

Table D4.7(1) The Results of Analysis of Components in SPM (PM10)

(Unit:ng/m³)

Component	February, 1998												Average	Component							
	January, 1998			February, 1998			March, 1998			April, 1998											
	27-28	28-29	29-30	30-31	31-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	
SPM	498.18	689.41	437.80	427.72	503.22	145.93	188.19	327.09	377.41	166.06	337.15	442.83	1322.89	256.64	790.05	1172.80	1449.27	367.93	322.06	276.77	520.93
Na	10.5	17.5	3.6	3.8	11.2	0.1	0.1	1.1	0.7	0.1	3.1	14.6	222	1.6	96.8	177	251	7.7	6.8	4.4	41.8
Mg	1.3	17.9	4.5	3.0	8.7	0.1	0.2	0.9	0.2	0.1	0.6	7.4	101	0.7	50.7	107	132	3.4	2.9	2.6	22.3
Al	7.5	143	23.1	28.5	79.6	1.2	2.1	3.9	7.5	1.3	6.7	97.8	1836	10.6	834	2305	3354	40.7	57.3	65.1	445
P	21.2	64.1	35.9	19.7	45.7	3.3	9.4	29.2	18.9	6.4	16.9	25.7	268	10.1	52.6	107	166	19.1	7.8	4.3	46.5
Cl	2.7	3.6	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.7	19.3	0.2	0.7	7.8	18.8	0.1	0.1	0.1	2.8
K	4.7	11.6	4.0	3.4	7.9	0.8	1.3	2.8	2.5	0.7	2.1	5.1	61.2	1.9	18.6	47.5	73.7	3.2	2.4	2.8	12.9
Ca	13.7	63.3	16.7	12.7	16.1	4.0	8.9	23.3	2.0	2.6	5.0	209	30.7	3.4	30.7	62.8	98.8	6.9	5.5	2.4	28.4
Sc	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.03
Ti	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.4	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1
V	0.2	0.2	0.3	0.1	0.5	0.1	0.2	0.3	0.1	0.1	0.1	0.2	0.4	0.1	0.2	0.4	0.7	0.4	0.1	0.1	0.2
Cr	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
Mn	0.1	0.1	0.1	0.0	0.1	0.0	0.8	1.1	0.1	0.1	0.2	0.5	2.6	0.1	0.7	1.0	0.9	0.1	0.1	0.1	0.44
Fe	1.2	0.1	1.9	1.3	3.1	0.4	1.1	0.9	0.2	0.4	0.8	1.4	6.5	0.9	3.7	6.1	6.8	1.6	1.0	1.4	2.03
Co	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Ni	0.1	0.1	0.1	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.0	0.10
Cu	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Zn	0.1	0.2	0.2	0.1	0.3	0.0	0.1	0.1	0.1	0.0	0.2	0.1	0.4	0.1	0.2	0.5	0.4	0.2	0.2	0.1	0.18
Ga	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Ge	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
As	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
Se	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Br	0.1	0.1	0.1	0.1	0.2	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.01
Rb	0.0	0.1	1.9	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.13
Sr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Y	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Zr	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Mo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
Rh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Pd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Ag	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Cd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Sn	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Sb	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Te	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Cs	0.3	0.9	1.3	0.7	0.7	0.0	-1.0	1.9	0.9	1.0	1.2	0.6	1.0	0.2	2.0	0.6	1.1	-0.3	1.2	0.8	0.76
Ba	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
La	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Y	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Au	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03
Hg	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03
Pb	0.4	0.8	1.3	7.8	0.9	0.1	0.2	0.5	0.5	0.3	0.3	0.3	1.5	0.3	0.7	1.3	1.8	0.7	1.1	0.2	1.1

Note:

- 1) * Indicates that the concentration is below 3 times the uncertainty.
- 2) SPM concentration is the readjusted value for zero error in the weight of the filter paper, before and after sampling.
- 3) - shows the value for big fluctuations in the data for XRF measurement accuracy, which cannot be listed. For reference purposes, part of the average value are listed.

Table D4.7(2) The Results of Analysis of Components in SPM

(Unit: ng/m³)

Component	Republics Hydrometeorological Institute (RH1)												Rail Way Station (RWS)												Component
	December, 1997				January, 1998				February, 1998				Average				Average (PM10)								
	24-25 PM10	25-26 PM10	26-27 PM10	Average	12-13 PM10	13-14 PM10	14-15 PM10	Average	16-17 PM10	17-18 PM10	18-19 PM10	19-20 PM10	20-21 PM10												
SPM	137882	182669	33213	63194	10069	171655	149602	102191	108192	104499	99638	35069	126092	118244	310487	58857	39251	97421	108192	122183	SPM				
Na	176*	283*	14.1*	51.1*	25.2*	13.6*	298*	237*	107*	124*	119*	30.0*	171*	157*	614*	41.2*	20.5*	117*	126*	184*	Na				
Mg	154*	254*	9.6*	24.1*	5.4*	1.3*	146*	135*	42.3*	56.9*	46.3*	10.3*	78.2*	85.3*	551*	29.4*	10.3*	85.7*	94.0*	154*	Mg				
Al	3815*	7517*	222*	748*	136*	4.8*	4932*	3966*	1147*	1452*	1071*	296*	2383*	2149*	4475*	124*	39.7*	542*	419*	1120*	Al				
P	180*	275*	22.8*	37.7*	13.4*	232*	195*	183*	202*	202*	202*	48.3*	206*	200*	758*	51.7*	24.0*	137*	195*	233*	P				
S	40.2*	20.8*	0.0*	10.1*	2.6*	1.1*	22.4*	24.8*	14.2*	18.8*	18.0*	4.6*	18.2*	20.9*	295*	11.1*	6.7*	47.2*	55.2*	83.1*	S				
Cl	79.4	122	4.5	26.6	6.8	0.8	91.7	74.3	36.7	46.9	46.0*	11.4*	55.6*	394	12.9	6.8	46.5*	51.1*	82.3*	82.3*	Cl				
K	139	104	2.0	15.2	3.2	5.3	88.8	132	37.7	30.9	69.4	127	7.9	65.3	145	72.0	37.1	194	225	395	K				
Ca	-0.1*	-0.1*	-0.1*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	-0.1*	0.0*	0.0*	0.0*	-0.1*	-0.1*	-0.1*	0.0*	0.0*	Ca				
Sc	0.2*	0.2*	0.2*	0.0*	0.0*	0.0*	0.0*	0.0*	0.1*	0.2*	0.1*	0.2*	0.0*	0.2*	1.9*	0.7*	0.6*	0.9*	0.9*	1.0*	Sc				
Ti	0.3	0.5	0.2	0.3	0.2	0.3	0.5	0.4	0.5	0.6	0.7	0.6	0.2	0.6	0.8	0.5	0.3	0.5	0.6	0.5*	Ti				
V	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	V				
Cz	0.9	1.9	0.2	0.5	0.4	0.0	0.8	0.8	0.8	0.9	0.9	0.3	0.8	0.8	1.0	0.5	0.5	1.6	1.3	1.0	Cz				
Mn	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Mn				
Co	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Co				
Ni	0.1	0.2	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	Ni				
Cu	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Cu				
Zn	1.1	1.0	0.2	0.2	0.1	1.8	0.6	0.6	0.5	0.5	0.5	0.7	0.5	0.5	1.3	0.6	0.6	0.9	1.1	0.90	Zn				
Ga	-0.1*	0.0*	0.6*	0.1*	0.1*	0.0*	-0.1*	-0.1*	-0.1*	-0.1*	-0.1*	0.0*	-0.1*	-0.1*	-0.2*	-0.1*	0.0*	-0.1*	-0.1*	-0.10	Ga				
Ge	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.00	Ge				
As	0.3	0.6	0.1*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	-0.2*	-0.2*	-0.3*	-0.6*	-0.32	As				
Se	0.0	0.1	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0	Se				
Br	0.3	0.3	0.0	0.2	0.1*	0.0	0.4	0.4	0.4	0.3	0.4	0.1	0.4	0.4	5.8	2.2	3.4	4.3	5.5	4.24	Br				
Rb	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.2	0.2	0.2	0.20	Rb				
Sr	0.0	0.1	0.0*	-0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.1	-0.1*	-0.1*	0.0*	0.0	-0.02	Sr				
Y	-0.1	0.0*	0.0*	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	-0.1*	-0.1	-0.06	Y				
Zr	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.1*	0.0	0.02	Zr				
Mo	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	-0.1	-0.1*	-0.1*	-0.1	-0.1	-0.10	Mo				
Rh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rh				
Pd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Pd				
Ag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Ag				
Cd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cd				
Sn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Sn				
Sb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Sb				
Te	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Te				
I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I				
Cs	-0.1*	-0.8*	0.3*	0.2*	0.4*	0.6*	1.6*	0.6*	2.3*	2.0*	2.8*	0.6	0.4	2.2	1.1	-0.3*	-0.3*	0.9*	0.0*	0.9	0.24	Cs			
Ba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Ba				
La	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	La				
W	0.0*	-0.1*	-0.1*	-0.1*	-0.1*	-0.1*	-0.1*	-0.1*	-0.1*	-0.1*	-0.1*	-0.1*	-0.1*	-0.1*	-0.2*	-0.2*	-0.1*	-0.1*	-0.2*	-0.18	W				
Au	0.1*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*	0.1*	0.1*	0.0	0.0	0.0	-0.08	Au				
Hg	0.0	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	-0.1*	-0.1*	0.1	0.0	-0.02	Hg				
Pb	2.4	2.5	0.5	0.7	6.0	1.8	1.7	1.6	1.7	1.6	1.7	2.0	1.9	1.8	18.8	8.3	11.9	14.0	17.7	14.1	Pb				

Note:

- 1) * Indicates that the concentration is below 3 times the uncertainty.
- 2) SPM concentration is the readjusted value for zero error in the weight of the filter paper, before and after sampling.
- 3) - shows the value for big fluctuations in the data for XRF measurement accuracy, which cannot be listed. For reference purposes, part of the average value are listed.

Table D4.7(3) The Results of Analysis of Components in SPM (PM10)

(Unit:ng/mc3)

Component	February, 1998												Average	Component						
	27-28	29-29	30-30	31-31	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9			9-10	10-11	11-12	12-13	13-14	14-15
SPM	29690	5235	33715	17612	20128	0	13587	10084	25664	16606	37238	26167	13587	71960	74476	81018	14593	25161	52358	29237
Na	1.6	0.1	1.6	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1	1.6	0.1	56.2	60.6	47.3	0.1	0.7	35.8	10.7
Mg	0.1	0.1	1.0	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.8	0.1	29.1	31.3	21.9	0.1	0.6	14.2	5.2
Al	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Si	2.5	0.8	3.0	1.6	3.9	0.9	0.9	0.9	1.3	1.1	1.3	15.5	0.7	368	393	338	4.6	7.7	195	69.3
P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04
S	6.3	0.1	11.7	2.6	5.2	0.9	5.8	4.9	11.3	5.3	6.3	19.1	9.4	49.8	67.4	62.8	4.9	7.3	23.3	15.5
Cl	0.6	0.1	0.3	0.3	0.2	0.1	0.2	0.1	0.2	0.1	0.2	1.1	0.3	9.9	16.0	19.9	1.0	1.5	8.8	1.3
K	1.5	0.1	1.9	1.0	1.3	0.3	0.8	0.6	1.7	0.8	1.0	3.4	2.5	17.3	24.0	19.9	1.0	1.5	8.8	1.5
Ca	2.6	0.1	4.9	1.4	1.9	0.4	2.2	0.4	3.3	0.6	1.7	4.7	1.3	30.2	38.4	17.1	1.7	3.5	15.1	6.6
Sc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ti	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.1	0.1	0.3	0.1
V	0.1	0.0	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.3	0.3	0.1	0.3	0.2	0.3
Cr	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mn	0.3	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.1	0.1	0.1	0.2	0.5	0.3	0.6	0.4	0.2	0.1	0.2	0.20
Fe	0.7	0.0	0.9	0.6	0.9	0.1	0.5	0.3	0.3	0.3	1.0	1.3	0.7	1.0	3.3	5.1	2.2	0.8	1.0	2.9
Co	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ni	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Cu	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zn	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.3	0.4	0.2	0.1	0.1	0.2	0.1
Ga	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ce	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
As	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Se	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Br	0.1	0.0	0.2	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.1	0.5	0.8	0.5	0.1	0.1	0.2	0.1
Rb	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sr	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Y	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zr	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mo	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cs	0.9	0.3	0.5	1.9	0.8	-0.3	-0.7	1.3	1.3	1.9	0.2	0.3	1.8	0.3	0.0	1.5	-0.6	1.2	0.0	0.71
Ba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
La	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	0.0	-0.1	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	-0.2	-0.09
Au	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
Hg	-0.1	0.0	-0.1	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.2	-0.1	0.0	-0.04
Pb	0.6	0.1	1.1	0.8	0.9	0.3	0.6	0.4	1.0	0.6	1.0	1.5	0.8	0.9	2.4	3.4	3.0	0.7	1.6	1.2

Note:

- 1) * Indicates that the concentration is below 3 times the uncertainty.
- 2) SPM concentration is the readjusted value for zero error in the weight of the filter paper, before and after sampling.
- 3) - shows the value for big fluctuations in the data for XRF measurement accuracy, which cannot be listed. For reference purposes, part of the average value are listed.

Table D4.8 The Results of Carbon Analysis

Stationary Sources(Dust in Stack Gas)

Heating Facilities	Fuel	Sample No.	SPM Conc. (mg/m3)	Carbon					
				C-org		C-ele		C-total	
				Conc. (mg/m3)	Content (%)	Conc. (mg/m3)	Content (%)	Conc. (mg/m3)	Content (%)
Central Heating Plant-EAST	Heavy Oil	1	40.2	-	-	15.2	37.9	-	-
		2	38.0	-	-	10.9	28.6	-	-
		3	35.6	-	-	12.1	34.0	-	-
Central Heating Plant-WEST	Heavy Oil	1	242.8	-	-	11.0	4.5	-	-
		2	176.8	-	-	58.8	33.2	-	-
		3	57.6	-	-	23.1	40.1	-	-
		4	70.0	-	-	24.1	34.4	-	-
T. H. School - "Boro Petrusevski"	Heavy Oil	1	28.9	-	-	18.7	64.7	-	-
		2	21.6	-	-	11.2	51.6	-	-
		3	31.9	-	-	8.6	26.9	-	-
T. H. School "Mihaijlo Pupin"	Light Oil	1	13.0	-	-	6.3	48.8	-	-
		2	18.0	-	-	4.2	23.4	-	-
		3	12.6	-	-	5.3	42.1	-	-
T. H. School "Nikola Tesla"	Coal	1	34.0	-	-	3.6	10.5	-	-
		2	233.0	-	-	49.1	21.1	-	-
		3	200.5	-	-	41.9	20.9	-	-
Private Houses (two seame tipe)	Firewood	1	72.3	15.9	22.0	51.7	71.6	67.6	93.6
		2	73.4	16.1	21.9	45.1	61.5	61.2	83.4
		3	30.3	12.0	39.6	9.8	32.4	21.8	72.0
		4	77.0	20.3	26.4	29.0	37.7	49.3	64.1

Note * Content (%): Ratio of component for SPM

Table D4.9 Results form the Chemical Analysis of Soil Samplers (given in %)

Element	Sample 1	Sample 2	Sample 3	Sample 4
Na	0.057	0.066	0.100	0.032
K	0.45	0.32	0.18	0.24
Ca	16.19	28.10	18.43	20.52
Mg	0.40	0.38	0.21	0.18
Fe	0.10	0.24	0.18	0.24
Zn	0.015	0.010	0.010	0.012
Mn	0.001	0.012	0.001	0.001
Pb	0.004	0.002	0.001	0.004
Cu	0.005	0.001	0.004	0.004
Co	0.001	0.001	0.001	0.001

< Chassis Dynamometer Test (Hungary ; Sajo Valley Area) >

From the result of these analyses, two driving modes were obtained as follows:

- Mode 1: Major roads
- Mode 2: Other roads

Parameter values of above two modes are shown in Table D4.10.

