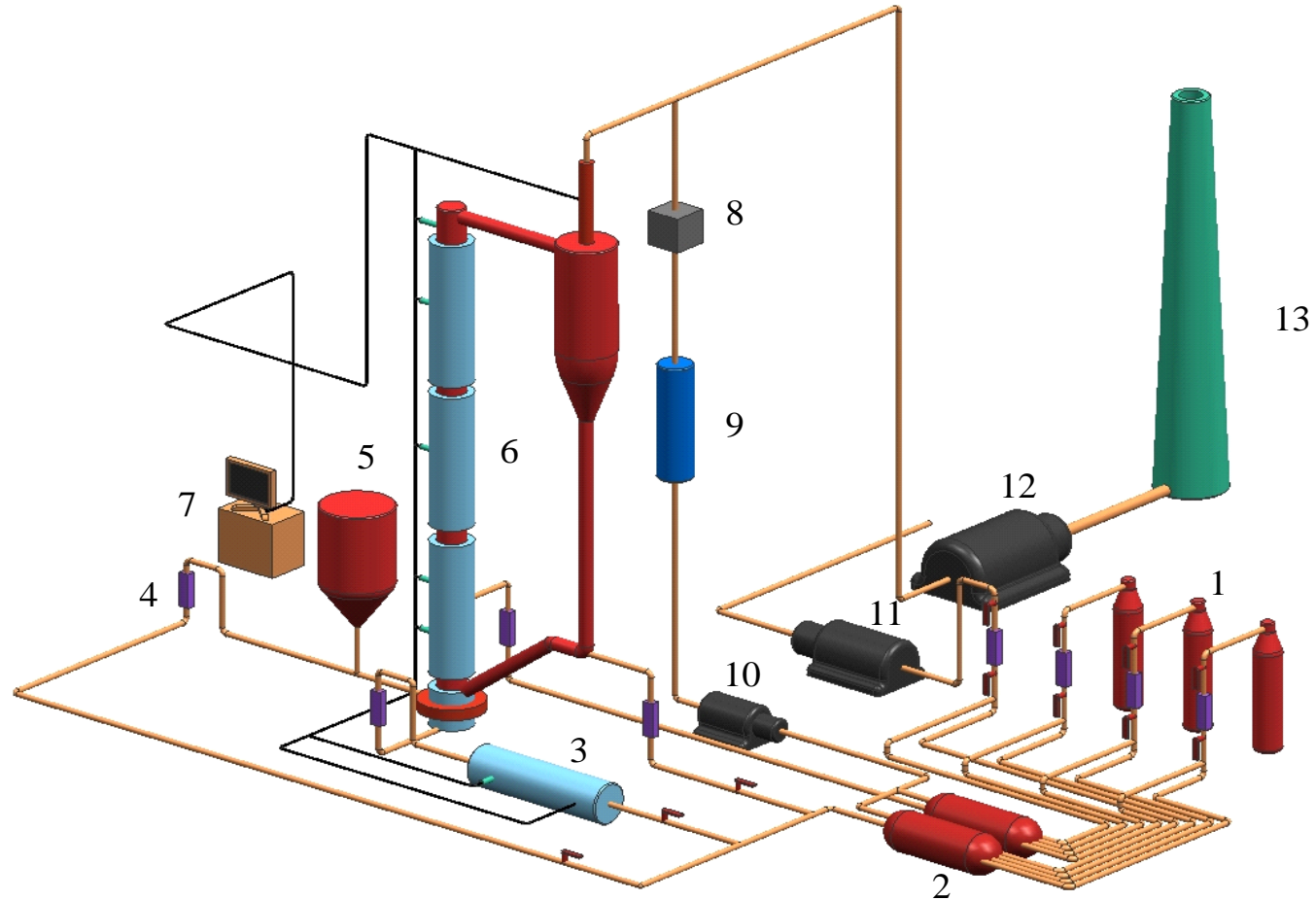
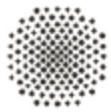


Oxy-fuel coal combustion in a 50kWth CFB combustor with warm flue gas recycle

Lunbo Duan, Ph.D
Southeast University, China





Flow chart of the 50kWth Oxy-CFB at SEU



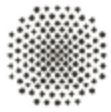
University of Stuttgart
Germany



Oxy-Fuel FBC 2012
June 28-29, Stuttgart



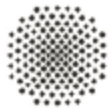
Southeast University



Main dimensions and parameters of the existing facility

Design Parameter	Metric System	
	Value	Unit
Thermal input	50	kW
Dense zone height	800	mm
Dilute zone height	4000	mm
Total riser height	5200	mm
2 nd air injection elevation	600, 800, 1000	mm
Solid return point elevation	200	mm
Coal feed rate	8-10	kg/h
Dense zone inside diameter	122	mm
Dilute zone inside diameter	150	mm
Coal feed point elevation	400	mm
Cyclone inlet elevation	5000	mm



