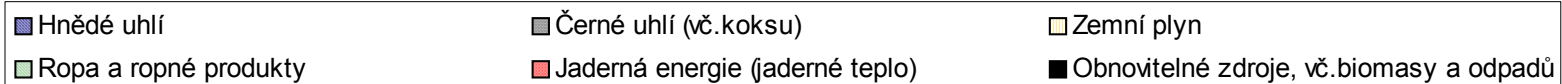
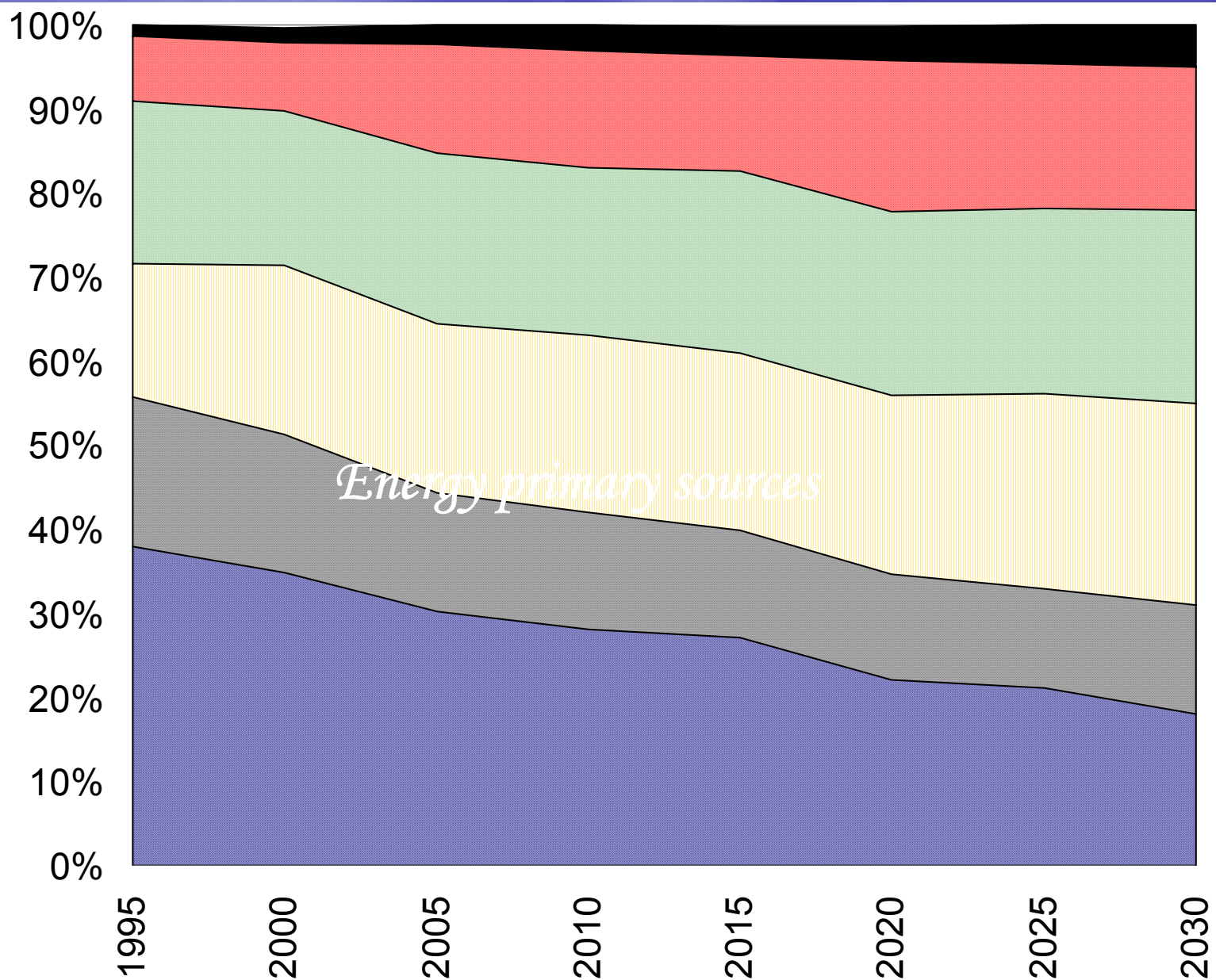
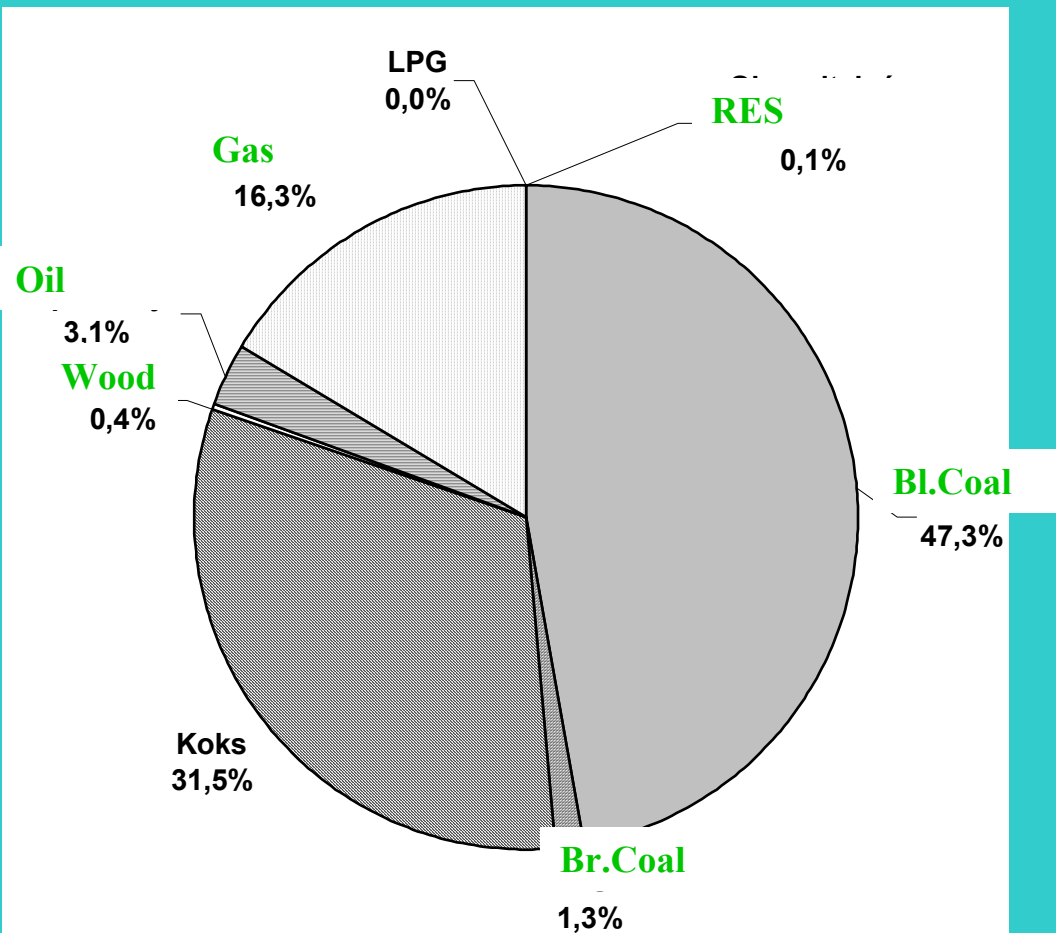