Table D4.10 Parameters of Traffic Flow for Emissions Mode

Term	unit	Mode No.1	Mode No.2
Average traveling speed	(km/h)	46.1	39.1
Maximum speed	(km/h)	92	78
Time at idle	(%)	3.2	8.0
Number of stops	(number/km)	0.22	0.36
Number of acceleration	(number/km)	0.42	0.75
Number of deceleration	(number/km)	0.47	0.79

< Emission Factor Test by Chassis Dynamometer >

Chassis dynamometer test was conducted at the Institute for Transport Sciences. It was carried out as a series of tests for the determination of emission factors serving for estimating the amount of air pollutants emitted by the motor vehicles running in the Sajó Valley Area.

(1) Passenger Cars

The tests of 9 passenger cars, whose main technical data are shown in Table D4.11, were conducted to determine emission factors (g/km) of HC, NO_x, CO, CO₂ and particulate matter, as well as fuel consumption rate. The test modes are as follows.

- European urban driving cycle (UN/ECE 15.04)
- Extra urban driving cycle (90 EUDC)
- Driving cycles characteristic in Miskolc (Miskolc Mode 1 and Mode 2)

Table D4.11 Technical Data of Tested Passenger Cars

No.	Car Name	Engine Type	Engine Capacity(cc)	GVW (kg)	Age (years)	Mileage (km)
1	Travant 601	2-stroke	600	1,000	4	77,900
2	Wartburg 353W	2-stroke	992	1,320	6	117,800
3	Dácia 1310	4-stroke	1,289	1,300	5	71,800
4	Lada 21053	4-stroke	1,452	1,440	0.3	2,300
5	Wartburg 1.3	4-stroke	1,272	1,320	3	28,200
6	Skoda 105	4-stroke	1,046	1,255	5	32,500
7	Opelatra 1.4i	4-stroke	1,389	1,455	0.5	6,700
8	Ford Escort	Diesel	1,608	1,300	8	128,000
9	Lada 2104	4-stroke	1,294	1,460	7	150,300

GVW;Gross vehicle weight

(2) Small Commercial Vehicles

Two small commercial vehicles whose gross vehicle weight (GVW) is 3.5 ton or less were tested. Their technical data are shown in Table D4.12. The tests were conducted in the same manner as that for passenger cars for two loading conditions : with load and without load.

Table D4.12 Technical Data of Tested Small Commercial Vehicles

No.	Car Name	Engine Type	Engine Capacity(cc)	GVW(kg)	Age(years)	Mileage(km)
1	Barkas	2-stroke	992	2,050	13	78,800
2	Mazda E 2200	Diesel	2,184	2,794	0.5	13,500

GVW;Gross vehicle weight

(3) Large Vehicles

Emissions from diesel-powered engines for large vehicles were tested using an engine test bench. Test engines are as follows :

RABA-MAN D2156 : truck and bus engine made in Hungry

KAMAZ 740 type : truck engine made in USSR

Emission factors of CO, HC and NO_x were determined according to the UN/ECE regulation No. 49.

(4) Test Result

The results of the chassis dynamometer test are shown in Table

Table D4.13 Emission Factors for Estimation of Pollutant Emissions

Unit :g/km

Pollutant	Kind of Cars	Test Modes		
		MISKOLC1	MISKOLC 2	ECE NO.49
SO ₂	Passenger car	0.044	0.047	-
	Small truck	0.068	0.073	
	Bus	-	-	1.546
	Large truck			1.374
NO _x	Passenger car	0.797	0.802	-
	Small truck	0.855	0.992	
	Bus	-	-	16.585
	Large truck			14.742
CO	Passenger car	6.99	7.76	-
	Small truck	7.94	8.41	
	Bus	-	-	7.39
	Large truck			7.57

Table D4.14(1) Summary results of Questionnaire for Community Cair

No.	Plant name and Address	Type of ind.	Operati on rate	Emplo yee	Main prod.	Output	Install. power (MW)	Kind of fuel	Fuels used (in kg/h)	Kind of pollutants emitted; gas /	No boilers	No of stacks	Stack height, m	Stack Id., m	Vol. of effluent gas Nm ³ /h	Total vol. flow (in Nm ³ /h)	Velocity m/s	
Primary Schools																		
1	Vasil Glavinov	Education	-	65	-	-	1.22	L. Oil	80	SO ₂ , NO _x , CO	2	1	14	1.0	675	1285		
2	Dzon Kenedi 20	Education	-	64	-	-	1.10	L. oil	100	SO ₂ , NO _x , CO	2	1	10	0.50	580	1160		
3	Rajko Zinzifov M. Mitrevski bb	Education	-	76	-	-	1.16	L. Oil	100	SO ₂ , NO _x , CO	2	1	14	0.60	610	1220		
4	Peaar Zdravkovski II Mak. Brigada bb	Education	-	59	-	-	1.20	L. oil	500 L/d 11 t/month	SO ₂ , NO _x , CO	2	1	10	0.60	630	1260		
5	Panajot Ginevski Ul. Ferid Bajram, No. 30	Education	-	68	-	-	1.60	L. Oil	270	SO ₂ , NO _x , CO	4	2	5	0.40	630	1683		
6	Zivko Brajkovski Ho Si Min bb	Education	-	55	-	-	1.66	L. Oil	140	SO ₂ , NO _x , CO	2	1	9	0.70	374	1748		
7	Kliment Ohridski Prizrenska bb 26 Juli	Education	-	104	-	-	1.18	L. oil	80	SO ₂ , NO _x , CO	2	1	20	0.40	610	1242		
8	Orizare bb Braca Ramiz Hamid Suto Orizare bb	Education	-	93	-	-	0.80	L. Oil	60	SO ₂ , NO _x , CO	2	1	14	0.60	420	840		
9	Idnina II Mak. Brigada 3	Education	-	55	-	-	0.81	L. Oil	170	SO ₂ , NO _x , CO	4	2	5	0.40	316	856		
10	Nikola Vapcarov 212 bb	Education	-	64	-	-	0.81	L. Oil	80	SO ₂ , NO _x , CO	1	1	8	0.40	420	840		
11	Aco Sopen Radisanska bb	Education	-	58	-	-	5.3	Coal	-	SO ₂ , NO _x , CO PM	2	1	10	1.50	-	-		
Kinder - giten																		
12	Snezana. Dzon Kenedi 1	Care&Ed.	-	43	-	-	0.60	L. oil	60	SO ₂ , NO _x , CO	2	1	10	0.50	316	632		
13	Snezana, K-1 Nikola Grcevo 3	Care&Ed.	-	94	-	-	0.60	L. Oil	60	SO ₂ , NO _x , CO	1	1	8	0.50	420	632		
14	Snezana, K-2 Suto Orizari bb	Care&Ed.	-	94	-	-	0.40	L. oil	40	SO ₂ , NO _x , CO	1	1	10	0.50	316	420		
15	11 Oktomvri Radisanska bb	Care&Ed.	-	20	-	-	0.73	L. Oil	55	SO ₂ , NO _x , CO	2	2	15 10	0.30 0.20	390	760		
16	Rosica Resenska bb	Care&Ed.	-	22	-	-	0.40	L. Oil	30	SO ₂ , NO _x , CO	1	1	10	0.50	420	420		
17	Bratvo-Edinstvo Ferid Bajram 28	Care&Ed.	-	40	-	-	0.30	L. Oil	50	SO ₂ , NO _x , CO	2	1	14	0.50	316	316		
18	Brats.Edinstvo. K-S.P Nataniei Kuceviski bb	Care&Ed.	-	13	-	-	0.10	L. Oil	10	SO ₂ , NO _x , CO	1	1	7	0.30	105	105		
19	Br.Ed K-NK Nataniei Kuceviski bb	Care&Ed.	-	16	-	-	0.50	L. Oil	30	SO ₂ , NO _x , CO	2	1	12	0.80	263	326		
20	11 Oktomvri II Mak. Brigada bb	Care&Ed.	-	22	-	-	0.60	L. Oil	50	SO ₂ , NO _x , CO	2	1	6	0.50	316	632		
High Schools																		
21	Arseni Jakov Cvetan Dimov 17	Education	-	131	-	-	1.2	L. Oil	120	SO ₂ , NO _x , CO	2	2	14	0.40	632	1264		
22	Cvetan Dimov Dzon Kenedi bb	Education	-	97	-	-	1.55	L. Oil	110	SO ₂ , NO _x , CO	2	1	12	1.0 x 0.80	1054	1634		
Med. & Care																		
23	Pension home Dzon Kenedi 18	Care	-	60	-	-	0.80	L. Oil	60	SO ₂ , NO _x , CO	2	1	15	0.60	-	-		

Table D4.14(2) Summary results of Questionnaire for Community Cair

No.	Plant name and Address	Type of ind.	Operati on rate	Emplo yee	Main prod.	Output	Instail. power (MW)	Kind of fuel	Fuels used (in kg/h)	Kind of pollutants emitted; gas I	No of boilers	No of stacks	Stack height; m	Stack Id., m	Vol. of effluent gas Nm ³ /h	Total vol. flow (in Nm ³ /h)	Velocity m/s
24	Rehabilitation center II Mak. Brigada bb	Med. care	-	72	-	-	3.60	Oil	240	SO ₂ , NO _x , CO	3	1	10	0.50	1260	3780	
25	Rehab. Center 25 May Pear Mandzukov bb	Med. Care	-	25	-	-	1.07	Oil	80	SO ₂ , NO _x , CO	2	2	15 10	0.30 0.20	890	890	
26	Ambulance Kraiska I	Health Protect.	-	35	-	-	0.15	Oil	20	SO ₂ , NO _x , CO	1	1	5	0.20	160	160	
27	Ambulance Car Nov zivot bb	Health Prot.	-	62	-	-	0.70	Wood	4 m ³ /day	SO ₂ , NO _x , CO	2	1	15	0.80	458	916	
28	Ambulance Car II Mak. Udama brig. 50	Health Prot.	-	162	-	-	1.37	L. oil	500 L/d	SO ₂ , NO _x , CO 271 °C	2	1	15	0.30	900	1550	0.16
Other communal institutions																	
29a	Post Cair. Ul. OrceNikolov b.b.	Post&Com	-	104	-	-	0.50	L. oil	50 l/h	SO ₂ , NO _x , CO 80 °C	2	1	20	0.30	316	316	
29b	Post Suto Orizari	Post&Com	-	4	-	-	0.100	L. oil	15 l/h	SO ₂ , NO _x , CO	1	1	12	0.25			
29c	Post Radisani	Post&Com	-	4	-	-	0.100	L. oil	15 l/h	SO ₂ , NO _x , CO	1	1	12	0.25			
30	Police Station Butelska bb	Police	-	-	-	-	0.08	Oil	8	SO ₂ , NO _x , CO	1	-	-	-	82	82	
31	Jail Skopje Suto Orizari bb	Police	-	78	-	-	1.78	L. oil	80	SO ₂ , NO _x , CO 243 °C	2	1	12	0.60	250	500	
32	Electrodistribut. Leninova 45	Electro-distribut.	-	95	-	-	3.75	L. oil	130 L/h	SO ₂ , NO _x , CO 226.7 °C	2	1	10	0.50	2250	3000	
Industry																	
33	Textile factory Nase Dete Butelska bb	Textile Co.	Bank-rupt	-	Textil e	-	0.11	Oil	10	SO ₂ , NO _x , CO	2	1	10	0.50	116	116	
34	Water Supply 6 Septemvri bb	Water suppl.	-	-	Water suppl.	-	3.49	Oil	300	SO ₂ , NO _x , CO 189 °C	2	2	15	0.30	1833	3133	
35	Textile factory Skoteks Tane Hristov bb	Textile Co.	Bank-rupt	-	Textil e	-	2.20	H. oil	50	SO ₂ , NO _x , CO	1	1	10	0.50	612	612	
36	Bakery 8 March Mak.-kos. Brigada b.b.	Bakery	-	202	Bread	26.118 t	4.50	L. oil (D-2)	350 L/h	SO ₂ , NO _x , CO 130 °C	3	1	15	0.60	3970	5550	5.3-6.0
37	Porc. factory IGM Bosna i Hercegovina bb	Ceramics& porcelain	70%	1130	Comm. &por.	111 mil. pieces	3.20	H. Oil	561	NO, PM, SO ₂ , CO, 90-160°C	11 (3 process furnaces)	3	7	1.0	69755	69755	12.8-17.8

