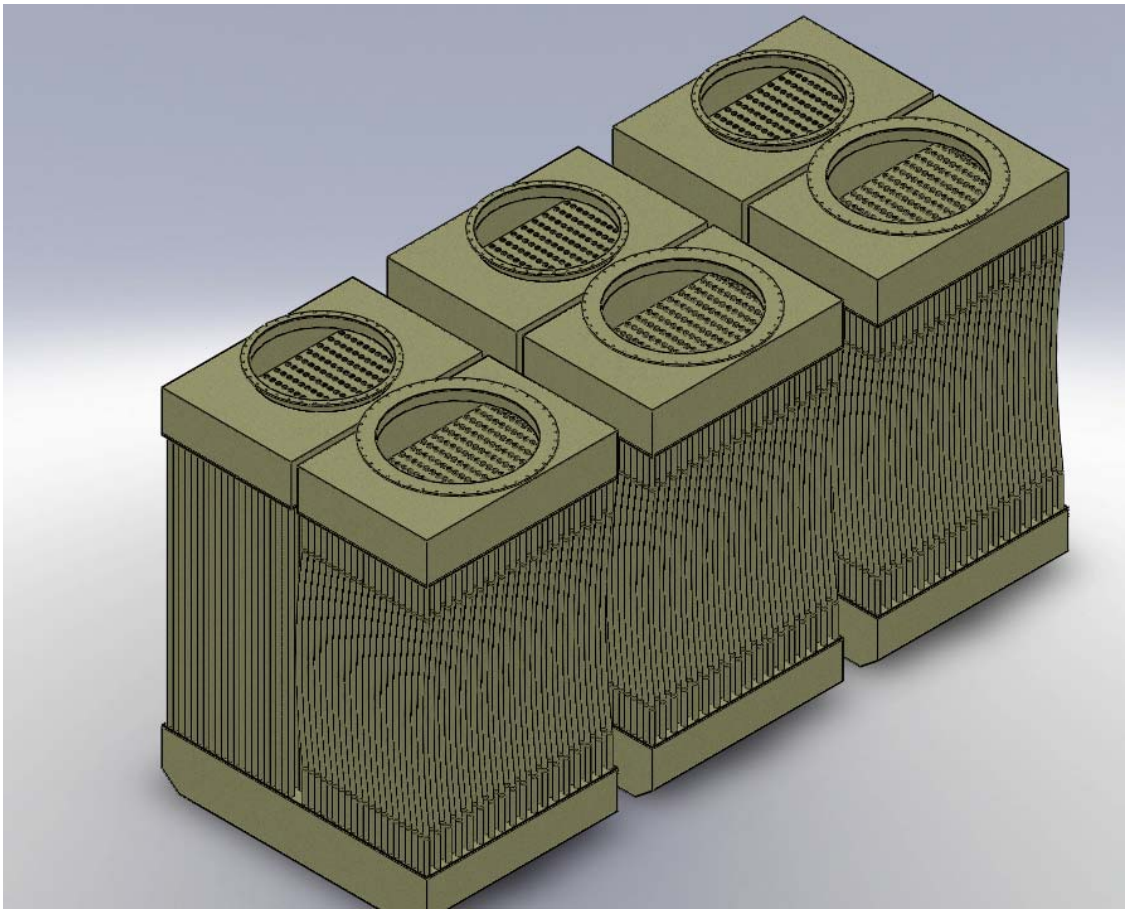
- Can handle flue gas temperature up to 1000^0C.
- Designed and developed metal alloy gills type recuperator for high temperature applications. Such recuperator have given longer life than the conventional recuperator. Expected life of the recuperator is 9-10 years.
- Pressure drop across the flue side 10-15 mm WG.
- Pressure drop across the air side 100-150 mm WG.
- Compact design. Accommodate more area in lesser space.
- Can be designed for air pre-heat temperature up to 470^0C.
- More efficient than any conventional recuperator.
- Guaranteed Efficiency as high as 70%.

PICTURES OF RECUPERATORS IN VARIOUS STAGE OF PRODUCTION.

Recuperator in Pre-assembly Stage

Side view of the Recuperator showing special alloys fins and sleeves.

Before Dispatch



The Photographs are Indicative Only.