*Utilization of alternative fuel
at the FBC
in the ČR*

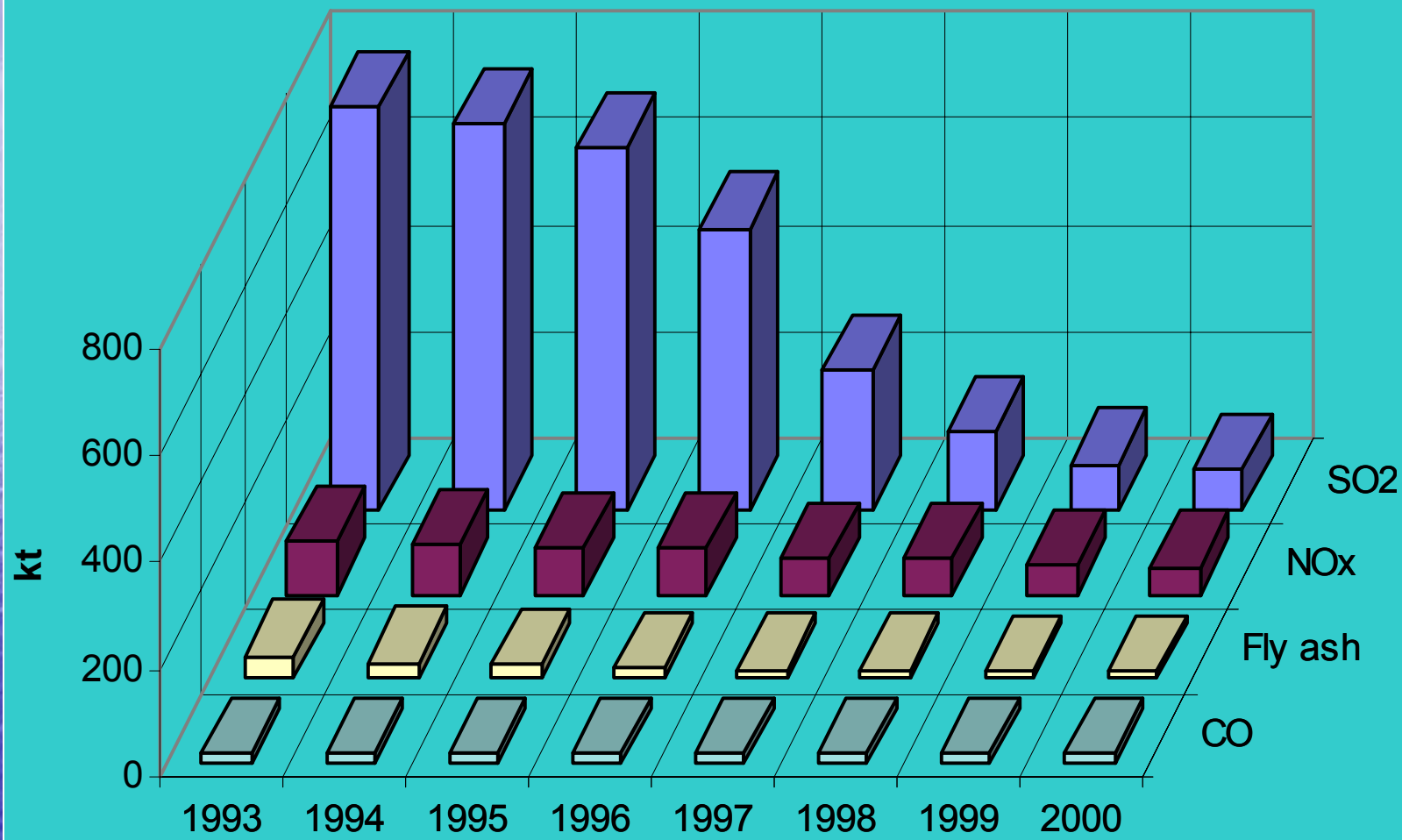
Dagmar Juchelkova
VŠB-Technical university of Ostrava
Energy Institute



Energiestruktur of Ostrava-Region



Emissions from Power plants



		Potential			Economical Potential		
		Invest.	Production	Share on the EP	Invest.	Production	Share on the EP
		mil.Kč	TJ/rok	%	mil.Kč	TJ/rok	%
Biomass		109 800	83 700	4,50	45 100	50 960	2,91
Waste		6 830	3 700	0,20	0	1 520	0,09
Solar		76 670	11 500	0,62	0	140	0,01
Photovoltaic		8 680	100	0,00	0	0	0,00
Heat pump		21 180	8 800	0,47	6 110	2 540	0,15
Water	Big	0	5 700	0,31	0	5 700	0,34
	Small	16 290	4 100	0,22	6 030	2 930	0,18
Wind		16 020	4 000	0,21	270	100	0,01
Total		255 470	121 600	6,53	64 010	63 890	3,69

FBC Units in the CZ

- Presently – 29 Units
- Steam capacity of the boilers
 - CEZ – 1 900 t/hour – 7 units
 - Other – 4 100 t/hour – 28 units
- Trend small units for heating (co-combustion)