Table D4.14(3) Summary results of Questionnaire for Community Cair

No.	Plant name and Address	Type of ind.	Operation rate	Emp-loyee	Main prod.	Output	Install. power (MW)	Kind of fuel	Fuels used (in kg/h)	Kind of pollutants emitted, gas temperature	No boilers	No of stacks	Stack height, m	Stack Id., m	Vol. of effluent gas Nm ³ /h	Total vol. flow (in Nm ³ /h)	Velocity m/s	
Primary Schools																		
38	Mirce Acev Meckin kamen bb	Education	-	61	-	-	1.395	L. Oil	140	SO ₂ , NO _x , CO 200 °C	2	1	13	0.80	675	1285		
39	Kaco Racin Lihnda b.b.	Education	-	74	-	-	0.50	L. oil	132	SO ₂ , NO _x , CO	4	4	10	0.50	516	2064		
40	Gj. Petrov 4 Juli 131	Education	-	43	-	-	1.162	L. Oil	100	SO ₂ , NO _x , CO	2	1	12	0.80	610	1220		
Kinder - giten																		
41	C-G Vbae Franc Presem 65	Care&Ed.	-	20	-	-	0.2	Oil	16	SO ₂ , NO _x , CO	2	1	10	0.60	630	1260		
42	C-G Gj. Petrov I Meckin kamen bb	Care&Ed.	-	20	-	-	0.522	Oil	26	SO ₂ , NO _x , CO	5	2	10	0.60	630	1683		
43	C-G Gj. Petrov II 4 Juli bb	Care&Ed.	-	20	-	-	0.186	Oil	20	SO ₂ , NO _x , CO	2	1	12	0.50	874	1748		
44	C-G G. Rostica Isajja Mazovskij 35	Care&Ed.	-	20	-	-	0.302	Oil	16	SO ₂ , NO _x , CO	2	1	12	0.50	610	1242		
Care and Health Protection																		
45	Gerontological center 4 Juli, 129	Care&Med.	-	182	-	-	1.162	Oil	102	SO ₂ , NO _x , CO	2	1	10	0.60	663	1326		
46	Ambulance G. Petrov G. Petrov b.b.	Care&Ed.	-	32	-	-	0.151	L. oil	15	SO ₂ , NO _x , CO	1	1	10	0.60	159	159		
47	Polyclinic G. Petrov	Care&Ed.	-	170	-	-	1.20	Wood -coal	-	SO ₂ , NO _x , CO 271 °C	3	1	20	0.60	1440	4320		
Posts																		
48a	Post Gj. Petrov	Post&Com.	-	66	-	-	2x0.29 =0.58	-	20 L/h 600 l/mth	SO ₂ , NO _x , CO 60 °C	2	1	15	0.30	-	-		
48b	Post Saraj	Post&Com.	-	4	-	-	0.100	L. oil	15 l/h	SO ₂ , NO _x , CO	2	1	12	0.25	316	632		
48c	Post Volkovo	Post&Com.	-	4	-	-	0.100	L. oil	15 l/h	SO ₂ , NO _x , CO	1	1	12	0.25	420	632		
Industry																		
49	Chem. Factory ADING	Construction and Chem. Co.	-	120	Additives, Chemicals for constr.	-	0.95	Coal	-	SO ₂ , NO _x , CO	2	1	10	0.50	542	1084		
50	Copper factory KUPROM	Cu&Cu-alloys products	20%	25	Cu&Cu-alloys products	-	2.0	L. Oil	100	SO ₂ , NO _x , CO	2	2	20	0.50	910	1820		
51	Textile factory Voin Draskovic VELUFLOK	Textile fac. Hrom bb	Bankrupt	-	Cloths	-	2.4	H. oil	120 20 t/y	SO ₂ , NO _x , CO	2	2	10 m	0.40	1370	2740		
52	Constr. Comp. Mavrovo	Exploitation & maintenance vehicles	-	531	Maintenance of constr. vehicles	-	3.48	H. oil	150	SO ₂ , NO _x , 199.5 °C	3	3	15	0.4	1222	3666		
53	TEHNOGAS Proleterska 4	Gas prod.	-	225	Tech. Gas (O ₂ , N ₂ , CO ₂)	-	1.180	L. oil (D-2)	105 l/h 2100 l/moth	SO ₂ , NO _x , CO	3	1	10	0.40 0.53	610	1200	0.8	
54	Constr. Comp. Karpos Proleterska 28	Construction materials	60%	500	Constructi on materials	75,000 t	5.8	H. oil	685	SO ₂ , NO _x , CO 200-250 °C	1	1	7.5	0.60	6081	6081	10.5	

Table D4.14(4) Summary results of Questionnaire for Community Cair

No.	Plant name and Address	Type of ind.	Operation rate	Emp-loyee	Main prod.	Output	Install. power (MW)	Kind of fuel	Fuels used (in kg/h)	Kind of pollutants emitted; gas temperature	No boilers	No of stacks	Stack height, m	Stack id., m	Vol. of effluent gas Nm ³ /h	Total vol. flow (in Nm ³ /h)	Velocity m/s
55	KOLEKTIV ul. 1409 No 3	Plastic	18%-97	105	Products from plastics	700 t	1.20	L. oil	120	SO ₂ , NO _x , CO	2	2	15	0.18	574	1148	
56	SLOVIN-Jugokoka Sarplaninska bb	Beverage prod. Co.	-	109	Non-alcoholic beverage	9,000,000 t	1.673	H. oil	102	SO ₂ , NO _x , CO 153-210 °C	3	2	12	0.60 0.80	611	1763	
57	Chem. and Cosm. co. ALKALOID	Chem. and cosmetic	-	1800	Chemicals, cosmetics		6.97	H. oil	1,100	SO ₂ , NO _x , CO, PM 226 °C	2	2	8.8 9.5	0.60 0.80	11954	11954	10.3
58	Novoselski pat bb	Construction	90%	1900	Construction	-	2.905	H. oil	70	SO ₂ , NO _x , CO	3	1	10	0.50	1194	3051	
59	Constr. Co. Beton Novoselski pat bb	Bakery	-	38	Bread	3456 t		L. oil	30	SO ₂ , NO _x 190 °C	3	1	8	0.30	330	330	
59	Bakery Zito luks - 9-Gj, Petrov Vele Markov 4	Bakery	-	113	Bread	540 t	1.0	L. oil (D-2)	40	SO ₂ , NO _x 140 °C	2	1	11	0.30	440	440	
60	Bakery Zito luks 9/13 Praska 11	Central heating	40.9 %	25	Heat energy	185,000 MWh	170.97	H. oil	18,29 t/h.	SO ₂ , NO _x , CO, PM 260-300 °C	6	3	30; 30; 32	1.0; 1.0; 2.3	176,000	242,000	23

Table D4.14(5) Summary results of Questionnaire for Community Cair

No.	Plant name and Address	Type of ind.	Operation rate	Emp-loyee	Main prod.	Output	Install. power (MW)	Kind of fuel	Fuels used (in kg/h)	Kind of pollutants emitted; gas temperature	No boilers	No of stacks	Stack height, m	Stack Id., m	Vol. of effluent gas Nm ³ /h	Total vol. flow (in Nm ³ /h)	Velocity m/s	
Primary Schools																		
61	Tefejuz Cairska bb	Education	-	68	-	-	1.16	L. Oil	100 g/mo	SO ₂ , NO _x , CO	2	1	15	1.0	613	1226		
62	Braštvo Edinrvo Cvetan Dimov bb	Education	-	25	-	-	0.60	L. Oil	40	SO ₂ , NO _x , CO	2	1	8	0.60	306	612		
63	Lirija Cvetan Dimov 94	Education	-	90	-	-	2.76	L. Oil	200	SO ₂ , NO _x , CO	3	1	16	0.60	1104	2820		
64	Cvetan Dimov Panec Nedelkovski bb	Education	-	47	-	-	1.30	L. Oil	100	SO ₂ , NO _x , CO	3	1	12	0.50 x 0.40	735	1347		
65	Dane Grujev Kosta Abrasevic 3	Education	-	80	-	-	1.16	Oil	80	SO ₂ , NO _x , CO	2	2	15	0.50	612	3211		
66	Lirija II Petar Georgiev bb	Education	-	26	-	-	1.50	L. Oil	66	SO ₂ , NO _x , CO	3	1	12	0.60	1054	1224		
67	C-G Cvet	Care&Ed.	-	23	-	-	1.0	Oil	40	SO ₂ , NO _x , CO	2	1	10	0.50	240	480		
Hotels and houses																		
68	Student house KJP Ivo Lola-Ribar 58	Stud. dormitory	-	4	-	-	2.895	H. oil	150 4 l/mo	SO ₂ , NO _x , CO 246 °C	3	1	35	1.0	1020	3005		
69	Hotel Grand Mosa Pjace bb	Hotel	-	120	-	-	2.40	Oil	170	SO ₂ , NO _x , CO	2	2	35	0.60	1264	2414		
70	Hotel Jadran 27 Mari 8	Hotel	-	26	-	-	0.41	Oil	20	SO ₂ , NO _x , CO	1	1	20	0.50	650	650		
71	Hotel Britsol Marzal Tito bb	Hotel	-	30	-	-	0.30	Oil	30	SO ₂ , NO _x , CO	1	1	20	0.50	280	280		
72	Hotel Turist Marzal Tito bb	Hotel	-	40	-	-	1.20	Oil	120	SO ₂ , NO _x , CO	2	1	22	0.50	680	1290		
73	Hotel Panorama Salvador Alende bb	Hotel	-	76	-	-	1.626	L. oil	100	SO ₂ , NO _x , CO	2	1	20	0.50	857	1714		
74	Hotel Skala Triglavska bb	Hotel	-	66	-	-	2.094	L. oil	140	SO ₂ , NO _x , CO	2	1	30	0.60	1100	2208		
Care & Med. Prot.																		
75	Rehabilitation medical depart. Savska 28		-	220	-	-	2.30	H. Oil	300	SO ₂ , NO _x , CO	2	2	12	0.40	1214	2428		
76	Clinic Center Vodnjanska 17		-	250	-	-	27.0	H. oil	12000	SO ₂ , NO _x , CO, PM 210-290 °C	4	4	20	0.50	9500	25500		
77	Medical Ginecol. Center - Cair Dizonska bb		-	220	-	-	3.0	H. oil	240	SO ₂ , NO _x , CO, PM 255 °C	2	1	24	0.50	1620	3211		
Posts																		
78	Telecom. Center Orce Nikolov bb		-	1537	-	-	4.0	L. oil	100 70l/mo	SO ₂ , NO _x , CO 60 °C	2	1	60	1.0	2450	4557		
78	Central Post		-	315	-	-	-	-	-	-	-	-	-	-	-	-	-	
Industry																		
79	Text. Comp. Makedonija sport 50 Divizija 12	Textile co.	-	420	Cloths	-	1.16	L. oil	60	SO ₂ , NO _x , CO 147.8 °C	2	1	15	4.0	608	-		
80	Graphic Comp. Goce Delcev 8-ma Udarna Brig.	Graphics& printing	-	-	Printed materials	-	-	-	-	SO ₂ , NO _x , CO	3	2	15	0.60	1070	1670		

Table D4.14(6) Summary results of Questionnaire for Community Cair

No.	Plant name and Address	Type of ind.	Operation rate	Emp-loyee	Main prod.	Output	Install. power (MW)	Kind of fuel	Fuels used (in kg/h)	Kind of pollutants emitted; gas temperature	No of boilers	No of stacks	Stack height, m	Stack id., m	Voi. of effluent gas Nm ³ /h	Total vol. flow (in Nm ³ /h)	Velocity m/s
81	Mebel fac. Treska	Furniture	43 %	514	Furniture		6.75	Wood H. oil	800 300	SO ₂ ; NO _x ; CO; PM	3	3	30; 16; 12	0.65	5796	5796	
82	Ivo Lela Ribar 130 Tobacco factory	prod. co. Tobacco fac.	42%	474	Cigarette	2098t	0.522	L. oil H. oil	260 240	SO ₂ ; NO _x ; CO 260-300 °C	7	5	35	0.35	1300	4600	7.3-17.1
83	Bakery Zito luks Vasil Gjorgov 11	Bakery		48	Bread	300 t	0.80	L. oil	80	SO ₂ ; NO _x ; CO 220 °C	4	1	18	0.60	300	300	3
84	Heating plant Park Londonska bb	Central heating	36.6 %	4	Heating energy	8700 MWh	8.95	H. oil	900	SO ₂ ; NO _x ; CO; PM 220 °C	2	1	15	0.50	11570	11750	23.6
85	Heating plant Vodno Londonska bb	Central heating	Preservate d		Heating energy		4.00	H. oil	-	SO ₂ ; NO _x ; CO	2	2	15	0.60	1800	3600	

Table D4.14(7) Summary results of Questionnaire for Community Cair

No.	Plant name and Address	Type of ind.	Operation rate	Emp-loyee	Main prod.	Output	Instal. power (MW)	Kind of fuel	Fuels used (in kg/h)	Kind of pollutants emitted; gas temperature	No boilers	No of stacks	Stack height, m	Stack Id., m	Vol. of effluent gas Nm ³ /h	Total vol. flow (in Nm ³ /h)	Velocity m/s	
Primary Schools																		
86	Gligor Priliciv	Education	-	33	-	-	0.63	Oil	90	SO ₂ ; NO _x ; CO	4	4	6	0.30	400	670		
87	Gemidziska bb Krate Misirkov	Education	-	35	-	-	0.36	Oil	100	SO ₂ ; NO _x ; CO	4	2	8	0.50	600	800		
88	Srecko Puzelko bb 25 May	Education	-	110	-	-	1.16	Oil	80	SO ₂ ; NO _x ; CO	2	1	12	0.60	611	1222		
89	Aljia Avdovic bb Dana Kravec Madzari bb	Education	-	62	-	-	1.13	L. oil	60 8.5 t/mon.	SO ₂ ; NO _x ; CO 220 °C	2	1	15	0.50	611	1191		
90	Naum Naumovski Borce	Education	-	51	-	-	1.16	L. oil	20	SO ₂ ; NO _x ; CO	2	1	15	0.50	611	1222		
91	Madzari 25 Vera Jovic Berski bb	Education	-	42	-	-	1.16	L. Oil	100	SO ₂ ; NO _x ; CO	2	1	8	0.30	611	1222		
Kindergarten																		
92	Deaska radost Bapcor 2	Education & Care	-	76	-	-	0.60	L. oil	60	SO ₂ ; NO _x ; CO 200 °C	2	1	10	0.50	316	632		
93	25 May I Srecko Puzalka 136	Education & Care	-	43	-	-	0.46	L. oil	50 t/mo	SO ₂ ; NO _x ; CO 383 °C	2	2	15	0.60	242	484		
94	25 May II Katlanovska bb	Education & Care	-	17	-	-	0.46	L. oil	50 t/mo	SO ₂ ; NO _x ; CO 383 °C	2	1	40	0.60	242	484		
95	25 May III Razloska bb	Education & Care	-	21	-	-	0.46	L. oil	50	SO ₂ ; NO _x ; CO 365 °C	2	2	35	0.60	242	484		
96	25 May IV Palmito Toljati bb	Education & Care	-	18	-	-	0.31	L. oil	24	SO ₂ ; NO _x ; CO 275 °C	2	1	10	1.0	170	328		
97	25 May V Modest Musorgski bb	Education & Care	-	18	-	-	0.30	L. oil	50	SO ₂ ; NO _x ; CO 412 °C	2	2	25	0.60	158	316		
High Schools																		
98	HS EMUC Nikola Tesla Bul. Edvard Kardelj 24	Education	-	103	-	-	-	Coal & Wood L. oil	1 t/d 0.25	SO ₂ ; NO _x ; CO; PM 92 °C (coal) 177 °C (oil)	9	1	10	1.05	-	5325		
99	HS ETUC Edvard Kardelj bb	Education	-	55	-	-	1.98	H. oil	100	SO ₂ ; NO _x ; CO	2	1	20	0.70	1475	2086		
100	HS ASUC Edvard Kardelj 26	Education	-	136	-	-	3.0	L. oil	120 60 t/y	SO ₂ ; NO _x ; CO; PM	2	2	15	0.61	1170	2340		
101	Home Sentic	Education	-	41	-	-	2.12	L. oil	100	SO ₂ ; NO _x ; CO 150 °C	2	1	8	0.50	1330	2194		
Others communal institutions																		
102	Hotel Continental A. Makedonski bb	Hotel	-	164	-	-	1.90	L. oil	130	SO ₂ ; NO _x ; CO 156-165 °C	2	1	25	1.0	1030	1870		
103a	Post Cento-TC	Hotel	-	265	-	-	0.40	L. oil	30	SO ₂ ; NO _x ; CO	2	2	15	0.25	70	140		
103b	Post Cento		-	45	-	-	0.25	L. oil	30 900/month	SO ₂ ; NO _x ; CO	2	1	12	0.25	70	140		
104	Custom Direction	Administ.	-	314	-	-	0.72	L. oil	80 (10 t/mo)	SO ₂ ; NO _x ; CO 140 °C	1	1	25	0.65	740	740		
105	Politicins Cento	Medic. care	-	120	-	-	0.46	L. oil	45	SO ₂ ; NO _x ; CO	2	1	10	0.30	242	484		
105a	Ambulance Mladinovi	Medic. care	-	11	-	-	-	L. oil	10 100 l/d	SO ₂ ; NO _x ; CO	5	5	3	0.10	-	-		

