«LUKOIL-Astrahanenergo» LLC
LUKOIL Oil Company

Our ref.: 03.1.1/5-476 dated December 12, 2011

«Northern Interindustry Company
«The Alternative» Ltd
For the attention of Chief Engineer,
Technical Director
V.I. Manykovsky

Dear Vladimir Igorevich,

We forward you technical and economic conclusion of the results of CMKA® heat exchange elements installed in regenerative air heater РВП-68 of boiler unit ТПЕ-430 No.2 and in regenerative air heater РВП-88 of boiler unit ТГМЕ-464 No.4.

As a response we report that these elements have showed the high efficiency. Their application considerably increased the effectiveness of boiler units performance.

In the long term, till 2014 year we plan to replace heat exchange elements in regenerative air heater РВП-68 in boiler unit ТПЕ-430 No.1 (the year 2012) and regenerative air heater РВП-88 in boiler unit ТГМЕ-464 No.3 (the year 2014).

On the basis of the received results, CMKA® heat exchange elements are recommended to be installed at all power objects of the LUKOIL company.

Enclosure:

1. List of the main technical and economic parameters of the performance of the boiler units ТПЕ-430 No.2 and ТГМЕ-464 No.4 of Astrakhan CHP-plant-2– in 2 sheets in 1 copy.

Deputy General Director

– Chief Engineer Y.S. Pyanov

List of the main technical and economical parameters of boiler unit ТГМЕ-464 No.4 of Astrakhan CHP-plant-2

No.	Parameter	Dimension	Until repair May 15, 2011	After repair with installation of CMKA® heat exchange elements in RAH Oct. 10, 2011
1.	Type of RAH		PBB-88	PBB-88
2.	Steam capacity	tons/hour	425	425
3.	Type of fuel		gas	gas
	Fuel consumption	thousands of Nm^3/h	30.2	30.2
	Calorie content of fuel	kcal/kg	8.1542	8.1542
4.	Air inleakage into furnace	%	under blast	
	Coefficient of excess air at furnace exit	–	1.05	1.05
	Coefficient of excess air before RAH	–	1.05	1.05
	Coefficient of excess air after RAH	–	1.28	1.28
5.	Gas temperature at RAH inlet	°C	320	320
	Air temperature at boiler outlet	°C	30	30
	Gas temperature at RAH outlet	°C	131	97
	Air temperature at RAH outlet	°C	201	260
6.	RAH resistance by gas	mm of water column	90	75
	RAH resistance by air	mm of water column	100	90
7.	Temperature of exhaust gases	°C	131	97
	Heat loss with exhaust gases	%	5.36	3.62
	Boiler gross efficiency	%	94.22	95.96

Head of Operation Department D.Y.Matunin

List of the main technical and economical parameters of boiler unit ТПЕ-430 No.2 Astrakhan CHP-plant-2.

No.	Parameter	Dimension	Until repair May 17, 2010	After repair with installation of СМКА® heat exchange elements in RAH Aug. 02, 2010
1.	Type of RAH		PBB-88	PBB-88
2.	Steam capacity	tons/hour	300	300
3.	Type of fuel		gas	gas
	Fuel consumption	thousands of nm^3/h	21.3	21.3
	Calorie content of fuel	$kcal/m^3$	8.1542	8.1542
4.	Air inleakage into furnace	%		
	Coefficient of excess air at furnace exit	–	1.08	1.08
	Coefficient of excess air before RAH	–	1.08	1.08
	Coefficient of excess air after RAH	–	1.39	1.39
5.	Gas temperature at RAH inlet	°C	340	340
	Air temperature at boiler outlet	°C	30	30
	Gas temperature at RAH outlet	°C	128	102
	Air temperature at RAH outlet	°C	265	301
6.	RAH resistance by gas	mm of water column	65	50
	RAH resistance by air	mm of water column	50	40
7.	Temperature of exhaust gases	°C	128	102
	Heat loss with exhaust gases	%	5.59	4.15
	Boiler gross efficiency	%	93.83	95.27

Head of Operation Department D.Y.Matunin