Various type of FBC in the CZ

SES Lurgi

ČEZ Elektrárna Tisová

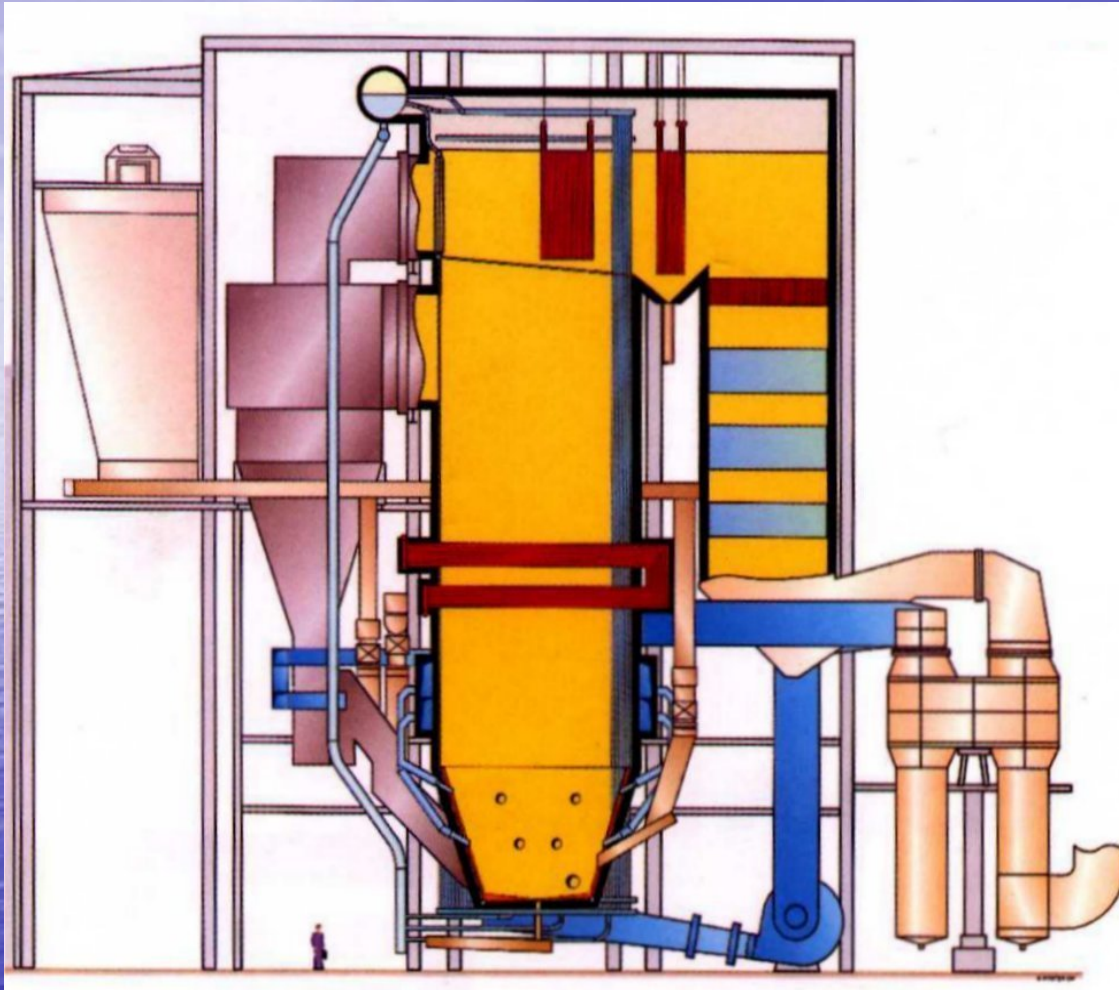
2 x 350 t/h

1995 und 1997

Brennstoff: Br. Coal

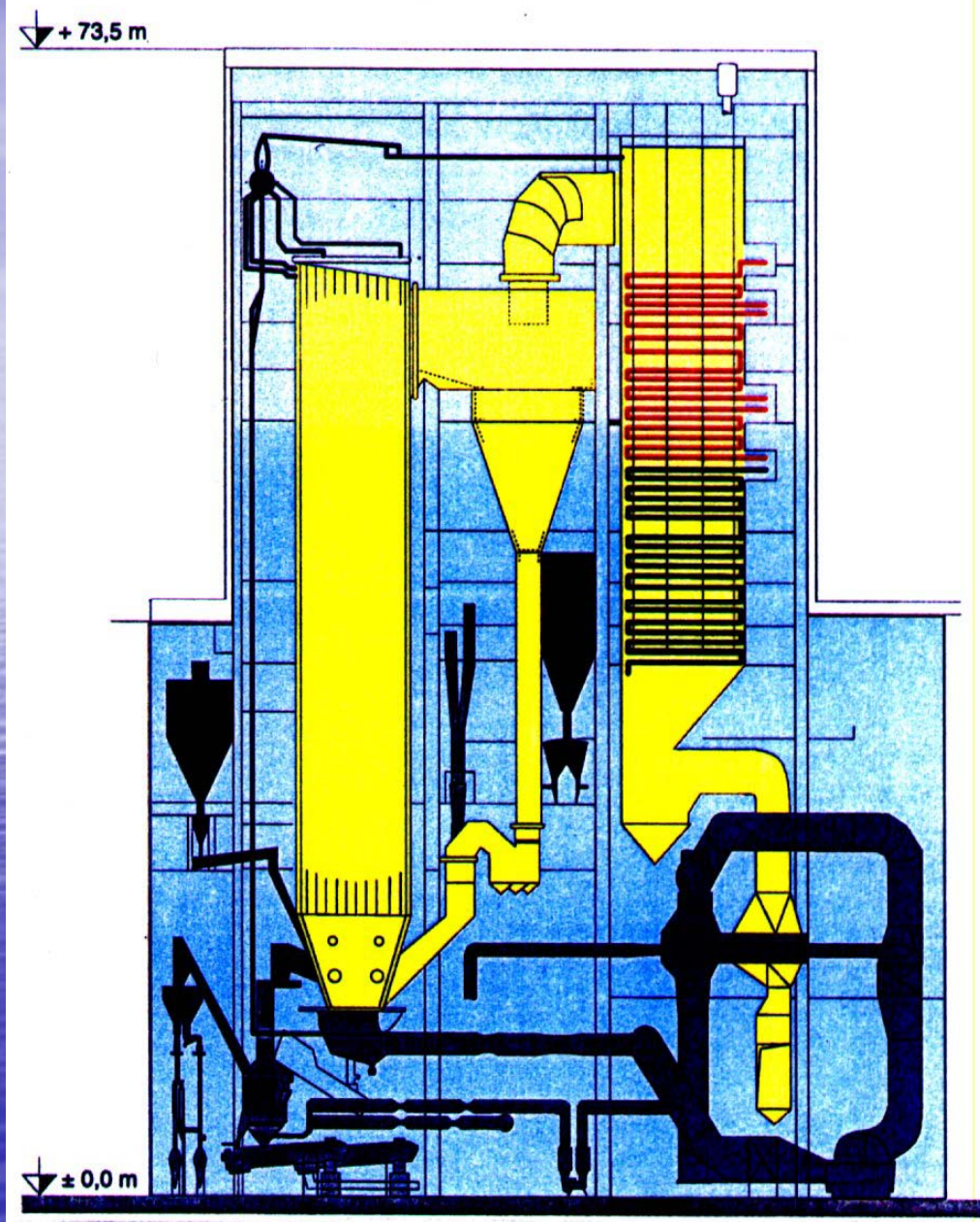
Alternative: Biomasse,
Papier, EBS





Frantschach Energo, a.s
fluidní kotel
220 t/h páry

- Leistung 220 t/h
- Dampftemp. 535°C
- Dampfdruck 9,4 MPa



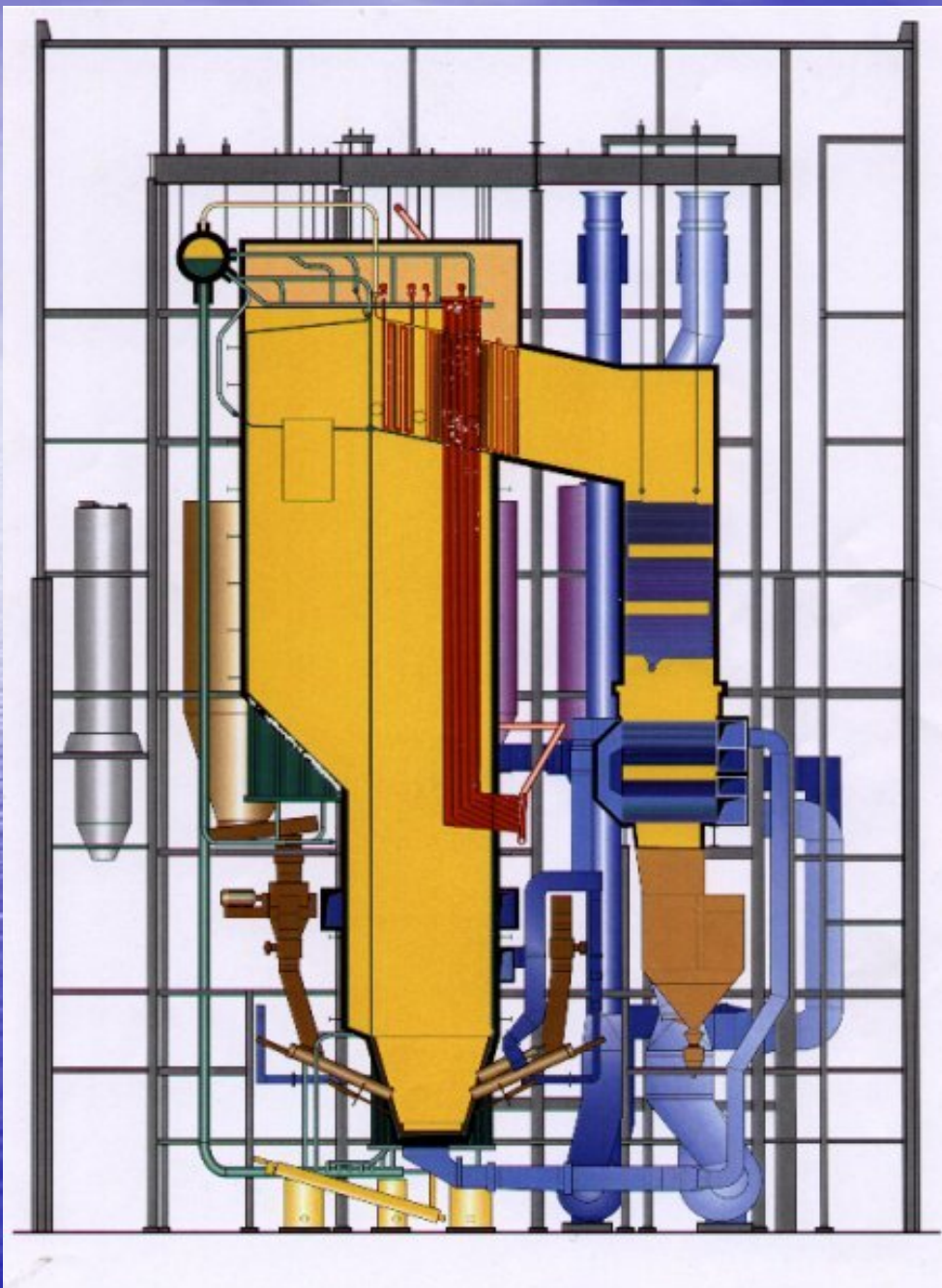
ČEZ a.s. Elektrárna Tisová
fluidní kotel