Table D4.14(8) Summary results of Questionnaire for Community Cair

No.	Plant name and Address	Type of ind.	Operation rate	Emp-loyee	Main prod.	Output	Install. power (MW)	Kind of fuel	Fuels used (in kg/h)	Kind of pollutants emitted; gas temperature	No boilers	No of stacks	Stack height, m	Stack ld., m	Vol. of effluent gas Nm ³ /h	Total vol. flow (in Nm ³ /h)	Velocity m/s
105b	Ambulance Aracinovo	Medic. care	-	21	-	-	0.5	L. oil	50	SO ₂ , NO _x , CO	1	1	6	0.10			
105c	Ambulance Iinden	Medic. care	-	17	-	-	0.5	L. oil	30	SO ₂ , NO _x , CO	1	1	6	0.10			
105d	Ambulance Petrovec	Medic. care	-	24	-	-	0.5	L. oil	50	SO ₂ , NO _x , CO	2	1	13	0.10			
106	Metall Constr. Co. MZT	Metall. Constr.	75%	327	Machines	2660 t	24.75	Coke Oil	1.4. Ud 2550	SO ₂ , NO _x , CO	6	2	18	0.90	6200	6811	
107	Textile fact. Tekstil	Textile prod.	-	120	Textile		2.90	L. oil	150	SO ₂ , NO _x , CO	4	2	15	0.80	1220	1830	
108	25 Maj	Textile prod.	-	-	Textile		1.68	Oil	140	SO ₂ , NO _x , CO, PM	2	2	20	0.40	885	1770	
109	Ranka Milanovic	Textile	-	-	Textile		0.93	Oil	85	SO ₂ , NO _x , CO	1	1	16	0.64	520	520	
110	Rubber Co. Autoguma	Rubber prod.	-	91	Rubber vulc.	2088 t	1.00	Coal & Wood	100	SO ₂ , NO _x , CO	1	1	16	0.64	2480	2480	
111	Beer Co. Pivara	Beer and other Beverage	52%	419	Beer & non-alcohol. beverage	1.1 mil hl	16.0	H. oil	1600 4500/moth Gas	SO ₂ , NO _x , CO, PM 230-250 °C NO _x , CO (240 °C)	2	2	7	0.70	9144	18288	9.23
112	Pharmaceutics Co. Alkaloid	Pharmaceutics	-	1800	Drugs	11800 t	12.55	H. oil	1800	SO ₂ , NO _x , CO, PM 150-210 °C	3	3	2x9 1x12	0.50 0.70	7650	12920	5.0-7.5
113	Color factory Alkaloid Bul. A. Makedonski 12	Color&coating prod.	-	1800	Colors, coating mat.		16.50	H. oil	1150	SO ₂ , NO _x , CO, PM 210-250 °C	4	4	2x18 2x15	0.60 0.40	4640	6856	7.42
114	Bakery Zitolluks	Bakery	-	134	Bread	6126 t	2.73	L. oil	150	SO ₂ , NO _x , CO 130-190 °C	1	1	12	0.50	3060	4590	4.27
115	Miekkara AD Blagoja Stefanovski 140 AD Gazela	Milk Co.	20%	158	Milk and Milk products	3600 t	2.80 2.80		150 150	SO ₂ , NO _x , CO 230 °C	2	1	40	1.0	2950	2950	
116	Leader factory	Leader factory	33% shoes 51% rubber	914	Prod. & remakin g of leader	232000 shoes 777 t	15.20	H. oil	1100	SO ₂ , NO _x , CO	3				3690	7380	
117	AD Komuna Romanija bb	Paper ind.	61%	673	Prod. & remakin g of paper	13,844 t	15.00	H. oil	350	SO ₂ , NO _x , CO, PM 210-250 °C	5	2	12	1.0	13100	13100	8.1
118	Textile fact. Makedonski folklor	Carpett prod.	17%	430	Carpett prod.	200000 m ²	12.10	H. oil	650	SO ₂ , NO _x , CO, PM 210-250 °C	2	2	20	0.40	6100	12000	11.0
119	Chocolate factory Evropa	Sweet prod.	65%	635	Chocol., others sweets	6400 t	3.72 1.80 1.5	H. oil L. Oil Gas	450 210 54 m ³ /h	SO ₂ , NO _x , CO, PM 210-250 °C	2	2	12	0.625	4800	4800	6.62
120	Leader Co. Kozara	Leader prod.	56%	816	Leader	6050 t	9.70	H. oil or Gas	1200 7000m ³ /h	SO ₂ , NO _x , CO 200-230 °C	5	5	19	2x0.80 3x06.0	10421	10421	10.87
121	Petrol Refinery OKTA	Petrol refinery	15%	1263	Gasoline L. oil, H. oil	374000 t	150	H. oil Gas	97 1400 2900	SO ₂ , NO _x , CO 250-280 °C	2	1	150	4.0	70000 (28000-97)	140000	
121a	Petrol Refinery OKTA - TE Power	Heating water and electricity	60%	150	Heating water	45 t	30	H. oil	97 3200	SO ₂ , NO _x , CO 180-200 °C	2	1	80	3.35	75000 (41000-97)	150000	

Table D4.14(9) Summary results of Questionnaire for Community Cair

No.	Plant name and Address	Type of ind.	Operation rate	Employee	Main prod.	Output	Install. power (MW)	Kind of fuel	Fuels used (in kg/h)	Kind of pollutants emitted, gas temperature	No boilers process furnaces	No of stacks	Stack height, m	Stack id., m	Vol. of effluent gas Nm ³ /h	Total vol. flow (in Nm ³ /h)	Velocity y m/s
122a	Iron&Steel Co. Topolnica	FeMn and SiMn prod.	52%-97	190	SiMn FeMn	27800t 2200 t	180	H. oil Coke	16300 3000	SO ₂ , NO _x , CO; PM 15-50 °C	2 process furnaces	2	45.5	0.60	36880	790317 158317	
122b	Iron&Steel Co. Energetika	Energetics	10 %	145	-Electric power -Heating -Stream	40 GWh/y		H. oil & Gas	4.1 t/h 2800 t/mo	SO ₂ , NO _x , CO; PM 160 °C	5	3	60	3.0	70000	210000	50
122c	Iron&Steel Co. Makstil	- Steel prod. - Hot rolling steel sheets	9.56 % steel 45%	391 515 (904)	-Steel -Rolled steel	28675 t 170000 t		Coke, Gas H. oil	58 Nm ³ /h 3 t/h (1500t/mo)	SO ₂ , NO _x , CO; PM 100 °C SO ₂ , NO _x , CO; PM 200 °C		1 2	35 30	0.60 1.0	160000 30000		
122d	Iron&Steel Co. Baikan Steel	Strip rolling	7.5 % (1997)	300	strip rolled sheets	60000 t (60000t - June 1998)		H. oil	55 kg/t steel	SO ₂ , NO _x , CO; PM 325 °C	-	2	30	1.0			
122e	Iron&Steel Co. Baikan Steel	Cold rolling steel	30%- '97	720	cold rol., painted and Zn-covered sheets	200000 t - '97 500000 - '98		Oil and Gas		SO ₂ , NO _x , CO; PM 53-57 °C	-	8	2 3 3	1.0 0.60 0.60	46836	46836	11.95
123	Central Heating plant- EAST Londonska bb	Central heating	52.3 %	110	Heating energy	405000 MWh	293.9	H. oil N. gas	28.2 t/h 18000 m ³ /h	SO ₂ , NO _x , CO; PM 260 °C	7	2	67 25	5.2 1.0	366500 21500		10.1 14.8

Table D4.14(10) Summary results of Questionnaire for Community Cair

No.	Plant name and Address	Type of ind.	Operatio n rate	Emp- loyee	Main prod.	Output	Instali. power (MW)	Kind of fuel	Fuels used (in kg/h)	Kind of pollutants emitted; gas temperature	No boilers	No of stacks	Stack height, m	Stack Id., m	Vol. of effluent gas Nm ³ /h	Total vol. flow (in Nm ³ /h)	Velocity m/s
Primary Schools																	
124	Rajko Zinzifov T. Pole bb	Education	-	64	-	-	0.816	L. oil	60	SO ₂ ; NO _x ; CO	2	1	8	0.50	432	864	
125	Goer Delev G. Listee bb	Education	-	43	-	-	1.162	L. oil	60	SO ₂ ; NO _x ; CO	2	2	6	0.40	612	1224	
126	K. Josifovski I Naum Ohridski bb	Education	-	58	-	-	1.0	Coal	60	SO ₂ ; NO _x ; CO	2	1	15	0.70	-	-	
127	K. Josifovski II Ognjan. Prica 2	Education	-	58	-	-	1.80	L. Oil	60	SO ₂ ; NO _x ; CO	2	1	14	0.60	948	1896	
128	Dr Zlatan Stremec Z. Zrenjanin 135	Education	-	44	-	-	1.626	L. oil	200 L/d	SO ₂ ; NO _x ; CO	2	1	15	0.80	857	1714	
129	BS Dimitar Makedonski	Education	-	54	-	-	1.00	Oil	130	SO ₂ ; NO _x ; CO	4	2	12	0.60	500	1000	
130	Kuzman Sepkarev Zarko Zrenjanin 135	Education	-	62	-	-	1.40	L. oil	80	SO ₂ ; NO _x ; CO	2	1	15	0.80	737	1474	
131	Pavemij Zografski D. Obradovic bb	Education	-	34	-	-	1.16	L. oil	100	SO ₂ ; NO _x ; CO	2	1	10	0.60	612	1224	
Kander - giten																	
132	8 Mart Kralaska bb	Care&Ed.	-	20	-	-	0.583	Oil	78	SO ₂ ; NO _x ; CO	2	1	10	0.50	372	744	
133	Veseli Cvetovi I Ognjan Prica bb	Care&Ed.	-	30	-	-	0.233	Oil	26	SO ₂ ; NO _x ; CO	2	1	10	0.50	240	240	
134	Veseli Cvetovi II Avrora bb	Care&Ed.	-	25	-	-	0.47	Oil	60	SO ₂ ; NO _x ; CO	2	1	10	0.50	252	504	
135	Veseli Cvetovi III Rauko Mitrovic bb	Care&Ed.	-	25	-	-	0.10	Oil	50	SO ₂ ; NO _x ; CO	2	1	10	0.50	580	1160	
136	Veseli Cvetovi IV Gramos bb	Care&Ed.	-	25	-	-	0.23	Oil	25	SO ₂ ; NO _x ; CO	1	1	10	0.50	240	-	
High Schools																	
137	M. Kiri Skolodvska II M. brigada 63	Education	-	75	-	-	1.20	L. oil	110	SO ₂ ; NO _x ; CO	3	1	8	0.60	842	1263	
138	Braza Mladinovi Kitka bb	Education	-	92	-	-	0.92	L. oil	50	SO ₂ ; NO _x ; CO	4	4	5	1.0	408	816	
Other institutions																	
139	Policinic Centar Dimitrija Cupovski bb	Med. care	-	80	-	-	1.162	Oil	100	SO ₂ ; NO _x ; CO	2	1	8	0.60	612	1224	
140	Post Dracevo Janko Mistic bb	Post	-	43	-	-	0.25	L. oil	30 900/m	SO ₂ ; NO _x ; CO	2	1	12	0.25	122	244	
141	Mac. Rel. transp. III Mak. brigada bb	Rel. transp.	30%	1236	-	768865	9.00	H. oil	800	SO ₂ ; NO _x ; CO 170-190 °C	2	2	10	0.80	4650	9400	
Industry																	
142	Crvens Zvezda Sava Kovacevic bb	Textile fact.	Bankrupt	-	-	-	-	Oil	-	SO ₂ ; NO _x ; CO	1	1	8	0.40	2500	2500	
143	Rade Koncar III Mak. brigada bb	Electric Co.	20%	900	Electric machines	-	10.50	H. oil	350	SO ₂ ; NO _x ; CO, PM 150-200 °C	4	2	5	0.50	3688	11056	
144	Mirka Ginova	Textile Co.	Bankrupt	-	-	-	1.80	Oil	140	SO ₂ ; NO _x ; CO	2	2	10	0.50	948	1896	
145	Alkaloid	Plant production	-	1800	tee, food	-	3.40	H. oil	440	SO ₂ ; NO _x ; CO 196 °C	2	2	7	0.80	1791	3582	

Table D4.14(11) Summary results of Questionnaire for Community Cair

No.	Plant name and Address	Type of ind.	Operatio n rate	Emp- loyee	Main prod.	Output	Install. power (MW)	Kind of fuel	Fuels used (in kg/h)	Kind of pollutants emitted; gas temperature	No boilers	No of stacks	Stack height, m	Stack ld., m	Vol. of effluent gas Nm ³ /h	Total vol. flow (in Nm ³ /h)	Velocity m/s
146	IGM Partizan Partizanski pat bb	Ceramic fac	-	-	-	-	-	Oil	310	SO ₂ ; NO _x ; CO	3	-	-	-	57045	57045	
147	Evroteks Sava Kovacevic bb	-	Bankrupt	-	-	-	0.70 1.16	Oil	86 90	SO ₂ ; NO _x ; CO	4	-	-	-	612	1968	
148	Bakery Zitluku S. Kovancevic 5	Bakery		42	Bread	3964 t	1.164	L. oil	150	SO ₂ ; NO _x ; CO 213 °C	4	1	12	0.30	350	1320	1.0
149	Glass fac. Prvomajska bb	Glass	Bankrupt	200	Glass product	-	-	Oil	-	SO ₂ ; NO _x ; CO	3	3	15	0.80	5000	5000	
150	Chemical Co. Hemeiks S. Gomo Lisice bb	Plastic fibres	Bankrupt	634	Polyester fibres	-	9.00	L. Oil H. Oil	300 375	NO _x ; CO; SO ₂ ; PM 200 °C	3	1	25	0.80	6322	9483	
151 a	USJE Prvomajska bb	Cement fac.	90%	1064	Cement asbest plates, sand	820000 t	6000 L/h 6500 kg/h	H. oil Coal	1000 7200/mo 6500 4680 t/mo	NO _x ; CO; SO ₂ ; PM 100-200 °C	44	2	60	3.0	240,000	1,641,940	6.6-35.8
151 b	Cement factory Prvomajska bb Heating plant	Cement fac.	50%	1064	Steam	10-12 t/h	6.8 4.2	H. oil Glass	680 454 m ³ /h	NO _x ; CO; SO ₂ 240 °C	4	4	16	0.60	4200-8100		7.5-11.5
152	OHIS Prvomajska bb	Chemical Co.	20%	3979	plastic, chemicals, pharma- centics; insecticides, detergent	311754 t	174.2	H. oil	2245	SO ₂ ; NO _x ; CO 200-260 °C	84	2	75 20	2.0	30,000	66250	11.24
153	Central heating Plant 11 Oktomvri Londonska bb	Central Heating	43.5%	8	Heating energy		28.21	H. oil	2.88 t/h	SO ₂ ; NO _x ; CO; PM 250 °C	3	3	18; 18; 18	2x0.75; 0.95	7950 21600	26748	9.6 16.2