Heat Consumption Reduces

Data	Old Recuperator	New Recuperator	Unit
Temperature of Air Exhaust	358	221	C
Air supply Temperature	361	450	C
Fuel Consumption per Hour	5,000	3,222	Lite /Hr
Annual Hour Of Operation	7,920	7,920	hr/year
Total Fuel Consumption per Annual	**39,600,000**	25,520,418	L/year
Total cost Fuel per Annual	**673,200,000**	433,847,109	Baht /year

Saving fuel cost per annual 239,352,890 Baht

	รายการ	ตัวย่อ	ค่า	หน่วย
	Before Improvement			
1	Inlet Air Energy	$E_{A,1}$	42.5	GJ/day
2	Hot Air Energy	$E_{A,2}$	751.4	GJ/day
3	Fuel Oil Consumption	$Q_{F,Old}$	5,448.0	GJ/day
4	Production	P	3,473.1	Ton/day
5	Charged Steel Energy	$E_{S,1}$	49.7	GJ/day
6	Discharged Steel Energy	$E_{S,2}$	3,030.4	GJ/day
7	Energy Recovery	$E_{R,Old}$	**708.9**	GJ/day
	$E_{R,Old} = E_{A,2}-E_{A,1}$			
8	Specific Energy Consumption	SEC_{Old}	**1,568.6**	MJ/Ton
	$SEC_{Old} = (Q_{F,Old}/P)*1000$			
9	Metal Efficiency	Eff_{Old}	**54.7**	%
	$Eff_{Old} = (E_{S,2}-E_{S,1})/Q_{F,Old}*100\%$			
	After Improvement			
10	Inlet Air Temperature	$T_{A,1}$	30.0	C
11	Hot Air Temperature	$T_{A,2}$	450.0	C
12	Air Density	*R*	1.2	kg/m^3
13	Air Specific Heating Value	C_p	1.005	kJ/kg-C
14	Fuel Oil Heating Value	LHV	41,030	kJ/kg
15	Air Volume Flow Rate (225,500 m^3/hr)	V_A	5,412,000.0	m^3/day
16	Production	P	3,473.1	Ton/day
17	Charged Steel Energy	$E_{S,1}$	49.7	GJ/day
18	Discharged Steel Energy	$E_{S,2}$	3,030.4	GJ/day
19	Energy Recovery	$E_{R,New}$	**2,284.4**	GJ/day
	$E_{R,New} = m_A*C_p*(T_{A,2}-T_{A,1})/10^6$			
20	Additional Energy Recovery	AE_R	**1,575.5**	GJ/day
	$AE_R = E_{R,New}-E_{R,Old}$			
21	Fuel Consumption Saving	m_F	**38,398.9**	kg/day
	$m_f = AE_R*10^6/LHV$			
22	Improved Fuel Oil Consumption	$Q_{F,New}$	**3,872.5**	GJ/day
	$Q_{F,New} = Q_{F,Old}-AE_R$			
23	Improved Specific Energy Consumption	SEC_{New}	**1,115.0**	MJ/Ton
	$SEC_{New} = (Q_{F,New}/P)*1000$			
24	Improved Metal Efficiency	Eff_{New}	**77.0**	%
	$Eff_{New} = (E_{S,2}-E_{S,1})/Q_{F,New}*100\%$			

ROI Alysis for High Efficiency Recoperator installtion project Of Sahaviriya Steel Industries

Sahaviriya Steel Industries wishes to improvement motor hight efficiency Project for their entire property, wherever it makes good business sense. , . We analyze the ROI on each DB individualy, as follows :

Furence		1 unit	TOTALS
Fuel Consumption	= L/Hr	5,000	5,000
Operating Hours	= Hours	24	24
Operating Days	= Days	330	365
Fuel Tariff	= Baht per Lite	17	17
Estimate Annual Fuel Cost	= Baht per annum	673,200,000	**673,200,000**
Approx Savings with hight efficiency Recuperator	= Lite per annum	14,081,760	14,081,760
Approx Savings with hight efficiency Recuperator	= Baht per anum	239,389,920	**239,389,920**
Recuperator hight efficiency Recommended		ENCON	
Number of Units Recommended	= Units	1	1
One-Time Investment Amount	= Baht	18,000,000	**18,000,000**
PayBack Period (break-even)	= Years	0.08	0.08
		1 month	**1 month**
Manufacturer's Warranty *(SPECIAL OFFER!!!)*	= Years	1	1
Equipment Lifespan	= Years	10	10
Annual Maintenance Fees (standby 24/7) *(chargeable only after Warranty Period)*	= Baht per anum	540,000	540,000
Minimum Savings Period (after Payback Period)	= Years	9.9	9.9
Total Gross Savings Potential (after Payback Period)	= Baht	2,375,899,200	2,375,899,200
Total Maintenance Fees (after Warranty Period)	= Baht	4,860,000	4,860,000
Total Nett Savings Potential (after Payback Period)	= Baht	**2,371,039,200**	**2,371,039,200**
Nett Return on Investment (ROI)	= over 10 Years	13172.4%	13172.4%
	= per annum	**1317.2%**	**1317.2%**