350 t/h páry

-Leistung 350 t/h

-Dampftemp. 505°C

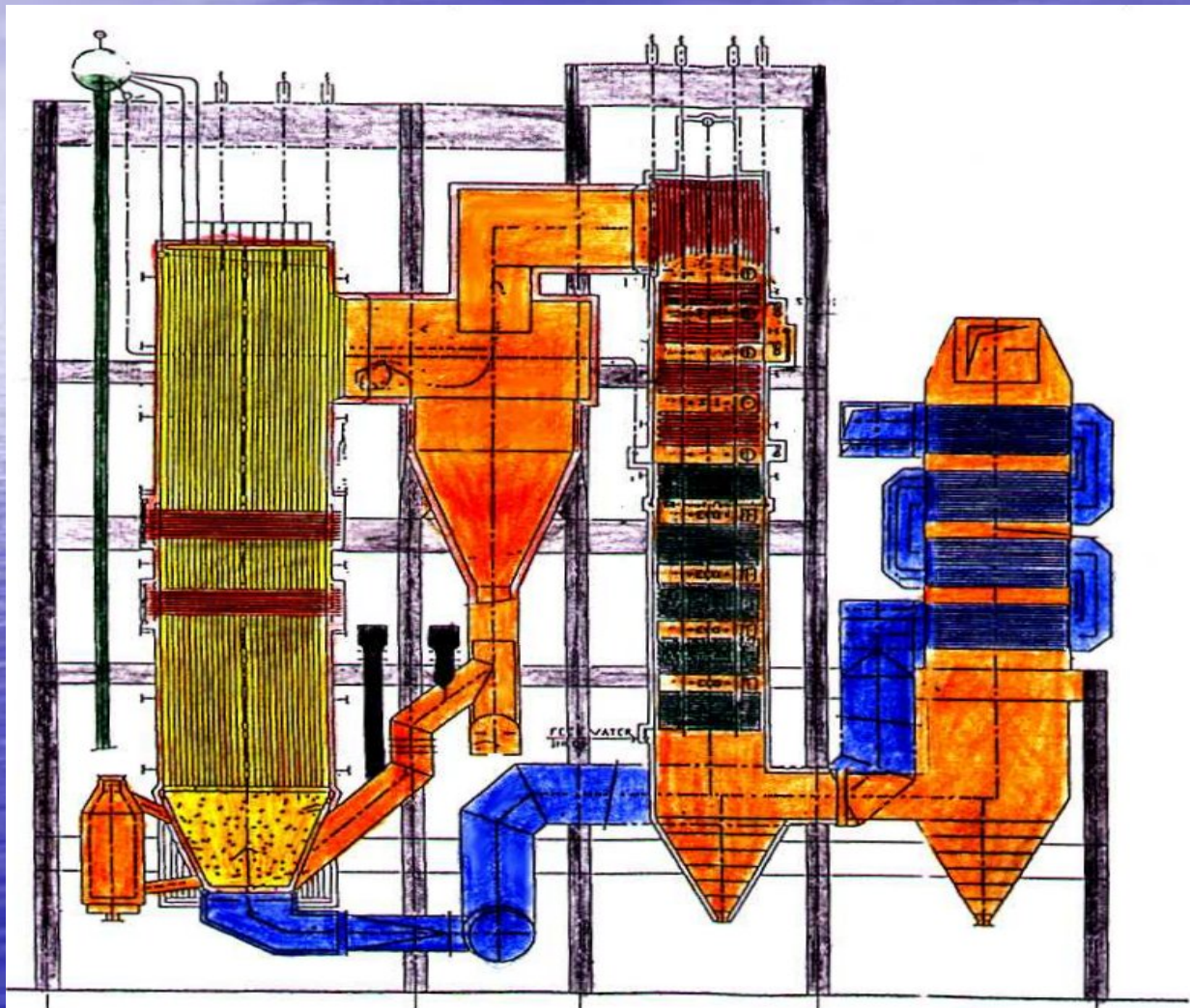
-Dampfdruck 9,4 MPa



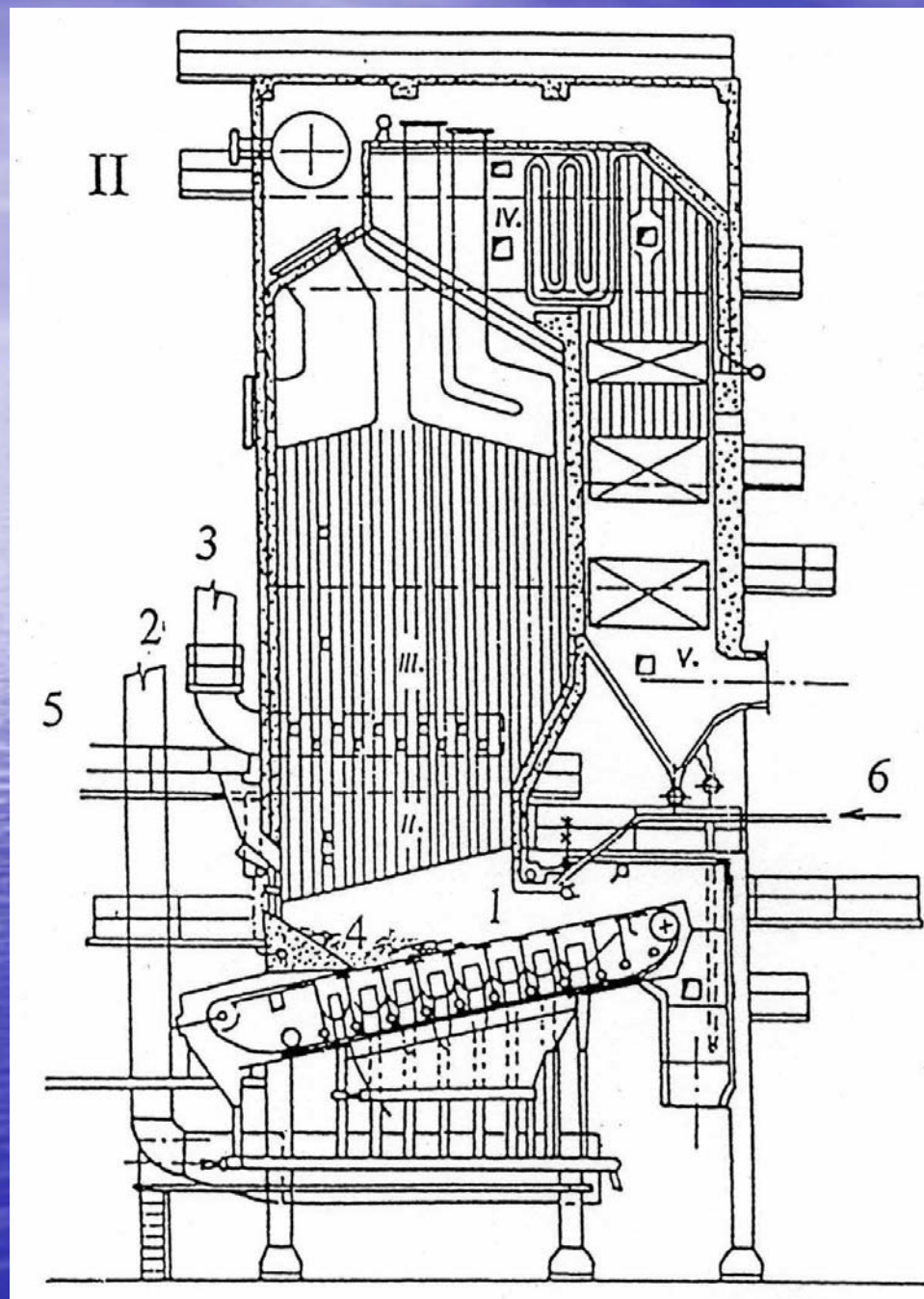
Dalkia Česká republika a.s.
Olomouc
fluidní kotel
188 t/h páry