Table D4.15 The Measurement Heating Facilities for Stack Gases

No.	No. from Register	Name	Type	No. of Measurement
1	123	Central Heating Plant-EAST	Boiler (using heavy oil)	1
2	60	Central Heating Plant-WEST	Boiler (using heavy oil)	2
3		Technical High School "Boro Petrusovski"	Boiler (using heavy oil)	1
4		Technical High School "Mihajlo Pupin"	Boiler (using light oil)	1
5		Technical High School "Nikola Tesla"	Boiler (using coal)	1
6	-	Two private houses	House heating (using firewood)	each 1

Table D4.16 Flue Gas Measurement Results

No. 1							Product						
Name of company							CENTRAL HEATING PLANT -- EAST						
Name of combustion facilities							Boiler VKSM 60						
Type of fuel used							Heavy oil		Fuel consumption			28.2 t/h	
Installation capacity							69.78 MW		Capacity at time of measurement				
Burner type and rating							SAACKE SKV400		Number of burners			2	
Measurement data													
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume	
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h	
		727.0	210.0	16.0	226.0	202	37.73	10.6	6.5	205.0	-	328204	
O ₂ 3% conversion value	ppm	925.0	260.7	19.9	280.6	251	-						
	mg/m ³	2581	349.3	40.7	390.0	313	46.84						
Emission standard	mg/m ³	400	-	-	250	170	50						
Emission	kg/h	682.4	92.36	10.76	103.1	82.9	12.38						
Emission standard	kg/h	5.0	-	-	5.0	-	0.5						
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd	
in dust, µg/m ³		903.8	40.5	25.2	12.9	158	0.1	4.02	2.39	14.8	21.8	0.15	
Outline of facilities and measurements													
Facilities													
<p>About 41,000 apartments and houses with 2,600,000 m² and 1,300,000 m² of offices are connected and use a heat from the central Heating Plant in Skopje. Distribution network is long 170 km. Total potential heating power of the consumption is 555 MW. During the heating season (officially from October 15 to April 15) a production of about 600 000 MWh heating energy with the consumption of liquid fuel of about 70,000 t per season. The consumption of electric power from the Central heating plants is 19,000,000 kWh per season.</p> <p>In the heating plant West there are cyclonic filter but in the period of our survey they were not into operation.</p> <p>According to existing data and data obtain during the visit of the Direction of Central Heating Plant in Skopje, there are 5 heating plant included into the central heating plant for the city of Skopje: East, West, 11 Oktomvri, Park and Vodno.</p>													
Location of measurement													
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.													
Problems and Countermeasures													
During the measuring period a concentration of all parameters over the permitted values.													
Estimated effects of countermeasurements													
-													

Table D4.17(1) Flue Gas Measurement Results

No. 2		Product											
Name of company		CENTRAL HEATING PLANT – WEST											
Name of combustion facilities		Boiler 3 VKSM 50											
Type of fuel used		Heavy oil				Fuel consumption				18.9 t/h			
Installation capacity		58.2 MW				Capacity at time of measurement							
Burner type and rating		SAACKE SKV300				Number of burners				2			
Measurement data													
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume	
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h	
		864.0	227.0	15.0	242.0	103	210.0	13.0	3.7	216.0	-	84500	
O ₂ 3% conversion value	ppm	899.0	236.1	15.6	251.7	107	-						
	mg/m ³	2571	316.3	32.0	348.3	134	218.5						
Emission standard	mg/m ³	400	-	-	250	170	50						
Emission	kg/h	208.8	25.7	2.6	28.3	10.9	17.7						
Emission standard	kg/h	5.0	-	-	5.0	-	0.5						
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd	
in dust,	µg/m ³	494.0	385.5	150.2	65.1	1009	0.1	38.1	7.75	72.6	179.3	0.69	
Outline of facilities and measurements													
Facilities													
Same as in Table D4.16													
Location of measurement													
Gas substance and dust concentration was measured at the measuring site installed on waste gases channel.													
Problems and Countermeasures													
During the measuring period a SO ₂ and dust concentrations are over the permitted values.													
Estimated effects of countermeasurements													
-													

Table D4.17(2) Flue Gas Measurement Results

No. 2		Product											
Name of company		CENTRAL HEATING PLANT – WEST											
Name of combustion facilities		Boiler 1											
Type of fuel used		Heavy oil					Fuel consumption						
Installation capacity		23.3 MW					Capacity at time of measurement						
Burner type and rating		SAACKE SKV2506					Number of burners						2
Measurement data													
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume	
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h	
		794.0	223.0	10.0	233.0	100	63.8	12.1	4.9	214.0	-	24333	
O ₂ 3%	ppm	887.7	249.3	11.2	260	112	-						
conversion value	mg/m ³	2539	334.1	22.9	357	140	71.3						
Emission standard	mg/m ³	1700	-	-	350	170	50						
Emission	kg/h	55.26	7.27	0.5	7.77	3.04	1.55						
Emission standard	kg/h	5.0	-	-	5.0	-	0.5						
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd	
in dust,	µg/m ³	1492	86.2	43.0	22.4	304	0.1	11.1	3.08	21.8	54.9	0.20	
Outline of facilities and measurements													
Facilities													
Same as in Table D4.16													
Location of measurement													
Gas substance and dust concentration was measured at the measuring site installed on waste gases channel.													
Problems and Countermeasures													
During the measuring period a SO ₂ and dust concentrations are over the permitted values.													
Estimated effects of countermeasurements													
-													

Table D4.18 Flue Gas Measurement Results

No. 3		Product										
Name of company		TECHNICAL SCHOOL BORO PETRUSEVSKI										
Name of combustion facilities		Boiler										
Type of fuel used		Heavy oil					Fuel consumption					
Installation capacity		3 MW					Capacity at time of measurement					
Burner type and rating		Number of burners										
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		740.0	109.0	8.0	117.0	95.0	27.47	11.3	6.2	211.0	-	1170
O ₂ 3% conversion value	ppm	900.0	132.6	9.7	142.3	116	-					
	mg/m ³	2574	177.6	19.9	197.5	144	33.41					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	2.48	0.17	0.02	0.19	0.14	0.032					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	264.1	28.7	43.6	13.5	89.8	0.1	5.92	1.89	13.1	11.6	0.10
Outline of facilities and measurements												
Facilities												
Heating department has 2 boilers using heavy oil.												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
During the measuring period a SO ₂ and dust concentrations are over the permitted values.												
Estimated effects of countermeasurements												
-												

Table D4.19 Flue Gas Measurement Results

No. 4		Product											
Name of company		TECHNICAL SCHOOL MIHAJLO PUPIN											
Name of combustion facilities		Boiler											
Type of fuel used		Light oil		Fuel consumption									600 kg/h
Installation capacity		4 MW		Capacity at time of measurement									
Burner type and rating		Vanson		Number of burners									
Measurement data													
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume	
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h	
		250.0	21.0	1.0	22.0	783	15.5	6.7	11.8	328.5	-	1639	
O ₂ 3% conversion value	ppm	489.1	41.1	2.0	43.1	1532	-						
	mg/m ³	1399	55.1	4.0	59.1	1915	30.3						
Emission standard	mg/m ³	1700	-	-	350	170	50						
Emission	kg/h	1.17	0.046	0.003	0.049	1.28	0.025						
Emission standard	kg/h	5.0	-	-	5.0	-	0.5						
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd	
in dust,	µg/m ³	155.8	113.5	19.3	6.61	34.0	0.1	3.7	0.82	11.7	6.58	0.08	
Outline of facilities and measurements													
Facilities													
Heating department has 2 boilers on light oil.													
Location of measurement													
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.													
Problems and Countermeasures													
During the measuring period all parameters (except for CO) were on the permitted values.													
Estimated effects of countermeasurements													
-													

Table D4.20 Flue Gas Measurement Results

No. 5		Product										
Name of company		TECHNICAL SCHOOL NIKOLA TESLA										
Name of combustion facilities		Boiler										
Type of fuel used		Coal & L. oil		Fuel consumption: 100 kg/h coal and 80 kg/h oil								
Installation capacity		3 MW		Capacity at time of measurement								
Burner type and rating		Number of burners										
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		148.0	22.0	1.0	22.0	9620	217.0	3.2	17.4	65.8	-	5325
O ₂ 7% conversion value	ppm	575.5	85.5	3.9	89.4	37411	-					
	mg/m ³	1646	114.6	8.0	122.6	46763	843.0					
Emission standard	mg/m ³	2000	-	-	500	250	50					
Emission	kg/h	2.25	0.157	0.01	0.167	64.0	1.16					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	2787	980	556.1	63.3	209	0.1	39.2	3.33	646.2	115.8	1.50
Outline of facilities and measurements												
Facilities												
<p>Heating department has 3 boilers using coal and heavy oil.</p>												
Location of measurement												
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>												
Problems and Countermeasures												
<p>During the measuring period the concentration of CO and dust was over the permitted values.</p>												
Estimated effects of countermeasurements												
-												

Table D4.21(1) Flue Gas Measurement Results

No. 6						Product						
Name of company						RESIDENTIAL – HOUSE 1						
Name of combustion facilities												
Type of fuel used						Wood						
Installation capacity						Capacity at time of measurement						
Burner type and rating						Number of burners						
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		175.0	8.5	2.0	10.5	1694	75.2	3.41	16.8	100.3	-	80
O ₂ 11% conversion value	ppm	416.7	19.5	4.8	24.3	4033	-					
	mg/m ³	1192	26.1	9.8	35.9	5042	179.0					
Emission standard	mg/m ³	500	-	-	500	250	50					
Emission	kg/h	0.04	0.001	0.0	0.001	136	0.006					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	669	2120	60.2	16.7	32.9	0.1	3.27	1.11	29.2	5.64	0.52
Outline of facilities and measurements												
<p>Facilities</p> <p>In Skopje many houses during heating season use wood for heating (about 200,000 m³ of wood per season).</p>												
Location of measurement												
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>												
Problems and Countermeasures												
<p>During the measuring period all concentrations are over the permitted values.</p>												
Estimated effects of countermeasurements												
-												

Table D4.21(2) Flue Gas Measurement Results

No. 7		Product										
Name of company		RESIDENTIAL - HOUSE 2										
Name of combustion facilities												
Type of fuel used		Wood					Fuel consumption					
Installation capacity		Capacity at time of measurement										
Burner type and rating		Number of burners										
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		280.0	17.0	2.0	19.0	1593	46.23	2.3	18.6	97.3	-	80
O ₂ 11% conversion value	ppm	1167	70.8	8.3	79.1	6637	-					
	mg/m ³	3337	94.9	17.1	112.0	8297	192.6					
Emission standard	mg/m ³	500	-	-	500	250	50					
Emission	kg/h	0.064	0.002	0.0	0.002	0.16	0.004					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	660.6	709.4	32.4	10.7	13.6	0.1	2.74	0.86	23.6	4.19	0.21
Outline of facilities and measurements												
Facilities												
Same as in Table D4.17(1)												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
Estimated effects of countermeasurements												

Table D4.22 The Measurement Heating Facilities for Stack Gases(Supporting Study)

No.	No. from Register	Name	Type	No. of Measurement
1	60	Central Heating Plant-WEST	Boiler (using heavy oil)	3
2	111	Beer Co.	Boiler (using gas)	1
3	122b	Iron & Steel Work. Energetic	Electric furnace	1
4	123	Central Heating Plant-EAST	Boiler (using heavy oil and gas)	1
5	151	Cement Factory	Process	3
6	152	Chemical Factory-OHIS	Boiler (using heavy oil)	1
7	153	Central Heating Plant-11 Oktomvri	Boiler (using heavy oil)	1

Table D4.23(1) Flue Gas Measurement Results

No. 60						Product						
Name of company						CENTRAL HEATING PLANT – WEST						
Name of combustion facilities						Boiler 20-1						
Type of fuel used						Fuel consumption						
Installation capacity						Capacity at time of measurement						
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		399	141.0	6.0	147.0	8.2	86.53	12.1	4.9	264	12.7	26457
O ₂ conversion value	ppm	446	158	7	165		-					
	mg/m ³	1276	211	14	225	11.5	96.74					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	30.19	4.17	0.18	4.35	0.24	2.29					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust.	µg/m ³											
Outline of facilities and measurements												
Facilities												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
During the measuring period a dust concentration is over the permitted value.												
Estimated effects of countermeasurements												
-												

Table D4.23(2) Flue Gas Measurement Results

No. 60					Product							
Name of company					CENTRAL HEATING PLANT – WEST							
Name of combustion facilities					Boiler 20-1							
Type of fuel used					Heavy oil							
Installation capacity					Capacity at time of measurement							
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		393	153	6	159	6.5	23.56	9.4	8.4	290	22.6	32164
O ₂ conversion value	ppm	561	219	8	227	9.3	-					
	mg/m ³	1606	293	18	311	11.6	33.66					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	36.15	6.74	0.39	7.13	2.61	0.76					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust.	µg/m ³											
Outline of facilities and measurements												
Facilities												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
During the measuring period the concentrations of all parameters are bellow the permitted values.												
Estimated effects of countermeasurements												
-												

Table D4.23(3) Flue Gas Measurement Results

No. 60		Product										
Name of company		CENTRAL HEATING PLANT – WEST										
Name of combustion facilities		Boiler 50-3										
Type of fuel used		Heavy oil				Fuel consumption						
Installation capacity		Capacity at time of measurement										
Burner type and rating		Number of burners										
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		601	234	11	245	38	53.55	13.2	3.4	246	23.26	87935
O ₂ conversion value	ppm	615	239	11	250	39	-					
	mg/m ³	1758	321	23	343	49	54.76					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	151.1	28.19	1.98	30.17	4.18	4.71					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust.	µg/m ³											
Outline of facilities and measurements												
Facilities												
Location of measurement												
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>												
Problems and Countermeasures												
<p>During the measuring period a SO₂ and dust concentrations are over the permitted values.</p>												
Estimated effects of countermeasurements												
-												