Project Summary

Temperatures of exhaust air reduces ion	**137 C**
Specific Energy Consumption reducesion	**453 MJ/Ton**
Fuel Oil Consumption reducesion	**1,575.5 KJ/day**
Fuel Consumption Saving	**42,665 L/day**
Fuel cost reducesion	**725,311 Baht/day**
Fuel cost reducesion	**239,352,890 Baht/year**
Improved Metal Efficiency	**22.3 %**

Project Investment

Recuperator for 275 tons/Hr Furnace 1 set 18,000,000 THB

Inclusion

Installation and commission
Installation drawing

Delivery 16 week from date of confirmed order

Terms of payment 30 % after confirmed order
50 % before delivery to factory
10 % after installation complete
10 % after commission

Material Detail

PIPE DETAILS	Material	Diameter (mm)	Thickness (mm)
Recuperator Hot Section	1.4828/ AISI-309	60.3	2.6
Recuperator Cold Section	1.4541/ AISI-321	60.3	2.6

LIST OF SOME PRESTIGIOUS CLIENTS
USING OUR "ENCON" RECUPERATORS

BHILAI ENGG. CORP. (BEC) LTD., Bhilai
BOMBAY FORGINGS LTD., Mumbai
CAMPHOR & ALLIED PRODUCTS LTD., Barielly
DHIMAN IRON & STEEL CO., Mandi Gobind Garh
ESCORTS MAHALE LTD., Bahadurgarh
FERRO ALLOYS CORPN. LTD. (FACOR), Nagpur
FORGE & FORGE (P) LTD., Rajkot
HAKIMCHAND JAICHAND FORGINGS (P) LTD., Mumbai
HINDALCO, Renukoot
HINDUSTAN LEVER LTD., Etah
INDUSTRIAL CABLES (I) LTD., Rajpura
JINDAL STRIPS LTD., Hissar
LLOYDS STEEL INDIA LTD., Wardha
MAHARASHTRA STEEL (P) LTD., Ghaziabad
MAHARASHTRA STEEL ROLLING & ENGG. WORKS, Mumbai
MARUDHAR INDS. LTD., Ahmedabad
METAL & STEEL FACTORY, Ishapore
MODI STEELS LTD., Modinagar
MOHTA ISPAT LTD., Ratlam
MOURYA UDYOG LIMITED, Faridabad
MUKAND LIMITED, Thane
NAVA KARNATAKA STEELS LTD., Bellary
NAV BHARAT STEEL ROLLING MILLS, Mumbai

NOVA UDYOG LTD., Haldwani
ORIENTAL STEEL LTD., Ballabhgarh
RAMAKRISHNA FORGINGS LTD., Calcutta
SHREE NARMADA ALUMINIUM LTD., Bharuch
SIMPLEX CASTINGS LTD., Raipur
SUPER ALLOYS (I) PVT. LTD., Faridabad
TATA SSL LIMITED, Tarapur
USHA MARTIN LIMITED, Jamshedpur
VISVESVARAYA IRON & STEEL LTD., Bhadravati

EXPORTS

ART ENGINEERING WORKS, Ndola (Zambia)
GTB COLOMBO CORP. (P) LTD., Colombo (Srilanka)
JORDAN STEELS LTD., Jordan
KENYA UNITEL STEEL CO. LTD., Mombasa (Kenya)
NALIN NAIL WORLS, Nairobi (Kenya)
ROLMIL KENYA LTD., Nairobi (Kenya)
STEEL ROLLING MILL, Kampala (Uganda)
TEMA STEEL CO. LTD., Tema (Ghana)
VOLTA IMPEX (P) LTD. (EXPORT DIVN.), Hyderabad
FIRST SOUTH CO. for Iron and Steel , Jorda

การรับประกันโครงการ และสนับสนุนจากการดำเนินการ โดย ESCO

- รับประกัน 1 ปี ของโครงการนับจากวันที่เริ่มเดินระบบ
- รับประกันผลประหยัดพลังงาน โดย ลงนามใน สัญญาพลังงาน
- ดำเนินการกู้เงินจากกองทุน ESCO FUND ในกรณี บริษัทกู้เงินลงทุน
- ดำเนินการออกเอกสารรับรองโครงการ ในการกู้เงินจากกองทุน กรณี ลูกค้าลงทุน
- ดำเนินการออกเอกสารรับรองโครงการ ขอรับเงินสนับสนุนจากรัฐบาล
- ดำเนินการประชาสัมพันธ์โครงการ และการประชาสัมพันธ์ โรงงาน (ESCO FAIR)

With best regards,

Mr. Attaporn Rojanarak
Managing Director

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