-Leistung 188 t/h
-Dampftemp. 535°C
-Dampfdruck 13,2 MPa

ČEZ a.s. Elektrárna Poříčí
fluidní kotel
250 t/h páry

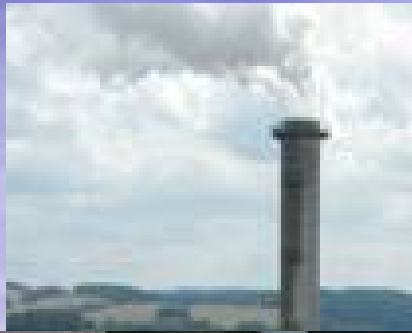


- Leistung 250 t/h
- Dampftemp. 520°C
- Dampfdruck 10 MPa



Dalkia Česká republika
a.s. Krnov
fluidní kotel Ignifluid
75 t/h páry

-Leistung 75 t/h
-Dampftemp. 445°C
-Dampfdruck 3,7 MPa

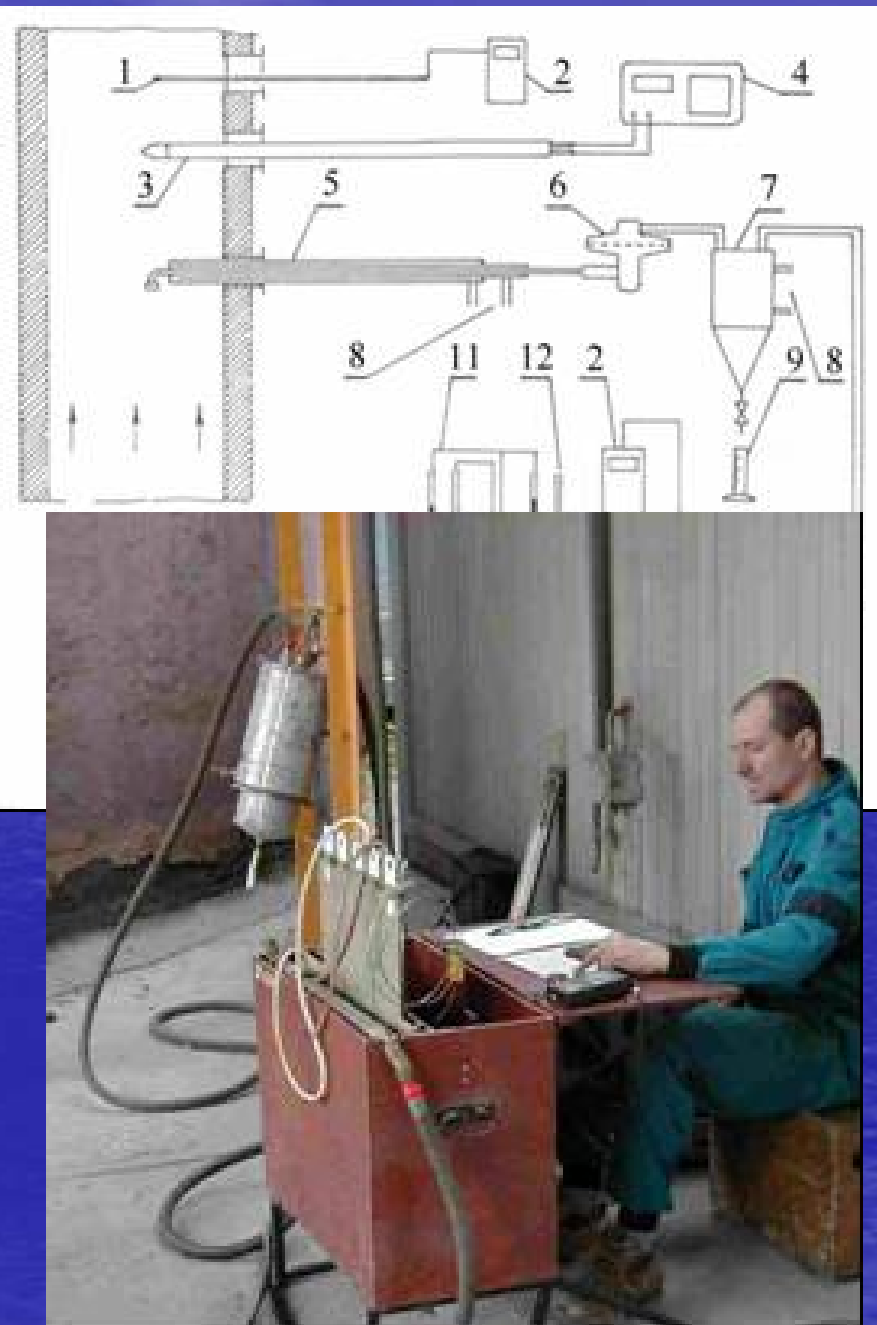
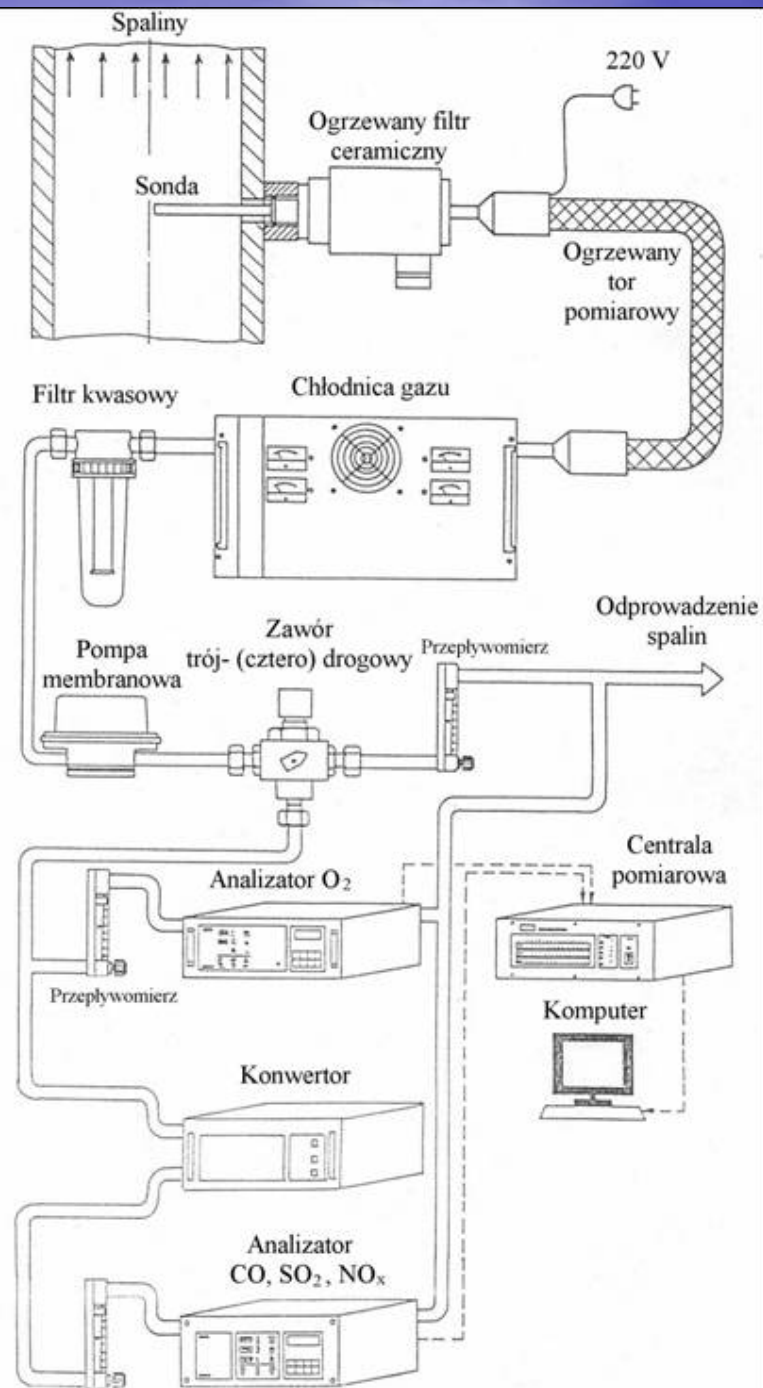


<i>Parameter</i>	<i>Mass</i>	<i>Middle</i>	<i>80 %</i>
Calorific capacity	[MJ.kg ⁻¹]	15	-
Ash	[%]	20	-
Cd	[mg.kg ⁻¹]	2,6	4,2
Th	[mg.kg ⁻¹]	0,5	0,5
Hg	[mg.kg ⁻¹]	0,43	0,58
As	[mg.kg ⁻¹]	1,4	2,1
Co	[mg.kg ⁻¹]	6,8	8,2
Ni	[mg.kg ⁻¹]	28	43
Sb	[mg.kg ⁻¹]	6,5	14
Pb	[mg.kg ⁻¹]	210	270
Cr	[mg.kg ⁻¹]	92	150
Cu	[mg.kg ⁻¹]	180	370
Va	[mg.kg ⁻¹]	6,9	10
Sn	[mg.kg ⁻¹]	14	17
Be	[mg.kg ⁻¹]	0,28	0,38
Zn	[mg.kg ⁻¹]	470	560
S	[%]	0,26	0,34
Cl	[%]	0,51	0,62

Certificated fuel from EU (dry substance)

Test	Output			Mass	Calorific	Flygas	Emissions [mg.m _N ⁻³] při 6% O ₂				
	[kg.s ⁻¹]	[t.h ⁻¹]	[MW]	<i>Coal: sawdust</i>	[MJ.kg ⁻¹]	O ₂ [%]	CO	NO _x	SO ₂	Solid	TOC
1	22,4	80	61	86,86 % : 13,14%	17,67	6,7	50	186	498	16,9	2,23
2	43,1	155	117	86,86 % : 13,14%	17,67	4,7	31	265	516	20,1	2,35
3	52,0	187	141	85,86 % : 14,14%	17,4	4,8	29	267	532	21,2	2,75
4	24,7	89	67	85,86 % : 14,14%	17,4	6	36	226	404	14,3	2,75
				<i>Coal: wood chips</i>							
5	24,7	89	68	89,48 % : 10,52%	17,25	6,4	32	236	440	15,0	1,25
6	52,1	187	142	89,48 % : 10,52%	17,25	4,1	33	282	484	23,1	1,30
7	52,1	187	142	95,71 % : 4,29%	17,6	4,1	31	264	543	20,0	2,15
8	23,5	84	64	95,71 % : 4,29%	17,6	6,8	29	278	385	14,1	2,75





Emissionen
Emise

Kohlenwasser-
stoffe
Uhlovodíky

$C_x H_y$
(Gasphase)
(*Plynná fáze*)