Table D4.24(1) Flue Gas Measurement Results (January 1999)

No. 111		Product Beer, nonalcoholic beverage											
Name of company		BEER COMPANY											
Name of combustion facilities		Boiler No. 10066											
Type of fuel used		Gas					Fuel consumption						
Installation capacity		8 MW					Capacity at time of measurement				8.0 MW		
Burner type and rating											Number of burners		2
Measurement data													
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume	
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h	
		9.5	57	2.7	59.7	9.6	0.0	4.7	12.3	240	14.38	14064	
O ₂ 3%	ppm	19.6	118	5.6	123.6	19.9	-						
	mg/m ³	56.2	158	11	169	24.8	0.0						
Emission standard	mg/m ³	1700	-	-	200	100	50						
Emission	kg/h	0.38	1.10	0.08	1.18	0.17	0.0						
Emission standard	kg/h	5.0	-	-	5.0	-	0.5						
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd	
in dust.	µg/m ³												
Outline of facilities and measurements													
<p>Facilities</p> <p>Company has 2 boilers in the heating plant producing steam for production processes and for heating.</p>													
<p>Location of measurement</p> <p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>													
<p>Problems and Countermeasures</p> <p>Using natural gas the concentration of all measured parameters are very low and the dust concentration is zero.</p>													
<p>Estimated effects of countermeasurements</p> <p>-</p>													

Table D4.24(2) Flue Gas Measurement Results

No. 122c		Product Steel and steel sheets										
Name of company		Iron&Steel Co. Maksteel										
Name of combustion facilities		Electric furnace for steel production from scrap										
Type of fuel used		Electric furnace					Fuel consumption					
Installation capacity		Capacity at time of measurement										
Burner type and rating		Number of burners										
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		0.0	29.5	1.5	31.0	685	39.51	0.10	20.7	150	12.31	103278
O ₂ conversion value	ppm	0.0	29.5	1.5	31.0	685	-					
	mg/m ³	0.0	39.5	3.0	42.5	856	39.51					
Emission standard	mg/m ³	1700	-	-	200	100	50					
Emission	kg/h	0.0	4.08	0.31	4.39	88.4	4.08					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content in dust.	µg/m ³	Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
Outline of facilities and measurements												
Facilities												
<p>Mastil is a new company which is a part of former Iron&Steel work in Skopje. This company produces steel and hot rolling steel sheets. Production of steel is made using electric furnace for steel production from scrap. There is a system for purification of waste gases from electric furnace.</p>												
Location of measurement												
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks after filtering of gases.</p>												
Problems and Countermeasures												
<p>This department is forking time by time. Purification system is almost satisfactory for cleaning of waste gases, which can be seen from the results from the measurement. Namely, all parameters (except CO) are below limits.</p>												
Estimated effects of countermeasurements												
-												

Table D4.25 Flue Gas Measurement Results

No. 123							Product					
Name of company							CENTRAL HEATING PLANT – EAST					
Name of combustion facilities							Boiler					
Type of fuel used							Heavy oil/gas		Fuel consumption			
Installation capacity							Capacity at time of measurement					
Burner type and rating							Number of burners					
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		258	152	6	158	7.9	36.4	6.8	10.5	293	10.5	286271
O ₂ conversion value	ppm	442	260	10	270	13.5	-					
	mg/m ³	1265	349	21	370	16.9	62.4					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	211.2	59.6	3.5	63.1	2.83	10.4					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust.		μg/m ³										
Outline of facilities and measurements												
Facilities												
<p>About 41,000 apartments and houses with 2,600,000 m² and 1 300,000 m² of offices are connected and use a heat from the central Heating Plant in Skopje. Distribution network is long 170 km. Total potential heating power of the consumption is 555 MW. During the heating season (officially from October 15 to April 15) a production of about 600,000 MWh heating energy with the consumption of liquid fuel of about 70 000 t per season. The consumption of electric power from the Central heating plants is 19,000,000 kWh per season.</p> <p>Starting from the heating season 1998/99 Heating Plant EAST use 50% of heavy oil and 50% natural gas (about 15 million Nm³ for a season).</p> <p>In the heating plant West there are cyclonic filter but in the period of our survey they were not into operation.</p> <p>According to existing data and data obtain during the visit of the Direction of Central Heating Plant in Skopje, there are 5 heating plant included into the central heating plant for the city of Skopje: East, West, 11 Oktomvri, Park and Vodno (which is not in use).</p>												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
During the measuring period a concentration of dust was over the permitted values. Emission standards were over the limits.												
Estimated effects of countermeasurements												
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Table D4.26(1) Flue Gas Measurement Results, November 1998)

No. 151		Product											Cement
Name of company		CEMENT COMPANY – USJE											
Name of combustion facilities		Preparation of material No. 2.1											
Type of fuel used		Fuel consumption											
Installation capacity		Capacity at time of measurement											
Burner type and rating		Number of burners											
Measurement data													
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume	
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h	
		7.1	175	1.6	176.6	615	144.7	4.7	14.5	131	12.63	100087	
O ₂ 5.8 % conversion value	ppm mg/m ³	7.4 21.3	183 252	1.7 3.4	185 255.3	644 806	- 151.7						
Emission standard	mg/m ³	400	-	-	1300	250	50						
Emission	kg/h	2.03	24.0	0.3	24.3	76.9	8.61						
Emission standard	kg/h	5.0	-	-	5.0	-	0.5						
Metal content in dust.	µg/m ³	Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd	
Outline of facilities and measurements													
Facilities													
<p>Cement factory USJE have different Preparation plants: preparation of coal dust, preparation of raw material by drying, milling, homogenization of the material, roasting of material, milling of final material. For the processes of preparation and roasting of the material heavy oil and coal are used in ration 30:70 (usually 1,000 kg/h oil and 6,500 kg/h coal). Gases from furnaces (with a temperature between 350 and 380 °C) pass through heat exchanger and are used for heating of preparation units. All departments have filters for dust.</p>													
Location of measurement													
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>													
Problems and Countermeasures													
<p>During the measuring period a concentration of CO and dust are over the permitted values.</p>													
Estimated effects of countermeasurements													
-													

Table D4.26(2) Flue Gas Measurement Results (November, 1998)

No. 151		Product										Cement	
Name of company		CEMENT COMPANY - USJE											
Name of combustion facilities		Preparation of material No. 2.2											
Type of fuel used		Fuel consumption											
Installation capacity		Capacity at time of measurement											
Burner type and rating		Number of burners											
Measurement data													
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume	
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h	
		6.4	169	1	170	534	89.75	4.7	14.6	113	13.28	150974	
O ₂ 5.8 % conversion value	ppm	6.7	176	1	177	556	-						
	mg/m ³	19.0	241	2	242	695	93.2						
Emission standard	mg/m ³	400	-	-	1300	250	50						
Emission	kg/h	27.6	35.0	0.3	36.3	101	12.26						
Emission standard	kg/h	5.0	-	-	5.0	-	0.5						
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd	
in dust.	µg/m ³												
Outline of facilities and measurements													
Facilities													
Table D4.26(1)													
Location of measurement													
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.													
Problems and Countermeasures													
Table 3.2.2.3(3).													
Estimated effects of countermeasurements													
-													

Table D4.26(3) Flue Gas Measurement Results

No. 151		Product Cement										
Name of company		CEMENT COMPANY – USJE										
Name of combustion facilities		Furnace										
Type of fuel used		Coal (70%) and H. oil (30%)		Fuel consumption		6.5 t/h coal, 6 t/h H. oil						
Installation capacity		Capacity at time of measurement: 6.5 t/h coal; 1 t/h heavy oil										
Burner type and rating		Number of burners 2x1										
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		-	-	-	-	-	49.84	5.1	14.0	110	27.57	406685
O ₂ 5.8 % conversion value	ppm	-	-	-	-	-	-	-	-	-	-	-
	mg/m ³	-	-	-	-	-	-	-	-	-	-	-
Emission standard	mg/m ³	400	-	-	1300	250	50	-	-	-	-	-
Emission	kg/h	-	-	-	-	-	20.27	-	-	-	-	-
Emission standard	kg/h	5.0	-	-	5.0	-	0.5	-	-	-	-	-
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust.	µg/m ³											
Outline of facilities and measurements												
Facilities												
Table D4.26(1)												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
-												
Estimated effects of countermeasurements												
-												

Table D4.26(4) Flue Gas Measurement Results

No. 151		Product Cement											
Name of company		OHIS – ORGANIC CHEMICAL COMPANY											
Name of combustion facilities		Boiler -- BABKOK											
Type of fuel used		Heavy oil		Fuel consumption							2245 kg/h		
Installation capacity		80 MW		Capacity at time of measurement									
Burner type and rating		Number of burners							2				
Measurement data													
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume	
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h	
		677	193	3.6	196.6	61.8	13.48	11.7	5.3	192.0	10.08	67628	
O ₂ conversion value	ppm	776	227.1	4.1	231.2	70.8	-						
	mg/m ³	2220	304.2	8.5	312.7	88.6	14.45						
Emission standard	mg/m ³	1700	-	-	350	170	50						
Emission	kg/h		17.5	0.5	18.0	5.22	0.91						
Emission standard	kg/h	5.0	-	-	5.0	-	0.5						
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd	
in dust.	µg/m ³												
Outline of facilities and measurements													
Facilities													
<p>Organic company OHIS produces different chemical products including polymers, pesticides, basic chemicals etc. Energetic department produces steam for all process departments, using heavy oil.</p>													
Location of measurement													
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>													
Problems and Countermeasures													
<p>Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period a concentration of all parameters (except for SO₂) were in the permitted values.</p>													
Estimated effects of countermeasurements													
-													

Table D4.27 Flue Gas Measurement Results

No. 153		Product										
Name of company		CENTRAL HEATING PLANT -- 11 OKTOMVRI										
Name of combustion facilities		Boiler 200/3										
Type of fuel used		Heavy oil				Fuel consumption			2.88 t/h			
Installation capacity		21.21 MW				Capacity at time of measurement						
Burner type and rating		Number of burners										
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		343	142	6	148	3.6	62.2	8.0	10.1	202	16.19	23544
O ₂ conversion value	ppm	566	234	10	344	6.0	-					
	mg/m ³	1620	314	20	334	7.4	102.7					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	23.1	4.58	0.29	4.87	0.11	1.29					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust.		µg/m ³										
Outline of facilities and measurements												
Facilities												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
During the measuring period dust concentrations was over the permitted values.												
Estimated effects of countermeasurements												

Table D4.28 List of Companies where Exhaust Gas Measurements were Made

No.	No. from Register	Name	Type	No. of measurements
1	36	Bakery 8 Mart	Boiler	2
2	37	Ceramics Co. TIPO	Process stacks	3
3	54	Constr. co. Karpos	Boiler	2
4	75	Alkaloid, Chemical and Pharmaceutical Department	Boiler	2
5	76	Clinic Center	Boiler	2
6	82	Tobacco Co.	Boiler	3
7	111	Beer Co.	Boiler	1
8	112	Alkaloid, Pharmaceutics Production Department	Boiler	2
9	113	Alkaloid, Colors Prod. Dept.	Boiler	1
10	114	Bakery Gazi Baba	Boiler	3
11	117	Paper Co. Komuna	Boiler	1
12	118	Carpet co. Makedonski folkor	Boiler	1
13	119	Chocolate factory EVROPA	Boiler	1
14	-120	Leader factory GODEL	Boiler	1
15	121	Refinery OKTA	Boiler and Process	1 1
16	122a	Iron&Steel Work, Smelting Plant for FeMn and SiMn	Electrical furnaces	2
17	122b	Iron&Steel Work, Energetic	Boiler	2
18	122c	Iron&Steel Work, Hot rolling	Process (furnaces)	2
19	122e	Iron&Steel Work, Cold rolling	Pickling process Annealing process	1 3
20	145	Alkaloid, Plant Prod. Dept.	Boiler	1
21	151	Cement factory	Process	11
22	152	Chemical factory -OHIS	Boiler	1

Table D4.29(1) Flue Gas Measurement Results

No. 36		Product Bread, freeze bread products										
Name of company		BAKERY 8 MART										
Name of combustion facilities		Boiler No. 1164										
Type of fuel used		Light oil (D-2)		Fuel consumption								
Installation capacity		4.5 MW		Capacity at time of measurement							3.0 MW	
Burner type and rating		Weishaupt RGL 60/2A		Number of burners							2	
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		225.2	68.0	0.9	68.9	4.2	0.68	9.5	8.2	126.8	5.26	3966
O ₂ 3% conversion value	ppm	316.7	95.6	1.26	96.86	5.9	-					
	mg/m ³	905.7	128.1	2.6	130.7	7.3	0.956					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	2.55	0.36	0.007	0.367	0.02	0.003					
Emission standard	kg/h	5.0					0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	-	-	0.412	25.1	30.1	3.88	9.71	1.24	-	2.37	0.02
Outline of facilities and measurements												
Facilities												
<p>Company has 3 lines for bread production, having a line for the freeze bread products. One of the biggest bread production companies in Skopje with the early production of more that 26000 t. There are boiling plant for steam for heating a process lines with 3 boilers using light oil (D-2). A system for using gas is build. After starting of work of gas system in Macedonia this company is ready to change from oil to gas.</p>												
Location of measurement												
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>												
Problems and Countermeasures												
<p>Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period a concentration of all parameters were in the permitted values.</p>												
Estimated effects of countermeasurements												
-												

Table D4.29(2) Flue Gas Measurement Results

No. 36		Product Bread, freeze bread products										
Name of company		BAKERY 8 MART										
Name of combustion facilities		Boiler No. 1166										
Type of fuel used		Light oil (D-2)					Fuel consumption					
Installation capacity		4.5 MW					Capacity at time of measurement		3.0 MW			
Burner type and rating		Weishaupt RGL 60/2A					Number of burners		2			
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		237.4	68.5	1.7	70.2	16.7	0.19	10.5	6.8	123.9	6.03	4588
O ₂ 3%	ppm	300.9	86.8	2.4	89.2	21.1	-					
conversion value	mg/m ³	860.6	116.3	4.9	121.2	26.4	0.241					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	3.115	0.42	0.016	0.436	0.10	0.01					
Emission standard	kg/h	5.0					0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	12.1	-	0.593	49.1	47.3	4.66	11.3	3.62	2.83	4.30	0.136
Outline of facilities and measurements												
Facilities												
Same as in Table D4.29(1)												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
Estimated effects of countermeasurements												