Schwefeloxide
Oxidy síry

SO_2
 SO_3

Stickstoffoxide
Oxidy dusíku

NO
NO₂
N₂O

Kohlenstoff-
oxide
Oxidy uhlíku

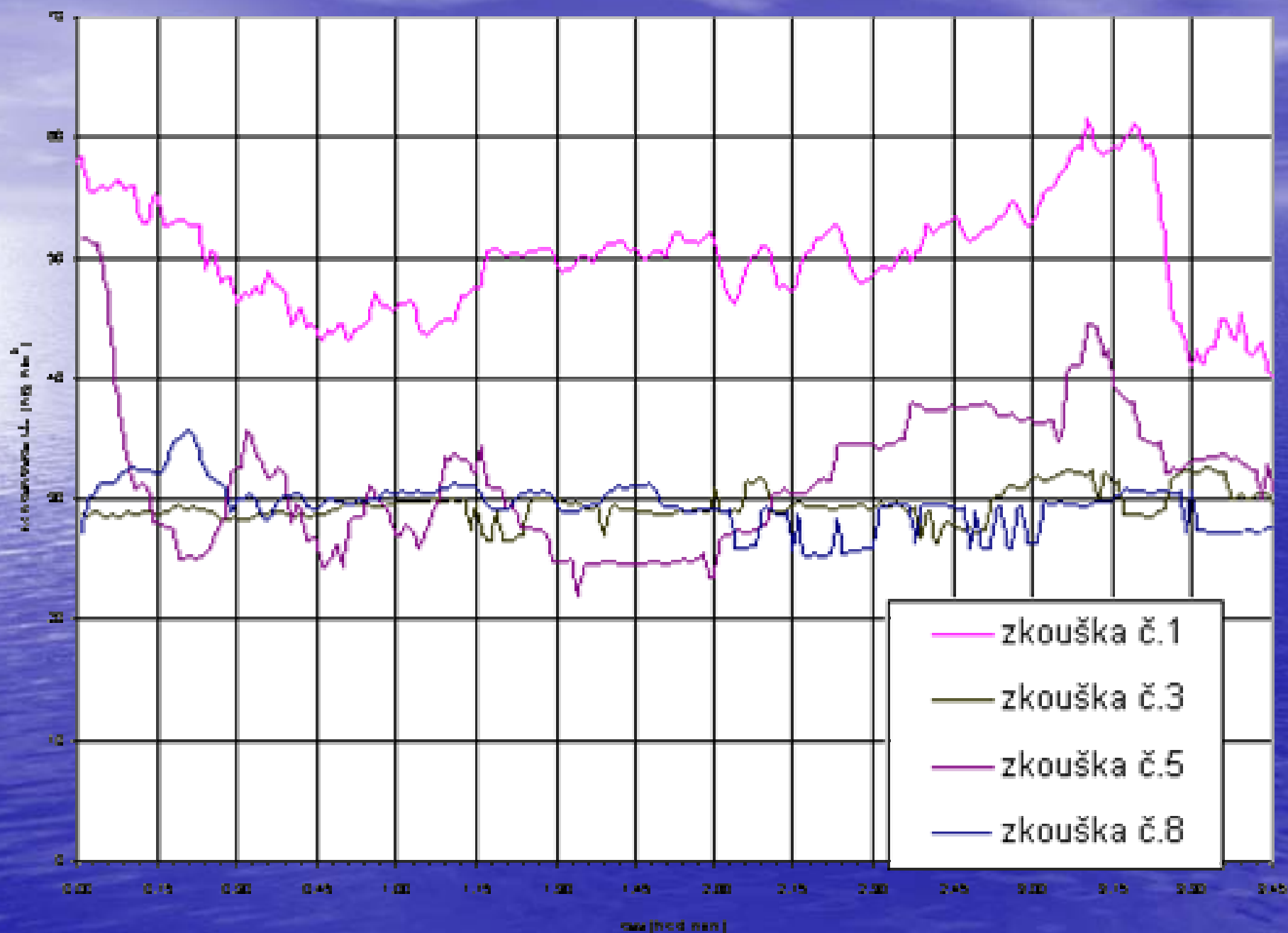
CO
CO₂

Wasserdampf
Vodní pára

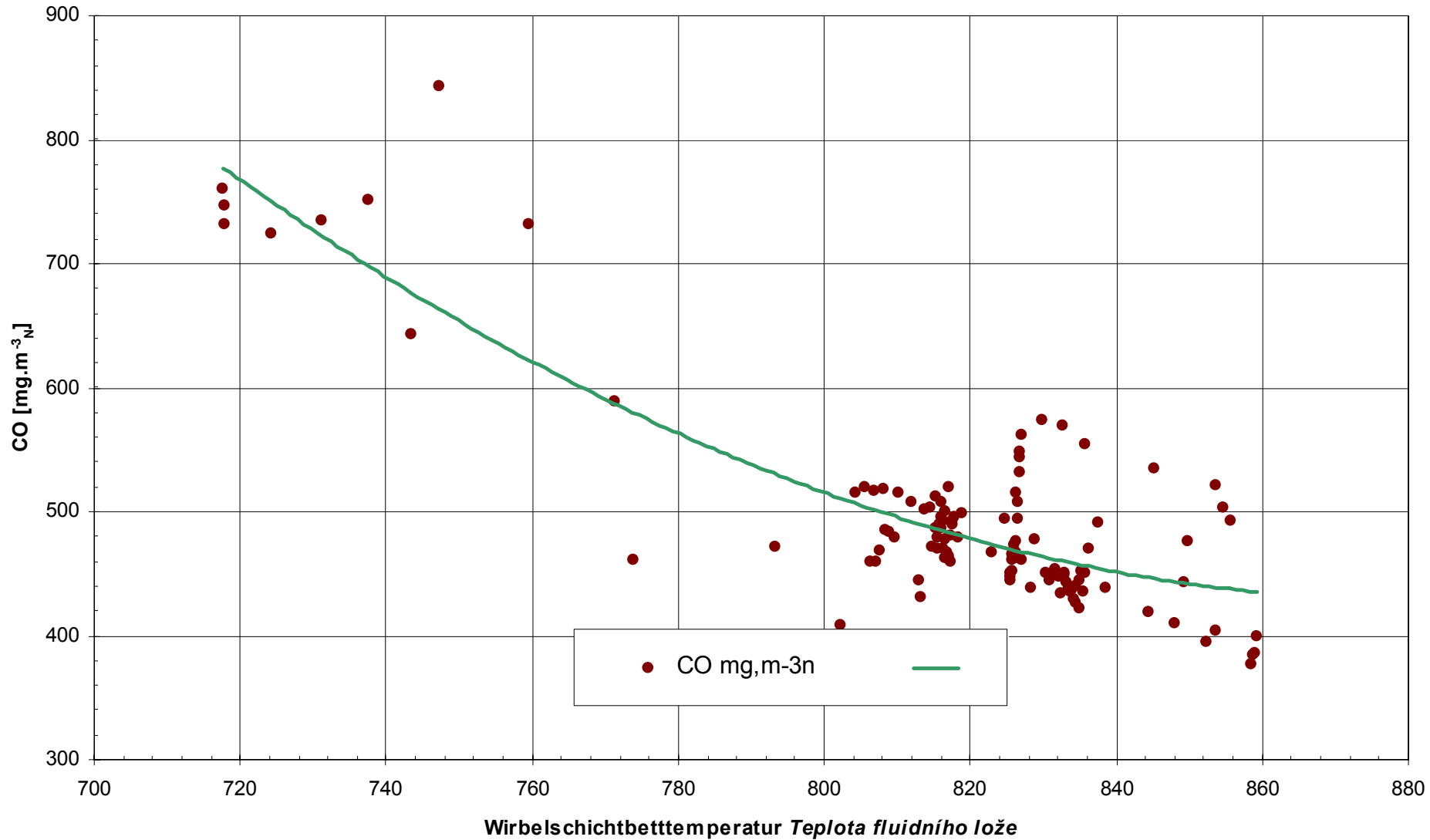
H₂O

Partikel
Částečky

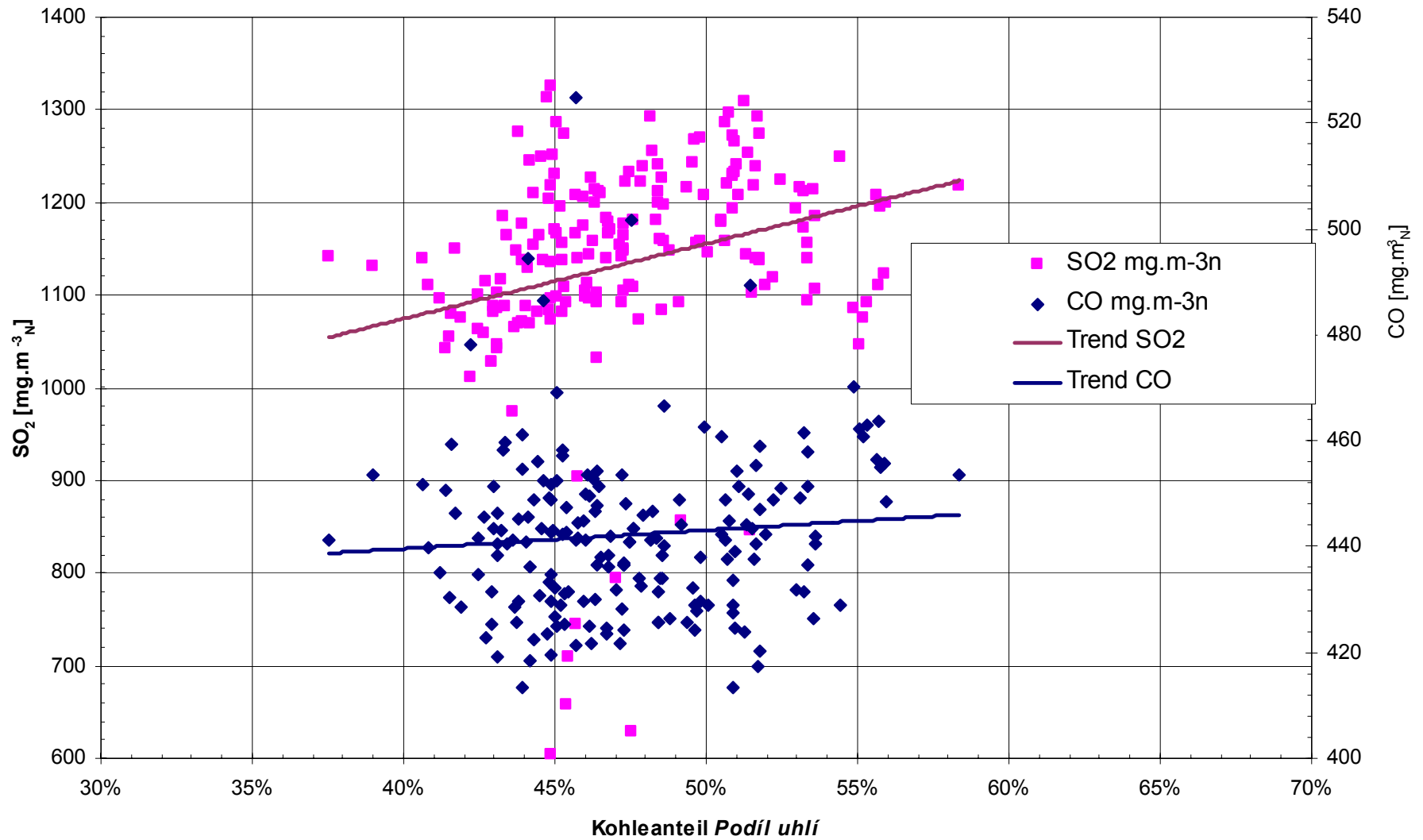
Unverbrannter Brennstoff
(kondensierte Phase)
Ruß, Asche,
Spurenelemente
Nespálené palivo
(*kondenzační fáze*)
Saze, popel, stopové prvky

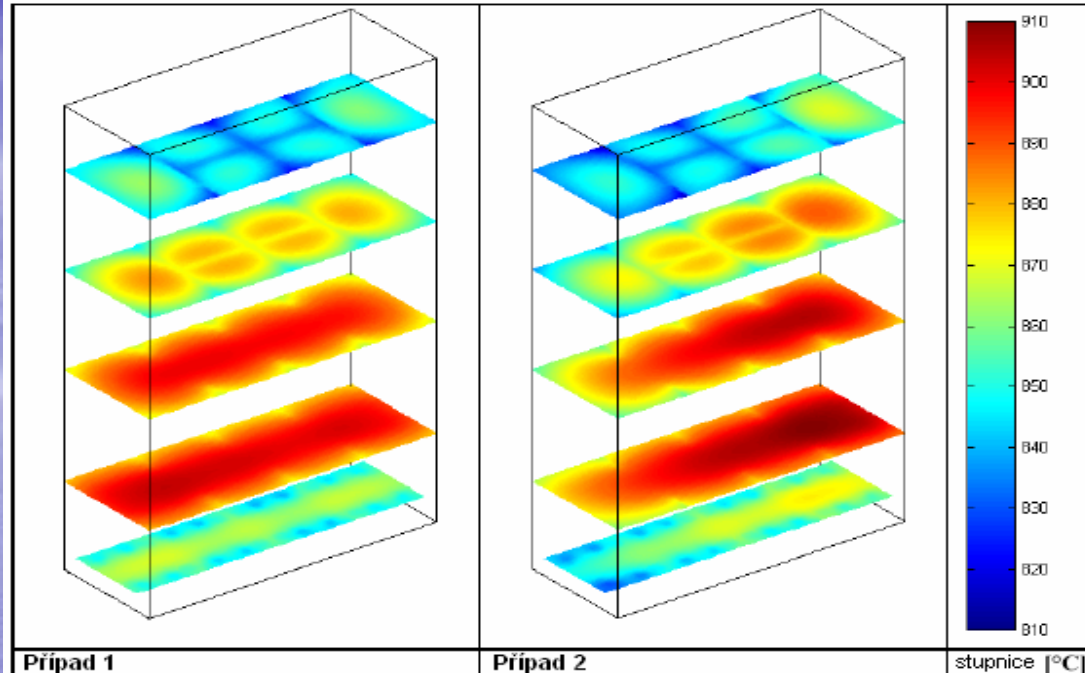


Einfluss der Wirbelschichtbetttemperatur an der CO-Emission
Závistost Koncentrace CO na teplotě fluidního lože

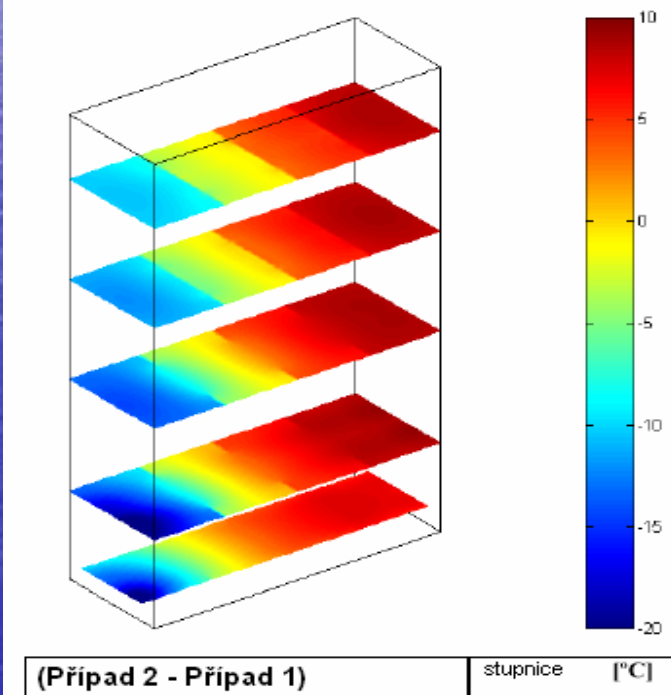


Einfluss der Brennstoffanteil an der Emissionen
Závislost poměru paliva na emisích





Rozdíl v teplotě plynné fáze [$^{\circ}\text{C}$] (Případ 2 - Případ 1)



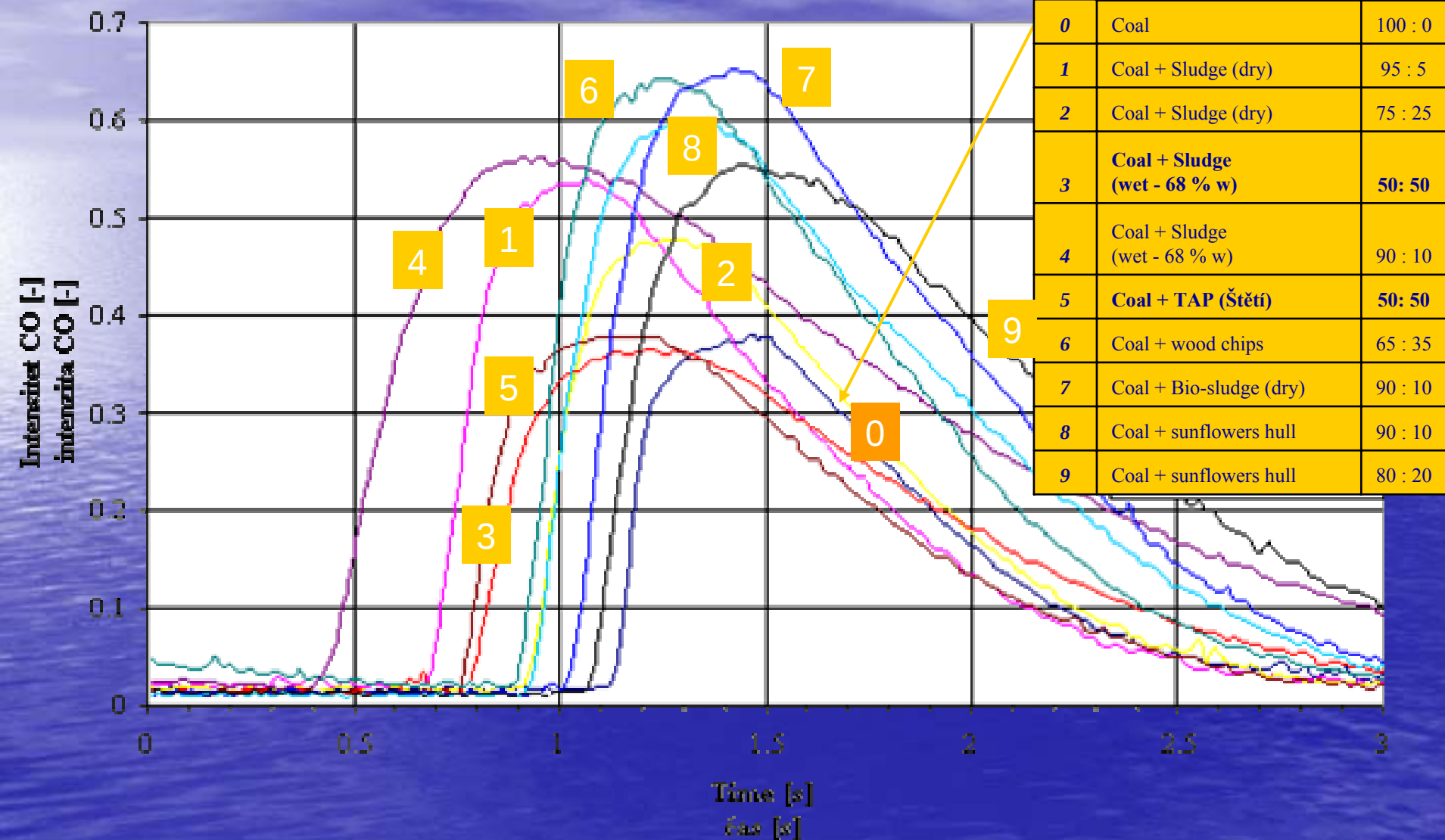
Solution on the pilot units

- Problematic mixture
- Cost reduction
- Suggestion for the new units

<i>Mixtures</i>	<i>Formula</i>	<i>[%]</i>
<i>0</i>	Coal	100 : 0
<i>1</i>	Coal + Sludge (dry)	95 : 5
<i>2</i>	Coal + Sludge (dry)	75 : 25
<i>3</i>	Coal + Sludge (wet - 68 % w)	50 : 50
<i>4</i>	Coal + Sludge (wet - 68 % w)	90 : 10
<i>5</i>	Coal + TAP (Štětí)	50 : 50
<i>6</i>	Coal + wood chips (Štětí)	65 : 35
<i>7</i>	Coal + Bio-sludge (dry, Štětí)	90 : 10
<i>8</i>	Coal + sunflowers hull	90 : 10
<i>9</i>	Coal + sunflowers hull	80 : 20
<i>10</i>	Mixture 2 + saturation sludge	10:1
<i>11</i>	Mixture 2 + caustifikation sludge	10:1