Table D4.30(1) Flue Gas Measurement Results

No. 37, Furnace 2		Product Ceramics, porcelain											
Name of company		CERAMIC Co. TIPO											
Name of combustion facilities		Furnaces No. 2 for ceramic baking											
Type of fuel used		Heavy oil		Fuel consumption								500 kg/h	
Installation capacity		3.2 MW		Capacity at time of measurement									
Burner type and rating		Number of burners											
Measurement data													
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume	
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h	
		65.5	14.0	ND	14.0	62.7	135.1	1.2	19.2	103.9	12.8	32677	
O ₂ 18 %	ppm	109.2	23.3	ND	23.3	104	-						
conversion value	mg/m ³	312.2	31.3	ND	31.3	131	225.1						
Emission standard	mg/m ³	1500	-	-	500	-	50						
Emission	kg/h	6.12	0.613	ND	0.613	2.56	4.42						
Emission standard	kg/h	10.0	-	-	5.0	-	0.5						
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd	
in dust, µg/m ³		139.1	123.6	0.585	249.5	156	19.3	37.7	1.32	0.0	78.7	0.04	
Outline of facilities and measurements													
Facilities													
<p>Company has 3 lines for ceramics preparation using 3 furnaces. Material is prepared before entering into furnaces. Heavy oil is used for furnaces heating.</p>													
Location of measurement													
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>													
Problems and Countermeasures													
<p>Problems with the waste gas pollution are connected mainly with a quality of imported oil. During the measuring period a concentrations of dust emission were over emission standards.</p>													
Estimated effects of countermeasurements													
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Table D4.30(2) Flue Gas Measurement Results

No. 37, Furnace 3							Product ceramics, porcelain					
Name of company							CERAMIC Co. TIPO					
Name of combustion facilities							Furnaces No. 3 for ceramic baking					
Type of fuel used				heavy oil		Fuel consumption				500 kg/h		
Installation capacity				3.2 MW		Capacity at time of measurement						
Burner type and rating							Number of burners					
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		36.8	16.6	ND	16.6	167	40.64	1.8	18.4	161.7	17.85	16137
O ₂ 18 %	ppm	42.5	19.1	ND	19.1	193	-					
conversion value	mg/m ³	121.4	25.7	ND	25.7	241	46.9					
Emission standard	mg/m ³	1500	-	-	500	-	50					
Emission	kg/h	1.7	0.36	ND	0.36	3.37	0.66					
Emission standard	kg/h	10.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	63.8	14.8	1.46	481	270	85.2	86.7	0.30	0.0	194	0.18
Outline of facilities and measurements												
Facilities												
Same as in Table D4.30(1)												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
Estimated effects of countermeasurements												

Table D4.30(3) Flue Gas Measurement Results

No. 37, Furnace 4		Product ceramics, porcelain										
Name of company		CERAMIC Co. TIPO										
Name of combustion facilities		Furnaces No. 4 for ceramic baking										
Type of fuel used		heavy oil			Fuel consumption		500 kg/h					
Installation capacity		3.2 MW			Capacity at time of measurement							
Burner type and rating		Number of burners										
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		122.8	32.3	ND	32.3	109	102.1	1.3	19.0	96.0	16.43	20941
O ₂ 18 %	ppm	184.2	48.45	ND	48.45	163	-					
conversion value	mg/m ³	526.8	64.9	ND	64.9	204	153.1					
Emission standard	mg/m ³	1500	-	-	500	-	50					
Emission	kg/h	7.35	1.93	ND	1.93	2.85	2.14					
Emission standard	kg/h	10.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	125.5	76.2	0.495	164	25.6	12.1	33.5	1.53	0.35	60.6	0.2
Outline of facilities and measurements												
Facilities												
Same as in Table D4.30(1)												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
Estimated effects of countermeasurements												
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Table D4.31 Flue Gas Measurement Results

No. 54		Product											Concrete blocks	
Name of company		Construction Co. KARPOS												
Name of combustion facilities		Boiler, type Djuro Djakovic, B												
Type of fuel used		Heavy oil		Fuel consumption		400 kg/h								
Installation capacity		3.2 MW		Capacity at time of measurement		3.2 MW								
Burner type and rating		Steamblock Optimal		Number of burners		2								
Measurement data														
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume		
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h		
		313.4	109.9	0.4	110.3	54	145.9	7.2	11.8	199	10.49	6081		
O ₂ 3%	ppm	613.2	215	0.8	215.8	106	-							
conversion value	mg/m ³	1754	288	1.6	289.6	132	285.5							
Emission standard	mg/m ³	1700	-	-	350	170	50							
Emission	kg/h	5.45	0.896	0.005	0.901	0.41	0.89							
Emission standard	kg/h	5.0	-	-	5.0	-	0.5							
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd		
in dust,	µg/m ³	461.9	109.3	2.16	478	151	27.6	86.1	5.63	11.25	284	0.36		
Outline of facilities and measurements														
Facilities														
<p>Company has Heating department producing steam for Production department. Steam is used for heating during the production of concrete blocks.</p>														
Location of measurement														
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>														
Problems and Countermeasures														
<p>Problems with the waste gas pollution are connected with the quality of imported oil. Thus, during measuring period, SO₂ concentration was over the standard after calculation on 3 % O₂, Namely, the oxygen concentration during combustion was high (11.8 %). Also, dust concentration and emission were over the standard.</p>														
Estimated effects of countermeasurements														
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Table D4.32 Flue Gas Measurement Results

No. 57		Product Chemical and cosmetics production										
Name of company		ALKALOID										
Name of combustion facilities		Boiler										
Type of fuel used		Heavy oil					Fuel consumption					
Installation capacity		4.5 MW					Capacity at time of measurement				3.0 MW	
Burner type and rating		Weishaupt RGL 60/2A					Number of burners				2	
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		892.5	166.5	1.0	167.5	52.3	63.65	6.8	10.9	226.0	10.33	11954
O ₂ 3%	ppm	1590	296.7	1.8	298.5	92.8	-					
conversion value	mg/m ³	4549	397.6	3.6	401.2	116	113.4					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	30.5	2.67	0.03	3.7	0.78	0.76					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust, µg/m ³		177.7	38.4	0.959	313.5	722	24.5	58.1	12.4	3.09	464	1.27
Outline of facilities and measurements												
Facilities												
<p>Company ALKALOID has 4 plants situated on different places in Skopje. Those four plants produce different kind of products: pharmaceuticals, cosmetics, chemicals, plant products. Each of those plants has one heating department producing steam for process and for heating.</p>												
Location of measurement												
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>												
Problems and Countermeasures												
<p>Problems with the waste gas pollution are connected with a quality of imported oil, but also because of combustion with high quantity of air (concentration of oxygen was 10.9 %). During the measuring period a concentration of all parameters (except for CO) were over the standards.</p>												
Estimated effects of countermeasurements												
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Table D4.33(1) Flue Gas Measurement Results

No. 76							Product						Steam	
Name of company							CLINIC CENTER, Heating plant							
Name of combustion facilities							Boiler No. 1 (Djuro Djakovic)							
Type of fuel used							Heavy oil		Fuel consumption				820 kg/h	
Installation capacity							12 t/h		Capacity at time of measurement				12 t/h	
Burner type and rating							Vanson		Number of burners				2	
Measurement data														
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume		
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h		
		757.4	135.2	0.5	135.7	41.8	102.0	7.5	11.8	218.0	9.41	5143		
O ₂ 3%	ppm	1482	264.5	0.982	65.48	81.6	-							
	mg/m ³	4238	354.5	2.0	356.5	102	199.6							
Emission standard	mg/m ³	1700	-	-	350	170	50							
Emission	kg/h	11.14	0.93	0.005	0.935	0.27	1.33							
Emission standard	kg/h	5.0	-	-	5.0	-	0.5							
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd		
in dust, μg/m ³		347.9	142.4	2.97	596	433	99.7	98.7	44.7	11.55	14.79	3.7		
Outline of facilities and measurements														
Facilities														
<p>The boiling plant of Clinic Center has 3 boilers using heavy oil. Two of them have capacity of 12 t/h of steam and one of 5 t/h. The consumption of heavy oil is about 500 t/month in heating season and about 200 t/month in nonheating season.</p>														
Location of measurement														
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>														
Problems and Countermeasures														
<p>Problems with the waste gas pollution are connected with a quality of imported oil and with a combustion facilities (concentration of O₂ was high - 11.8 %). During the measuring period a concentration of all parameters (except for CO) were over the standards.</p>														
Estimated effects of countermeasurements														
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Table D4.33(2) Flue Gas Measurement Results

No. 76		Product Steam										
Name of company		CLINIC CENTER, Heating plant										
Name of combustion facilities		Boiler No. 2 (Djuro Djakovic)										
Type of fuel used		Heavy oil		Fuel consumption							820 kg/h	
Installation capacity		12 t/h		Capacity at time of measurement							12 t/h	
Burner type and rating		Vanson		Number of burners							2	
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		1105	239.8	0.5	240.3	29.3	250.5	11.0	5.7	286.0	10.0	8138
O ₂ 3%	ppm	1300	282.1	0.6	282.7	28.1	-					
	mg/m ³	3718	378.0	1.2	379	35.1	294.7					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	25.72	2.61	0.008	2.618	0.30	2.04					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust, μg/m ³		431.5	210.3	2.09	311.6	639	123.2	86.1	19.0	11.2	13.0	3.84
Outline of facilities and measurements												
Facilities												
Same as in Table D4.33(1)												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
Estimated effects of countermeasurements												

Table D4.34(1) Flue Gas Measurement Results

No. 82		Product Tobacco, cigarettes										
Name of company		TOBACCO COMPANY										
Name of combustion facilities		Boiler No. 1689 (Djuro Djakovic)										
Type of fuel used		Heavy oil		Fuel consumption							130 kg/h	
Installation capacity		0.25 t/h		Capacity at time of measurement							0.25 t/h	
Burner type and rating		Vaporax		Number of burners							3	
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		194.0	61.0	0.5	61.5	42.8	-	9.9	7.5	276.0	7.26	1185
O ₂ 3%	ppm	258.7	81.3	0.6	81.9	57.0	-					
	mg/m ³	739.8	109.0	1.3	110.3	71.3	-					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	0.657	0.097	0.001	0.098	0.06	-					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust, μg/m ³		-	2.74	0.395	103.8	64.3	6.76	24.7	6.1	0.0	6.04	0.005
Outline of facilities and measurements												
<p>Facilities</p> <p>Company has boiling plant containing 3 boilers using heavy oil (2 with 2 t/h and one with 1.5 t/h capacity) and 4 boilers using light oil (with a capacity of 0.7 t/h). Steam using is mainly for technological purposes during the process of preparation of tobacco.</p>												
Location of measurement												
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>												
Problems and Countermeasures												
<p>Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period a concentration of all parameters were in the permitted values.</p>												
Estimated effects of countermeasurements												
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Table D4.34(2) Flue Gas Measurement Results

No. 82		Product Tobacco, cigarettes										
Name of company		TOBACCO COMPANY										
Name of combustion facilities		Boiler No. 1132 (Djuro Djakovic)										
Type of fuel used		Heavy oil		Fuel consumption							120 kg/h	
Installation capacity		0.25 t/h		Capacity at time of measurement							0.25 t/h	
Burner type and rating		Vaporax		Number of burners							3	
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		139.0	54.0	0.5	54.5	30.3	-	9.9	7.5	384	17.1	2301
O ₂ 3%	ppm	185.3	72.0	0.6	72.6	404	-					
	mg/m ³	530.0	96.5	1.3	97.8	50.5	-					
Emission standard		mg/m ³	1700	-	-	350	170	50				
Emission		kg/h	0.915	0.166	0.002	0.168	0.07	-				
Emission standard		kg/h	5.0	-	-	5.0	-	0.5				
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust, µg/m ³		-	-	0.49	270.4	168	15.6	61.4	4.69	17.0	13.5	0.055
Outline of facilities and measurements												
Facilities												
Same as in Table D4.34(1)												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
Estimated effects of countermeasurements												
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Table D4.34(3) Flue Gas Measurement Results

No. 82		Product Tobacco, cigarettes										
Name of company		TOBACCO COMPANY										
Name of combustion facilities		Boiler No. 1135 (Emo Celje)										
Type of fuel used	Heavy oil	Fuel consumption									100 kg/h	
Installation capacity	0.22 MW	Capacity at time of measurement									120 kg/h	
Burner type and rating	Weishaupt	Number of burners									3	
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		131.0	55.8	0.5	56.3	33.4	-	9.8	7.5	-	8.34	1290
O ₂ 3%	ppm	174.7	74.4	0.6	75.0	44.6	-					
	mg/m ³	499.6	99.7	1.3	101.0	55.7	-					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	0.48	0.096	0.001	0.097	0.05	-					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	-	-	0.39	31.9	135	4.69	9.9	3.03	47.2	3.0	0.02
Outline of facilities and measurements												
Facilities												
Same as in. Table D4.34(1)												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
Estimated effects of countermeasurements												
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Table D4.35 Flue Gas Measurement Results

No. 111		Product Beer, nonalcoholic beverage										
Name of company		BEER COMPANY										
Name of combustion facilities		Boiler No. 10066										
Type of fuel used		Heavy oil			Fuel consumption			1.6 t/h				
Installation capacity		8 MW			Capacity at time of measurement			8.0 MW				
Burner type and rating					Number of burners			2				
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		1023	233.7	0.9	234.6	39.7	16.95	10.5	4.02	232.8	9.23	9144
O ₂ 3%	ppm	1084	248.1	0.93	249.0	42.1	-					
	mg/m ³	3101	332.5	1.9	334.1	52.6	17.97					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	26.7	2.86	0.017	2.877	0.45	0.16					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	272.1	39.5	0.89	213.3	355	36.6	23.7	8.95	0.12	428	1.65
Outline of facilities and measurements												
Facilities												
<p>Company has 2 boilers in the heating plant producing steam for production processes and for heating.</p>												
Location of measurement												
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>												
Problems and Countermeasures												
<p>Problems with the waste gas pollution are connected with a quality of imported oil, which can be seen from the results of high SO₂ concentration.</p>												
Estimated effects of countermeasurements												

Table D4.36(1) Flue Gas Measurement Results

No. 112		Product Pharmaceutical products										
Name of company		ALKALOID, Pharmacy										
Name of combustion facilities		Boiler (Djuro Djakovic)										
Type of fuel used		Heavy oil		Fuel consumption							500 kg/h	
Installation capacity		5 t/h		Capacity at time of measurement							5 t/h	
Burner type and rating		Weishaupt RGL 60/2A		Number of burners							1	
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		777.9	161.3	0.5	161.8	79.5	141.0	8.9	9.3	150.0	4.97	2103
O ₂ 3%	ppm	1197	240.1	0.8	240.9	122	-					
	mg/m ³	3423	332.4	1.6	334.0	153	216.9					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	4.68	0.454	0.002	0.456	0.21	0.335					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	ug/m ³	616.5	96.1	2.58	576	480	71.1	138	21.5	12.2	296	2.94
Outline of facilities and measurements												
Facilities												
<p>Company has 3 boilers in the heating plant producing steam for production processes and for heating.</p>												
Location of measurement												
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>												
Problems and Countermeasures												
<p>Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period, SO₂ and dust concentration were over the emission standards.</p>												
Estimated effects of countermeasurements												
-												