Comparison of CO Emissions

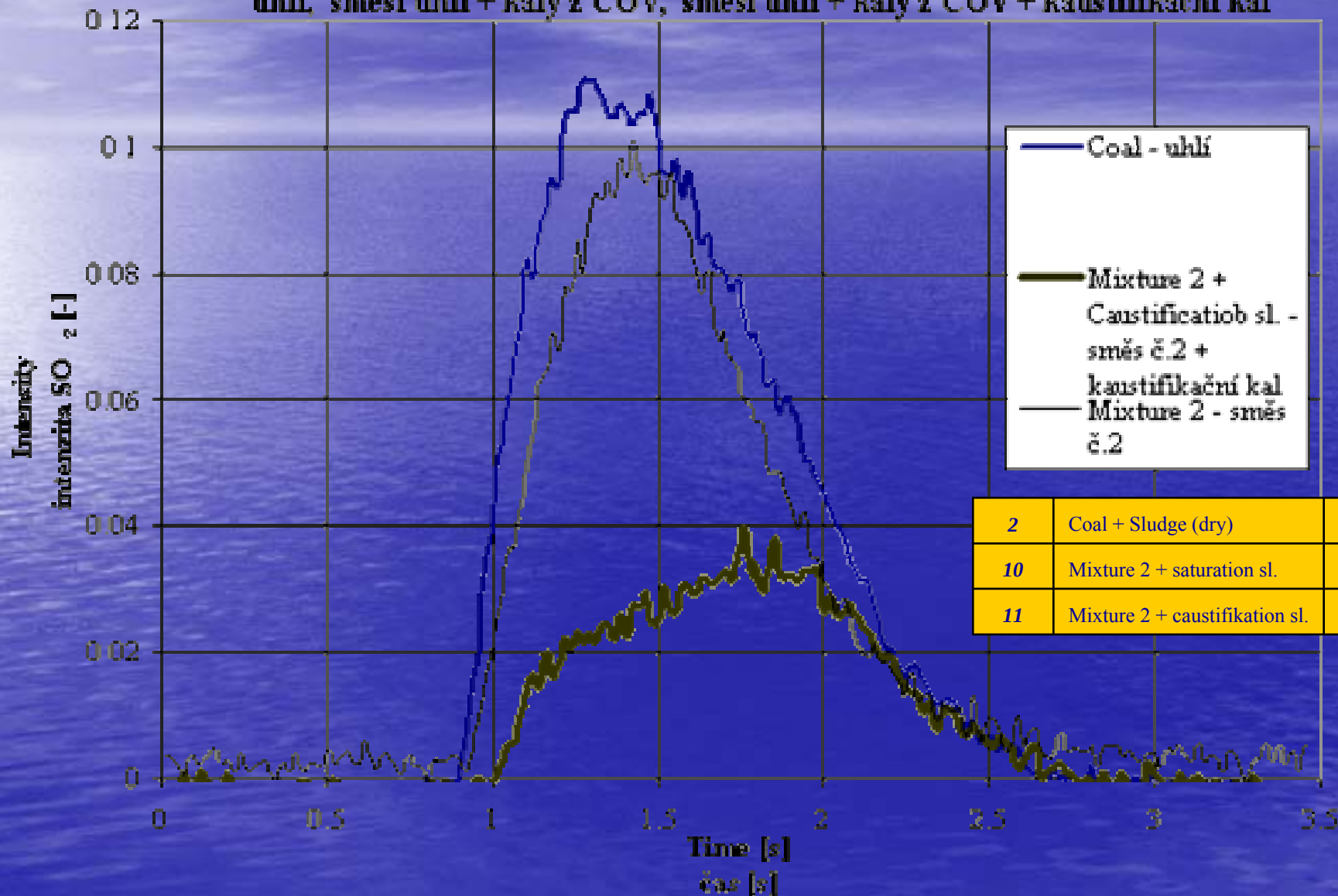
Porovnání emisí CO u jednotlivých směsí



SO₂ Emissions: Coal, Coal+Sludge, Coal+Sludge+Caustification Sludge

Srovnání emise SO₂ během spalování:

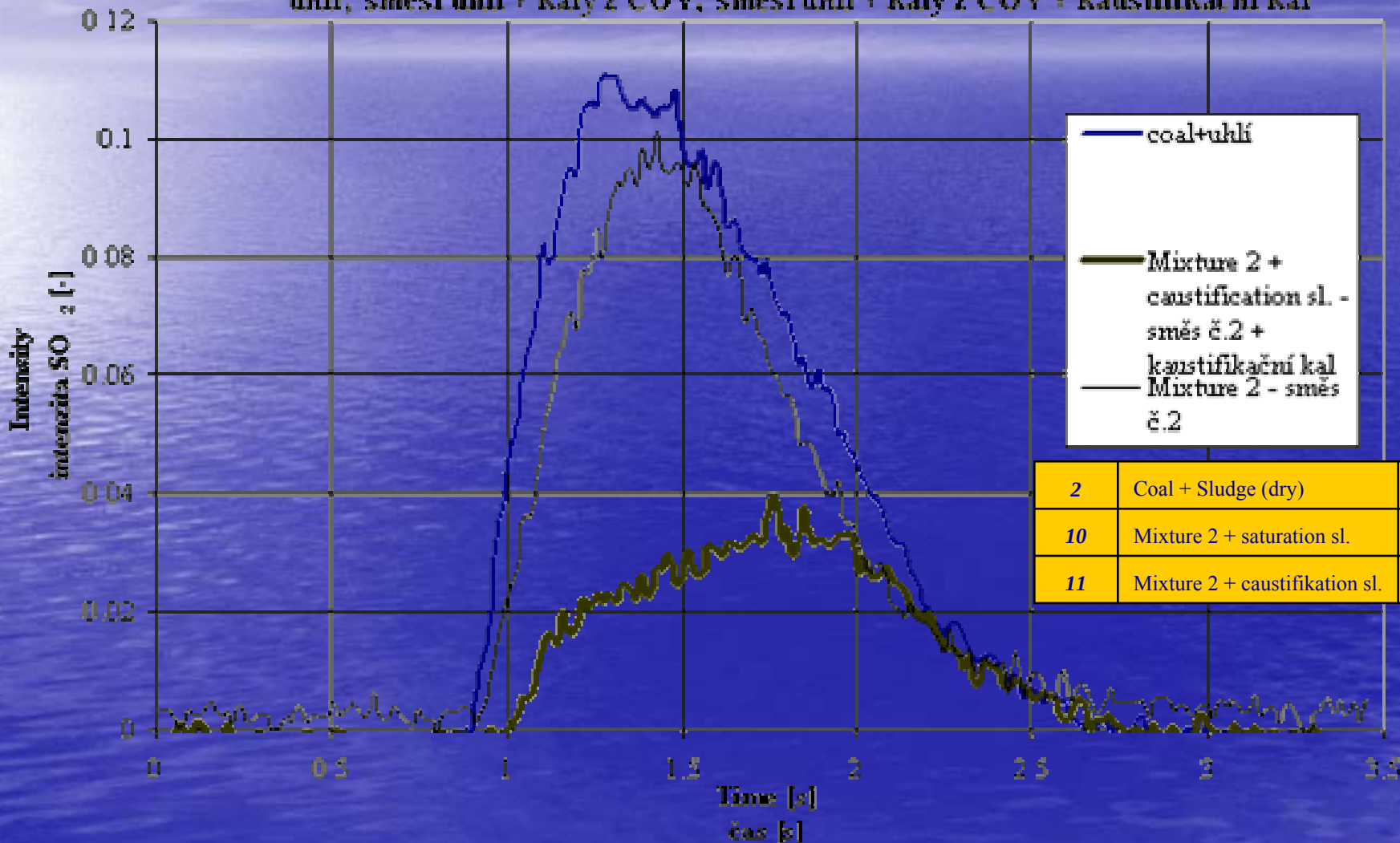
uhlí, směsi uhlí + kaly z ČOV, směsi uhlí + kaly z ČOV + kaustifikační kal



SO₂ Emissions: coal, coal+ sludge, coal+sludge+caustification sludge

Srovnání emisí SO₂ během spalování:

uhli, směsi uhlí + kaly z ČOV, směsi uhlí + kaly z ČOV + kaustifikační kal



Thank you for your attention

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