Table D4.36(2) Flue Gas Measurement Results

No. 112							Product Pharmaceutical products					
Name of company							ALKALOID, Pharmacy					
Name of combustion facilities							Boiler (TPK)					
Type of fuel used							Heavy oil		Fuel consumption		1 t/h	
Installation capacity							10 t/h		Capacity at time of measurement		10 t/h	
Burner type and rating							TPK		Number of burners		1	
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		655.0	124.7	1.0	125.7	136	141.6	6.4	11.4	198	7.58	2575
O ₂ 3%	ppm	1228	233.8	1.85	235.6	255	-					
	mg/m ³	3512	313.3	3.8	317.1	319	265.5					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	4.82	0.43	0.005	0.435	0.44	0.325					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	841	317	5.28	746	817	182	196	139	24.4	28.5	6.9
Outline of facilities and measurements												
Facilities Same as in Table D4.36(1)												
Location of measurement Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period a concentration of all parameters (except for NO _x) were over the permitted values.												
Estimated effects of countermeasurements -												

Table D4.37 Flue Gas Measurement Results

No. 113							Product						Color products	
Name of company							ALKALOID, Colors							
Name of combustion facilities							Boiler							
Type of fuel used							Heavy oil		Fuel consumption				500 kg/h	
Installation capacity							8 t/h		Capacity at time of measurement				8.0 t/h	
Burner type and rating							SAACKE 55		Number of burners				1	
Measurement data														
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume		
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h		
		1637	261.6	1.0	262.6	58.5	101.6	11.5	6.8	231.5	7.42	4641		
O ₂ 3%	ppm	2075	331.6	1.3	332.9	74.2	-							
	mg/m ³	5935	444.3	2.6	445.9	92.7	128.8							
Emission standard	mg/m ³	1700	-	-	350	170	50							
Emission	kg/h	21.7	1.63	0.01	1.64	0.34	0.52							
Emission standard	kg/h	5.0	-	-	5.0	-	0.5							
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd		
in dust, μg/m ³		481.3	188	1.81	462	596	50.1	82.9	13.2	9.35	14.7	1.15		
Outline of facilities and measurements														
Facilities														
<p>Heating department of the company has 2 boilers using heavy oil with a capacity of 8.0 and 7.5 t/h of steam, and 2 heating furnaces using heavy oil with a capacity of 12.8 and 7.5 t/h. Steam is used for process and for heating during heating season.</p>														
Location of measurement														
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>														
Problems and Countermeasures														
<p>Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period a concentration of all parameters (except for CO) were over the emission standards.</p>														
Estimated effects of countermeasurements														
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Table D4.38(1) Flue Gas Measurement Results

No. 114							Product						Bread	
Name of company							BAKERY ZITO LUX, Gazi Baba							
Name of combustion facilities							Boiler 761 (TPK BNP 1454)							
Type of fuel used							Heavy oil		Fuel consumption			145 kg/h		
Installation capacity							1.5 MW		Capacity at time of measurement			1.5 MW		
Burner type and rating							Weishaupt GL 8/1D		Number of burners			2		
Measurement data														
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume		
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h		
		229.3	48.0	0.8	48.8	12.3	1.97	8.7	9.1	186	6.97	2129		
O ₂ 3%	ppm	346.8	72.6	1.2	73.8	18.6	-							
	mg/m ³	991.9	97.3	2.5	99.8	23.2	2.98							
Emission standard	mg/m ³	1700	-	-	350	170	50							
Emission	kg/h	1.40	0.137	0.003	0.14	0.03	0.01							
Emission standard	kg/h	5.0	-	-	5.0	-	0.5							
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd		
in dust.		μg/m ³	3.06	8.28	0.46	56.8	179	5.74	10.3	1.27	0.0	2.44	0.04	
Outline of facilities and measurements														
Facilities														
<p>Company has boiling department with 3 boilers for steam production used for technological process and for heating.</p>														
Location of measurement														
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>														
Problems and Countermeasures														
<p>Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period a concentration of all parameters were in the permitted values.</p>														
Estimated effects of countermeasurements														
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Table D4.38(2) Flue Gas Measurement Results

No. 114					Product								Bread	
Name of company					BAKERY ZITO LUX, Gazi Baba									
Name of combustion facilities					Boiler 762 (TPK BN 1250)									
Type of fuel used					Heavy oil			Fuel consumption			100 kg/h			
Installation capacity					1.1 MW			Capacity at time of measurement			1.1 MW			
Burner type and rating					Weishaupt GL 8/AD			Number of burners			1			
Measurement data														
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume		
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h		
		315.2	54.9	1.0	55.9	16.7	4.67	12.2	4.4	129	3.7	1449		
O ₂ 3%	ppm	341.8	59.5	1.07	60.57	18.1	-							
	mg/m ³	977.5	79.8	2.2	82.0	22.6	5.06							
Emission standard	mg/m ³	1700	-	-	350	170	50							
Emission	kg/h	1.31	0.107	0.003	0.11	0.03	0.01							
Emission standard	kg/h	5.0	-	-	5.0	-	0.5							
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd		
in dust, µg/m ³		-	-	1.19	81.7	122	9.48	14.0	6.8	2.0	14.4	0.1		
Outline of facilities and measurements														
Facilities														
Same as in Table D4.38(1)														
Location of measurement														
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.														
Problems and Countermeasures														
Estimated effects of countermeasurements														

Table D4.38(3) Flue Gas Measurement Results

No. 114		Product							Bread			
Name of company		BAKERY ZITO LUX, Gazi Baba										
Name of combustion facilities		Boiler 763 (TPK 1250)										
Type of fuel used		Heavy oil			Fuel consumption			100 kg/h				
Installation capacity		4.5 MW			Capacity at time of measurement			1.1 MW				
Burner type and rating		Weishaupt GL 8/1A			Number of burners			1				
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		204.7	42.7	0.9	43.6	25.1	3.09	9.5	6.0	175	4.27	1494
O ₂ 3%	ppm	245.6	51.3	1.07	52.37	30.1	-					
	mg/m ³	702.5	68.7	2.2	70.9	37.6	3.71					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	0.875	0.085	0.003	0.088	0.05	0.01					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	-	-	0.4	46.1	36.8	3.8	10.8	3.2	0.0	5.9	0.03
Outline of facilities and measurements												
Facilities												
Same as in Table D4.38(1)												
Location of measurement												
Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.												
Problems and Countermeasures												
Estimated effects of countermeasurements												
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Table D4.39 Flue Gas Measurement Results

No. 117							Product						Paper		
Name of company							PAPER Co. KOMUNA								
Name of combustion facilities							Boiler 5154 – Optimal 800								
Type of fuel used							Heavy oil		Fuel consumption						
Installation capacity							8 t/h		Capacity at time of measurement					5 t/h	
Burner type and rating							Djuro Djakovic B-DAVC		Number of burners					2	
Measurement data															
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume			
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h			
		604.1	187.5	0.5	188.0	1.0	81.48	8.2	8.5	217	8.08	4545			
O ₂ 3%	ppm	869.9	250.0	0.7	250.7	1.36	-								
	mg/m ³	2488	335.0	1.4	336.4	1.7	117.3								
Emission standard	mg/m ³	1700	-	-	350	170	50								
Emission	kg/h	7.85	1.14	0.005	1.145	0.01	0.37								
Emission standard	kg/h	5.0	-	-	5.0	-	0.5								
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd			
in dust,	µg/m ³	916	156.6	3.42	717.6	240	120.4	104	7.2	9.50	818.5	0.2			
Outline of facilities and measurements															
Facilities															
<p>Company has 2 boilers using heavy oil. A system for using gas is build. After starting of work of gas system in Macedonia this company is ready to change from oil to gas.</p>															
Location of measurement															
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>															
Problems and Countermeasures															
<p>Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period a concentration of all parameters, except for SO₂ and dust concentration, were in the permitted values.</p>															
Estimated effects of countermeasurements															

Table D4.40 Flue Gas Measurement Results

No. 118		Product Textile, carpets										
Name of company		TEXTILE Co. MAKEDONSKI FOLKLOR										
Name of combustion facilities		Boiler 1511 – Minel										
Type of fuel used		Heavy oil		Fuel consumption							1.5 t/h	
Installation capacity		10 t/h		Capacity at time of measurement							5 t/h	
Burner type and rating		SAACKE		Number of burners							2	
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		654	97.4	1.0	98.4	119	92.77	4.9	14.1	217	11.0	3654
O ₂ 3%	ppm	1706	254.1	2.6	256.7	270	-					
	mg/m ³	4879	340.5	5.3	345.8	338	242.0					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	6.83	0.48	0.007	0.487	0.54	0.34					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust,	µg/m ³	99.7	96.0	2.4	316	254	114	53.5	10.0	166.6	539.8	0.3
Outline of facilities and measurements												
<p>Facilities</p> <p>Company has heating department with 2 boilers for steam production (max. capacity of 15 t/h) for technological process and for heating. During winter period consumption of oil is about 4-4.5 t/h.</p>												
<p>Location of measurement</p> <p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>												
<p>Problems and Countermeasures</p> <p>Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period a concentration of all parameters (except for CO) were over the permitted values.</p>												
<p>Estimated effects of countermeasurements</p> <p>-</p>												

Table D4.41 Flue Gas Measurement Results

No. 119		Product Chocolate and sweet products										
Name of company		CHOCOLATE Co. EVROPA										
Name of combustion facilities		Boiler 13410										
Type of fuel used		Heavy oil		Fuel consumption		450 kg/h						
Installation capacity		4.4 MW		Capacity at time of measurement		4.4 MW						
Burner type and rating				Number of burners		2						
Measurement data												
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h
		777.9	174.4	1.7	176.1	25.1	36.27	9.8	10.8	224.5	6.62	4098
O ₂ 3%	ppm	1373	307.8	3.0	310.8	44.3	-					
	mg/m ³	3926	412.4	6.1	418.5	55.4	64.0					
Emission standard	mg/m ³	1700	-	-	350	170	50					
Emission	kg/h	9.12	0.96	0.014	0.974	0.13	0.15					
Emission standard	kg/h	5.0	-	-	5.0	-	0.5					
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd
in dust.	µg/m ³	458.0	152.5	3.6	407.9	489	71.3	102	3.2	4.6	813.2	0.3
Outline of facilities and measurements												
Facilities												
<p>Company has 3 lines for bread production, having a line for the freeze bread products. One of the biggest bread production companies in Skopje with the early production of more that 26000 t. There are boiling plant for steam for heating a process lines with 3 boilers using light oil (D-2). A system for using gas is build. After starting of work of gas system in Macedonia this company is ready to change from oil to gas.</p>												
Location of measurement												
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>												
Problems and Countermeasures												
<p>Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period a concentration of all parameters were in the permitted values.</p>												
Estimated effects of countermeasurements.												

Table D4.42 Flue Gas Measurement Results

No. 120		Product Leader products											
Name of company		LEADER Co. GODEL											
Name of combustion facilities		Boiler – TPK											
Type of fuel used		Heavy oil		Fuel consumption								600 kg/h	
Installation capacity		9.8 MW (12.5 t/h steam)		Capacity at time of measurement								9.8 MW	
Burner type and rating		SKB-100-SAACKE		Number of burners								1	
Measurement data													
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume	
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h	
		729	182.3	0.9	183.2	20.8	42.54	8.3	10.0	230	10.87	10471	
O ₂ 3%	ppm	1193	298.3	1.0	299.3	34.0	-						
	mg/m ³	3412	399.7	2.0	402.7	42.5	69.61						
Emission standard	mg/m ³	1700	-	-	350	170	50						
Emission	kg/h	21.83	2.56	0.02	2.58	272	0.45						
Emission standard	kg/h	5.0	-	-	5.0	-	0.5						
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd	
in dust.	µg/m ³	116.0	13.8	2.1	196.1	204	122	37.4	8.0	12.5	594	0.2	
Outline of facilities and measurements													
Facilities													
<p>Heating plant in the company has 5 boilers (usually two of them are into operation) for process lines using heavy oil. A system for A system for using gas is build. In 1997, one boiler was connected on gas consuming about 1,000,000 m³ of gas for a season. After starting of work of gas system in Macedonia this company is ready to change from oil to gas.</p>													
Location of measurement													
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>													
Problems and Countermeasures													
<p>Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period a concentration of all parameters (except for CO) were in the standard values (very high O₂ concentration in waste gas – 10 %).</p>													
Estimated effects of countermeasurements													
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Table D4.43(1) Flue Gas Measurement Results

No. 121		Product											Petrol derivatives	
Name of company		REFINERY OKTA												
Name of combustion facilities		Thermoelectrical plant, Boiler 1 for steam and electricity prod.												
Type of fuel used		Heavy oil		Fuel consumption: max. capacity 5.8 t/h, '97 - 3.2 t/h										
Installation capacity		75 t/h		Capacity at time of measurement								45 t/h		
Burner type and rating		Number of burners										6		
Measurement data														
Item		SO ₂	NO	NO ₂	NO _x	CO	Dust	CO ₂	O ₂	Gas temp.	Gas velocity	Gas flow volume		
Measurement value		ppm	ppm	ppm	ppm	ppm	mg/m ³	%	%	°C	m/s	Nm ³ /h		
		675.5	174.4	0.2	174.6	8.4	-	9.8	7.9	153.0	9.13	69626		
O ₂ 3%	ppm	925.5	239.6	0.3	239.9	11.5								
	mg/m ³	2647	321.1	0.6	321.7	14.4	-							
Emission standard	mg/m ³	1700	-	-	350	170	80							
Emission	kg/h	134.5	16.27	0.03	16.3	0.73	-							
Emission standard	kg/h	5.0	-	-	5.0	-	0.5							
Metal content		Na	K	Zn	Mg	Fe	Pb	Mn	Cr	Cu	Ni	Cd		
in dust, μg/m ³														
Outline of facilities and measurements														
Facilities														
<p>Refinery is the only refinery in Macedonia having capacity of 2.5 million tons per year. In 1997 production was 374,000 t. Refinery produces different kinds of petrol products, mainly: gasoline, light oil and heavy oil. There two points for waste gas emission: thermoelectrical department for steam and electricity production and combustion of oil and gas for process (distillation of oil, hydrodesulfurization, catalytic reforming). Thermal plant has boilers with 6 burners each with a maximal capacity of 75 t/h of steam. In 1997 average production was 45 t/h of steam. Maximal consumption of heavy oil in this department is 5.8 t/h, but in 1997 it was 3.2 t/h.</p>														
Location of measurement														
<p>Gas substance and dust concentration was measured at the measuring site installed near the top of the smokestacks.</p>														
Problems and Countermeasures														
<p>Problems with the waste gas pollution are connected with a quality of imported oil. During the measuring period a concentration of all parameters (except for SO₂) were in the permitted values.</p>														
Estimated effects of countermeasurements														
-														