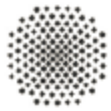


Coal analysis

Coal analysis,,air dry basis (wt.%)	Illinois #6 Bituminous coal	Huai Bei Bituminous coal	Petroleum Coke
Moisture	5.13	3.76	0.74
Ash	9.85	16.18	1.66
Volatile	35.34	28.38	8.82
Fixed carbon	49.68	51.68	88.78
C	67.42	65	88.56
H	4.14	3.85	3.53
O	9.37	9.95	0.14
N	1.04	0.76	1.06
S	3.05	0.5	4.31
Low heating value	26.66	25.05	31.88

Particle Size:
0-6mm



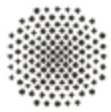


Limestone analysis

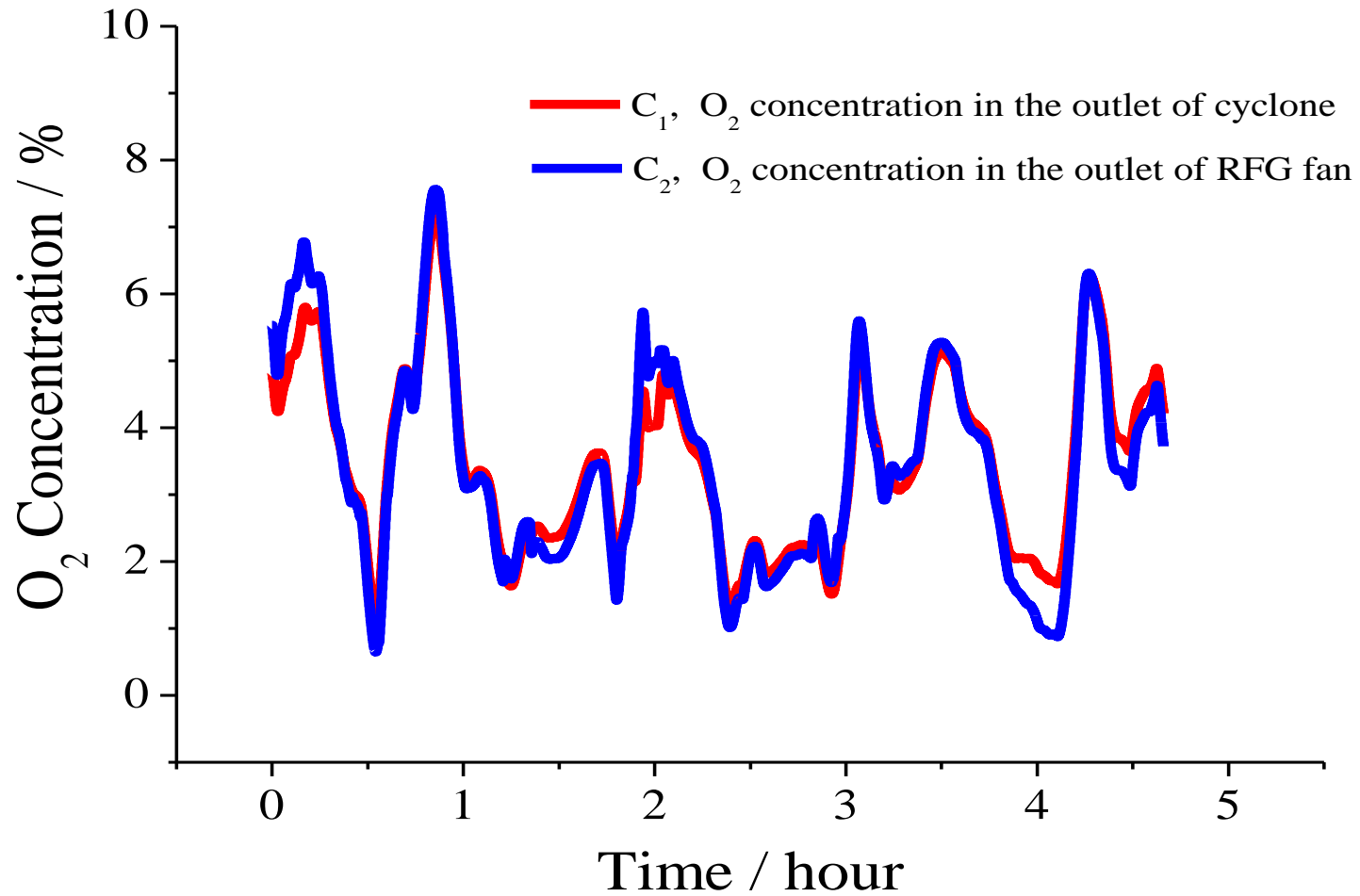
Limestone analysis	content (wt.%)
CaO	55.99
MgO	0.538
SiO ₂	0.392
Al ₂ O ₃	0.1
Fe ₂ O ₃	0.0503
Na ₂ O	0.041
SO ₃	0.0381
Cl	0.0219
SrO	0.0165
K ₂ O	0.0146
P ₂ O ₅	0.0101
TiO ₂	0.0041
LOI	42.77

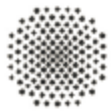
Particle size: 0-1 mm





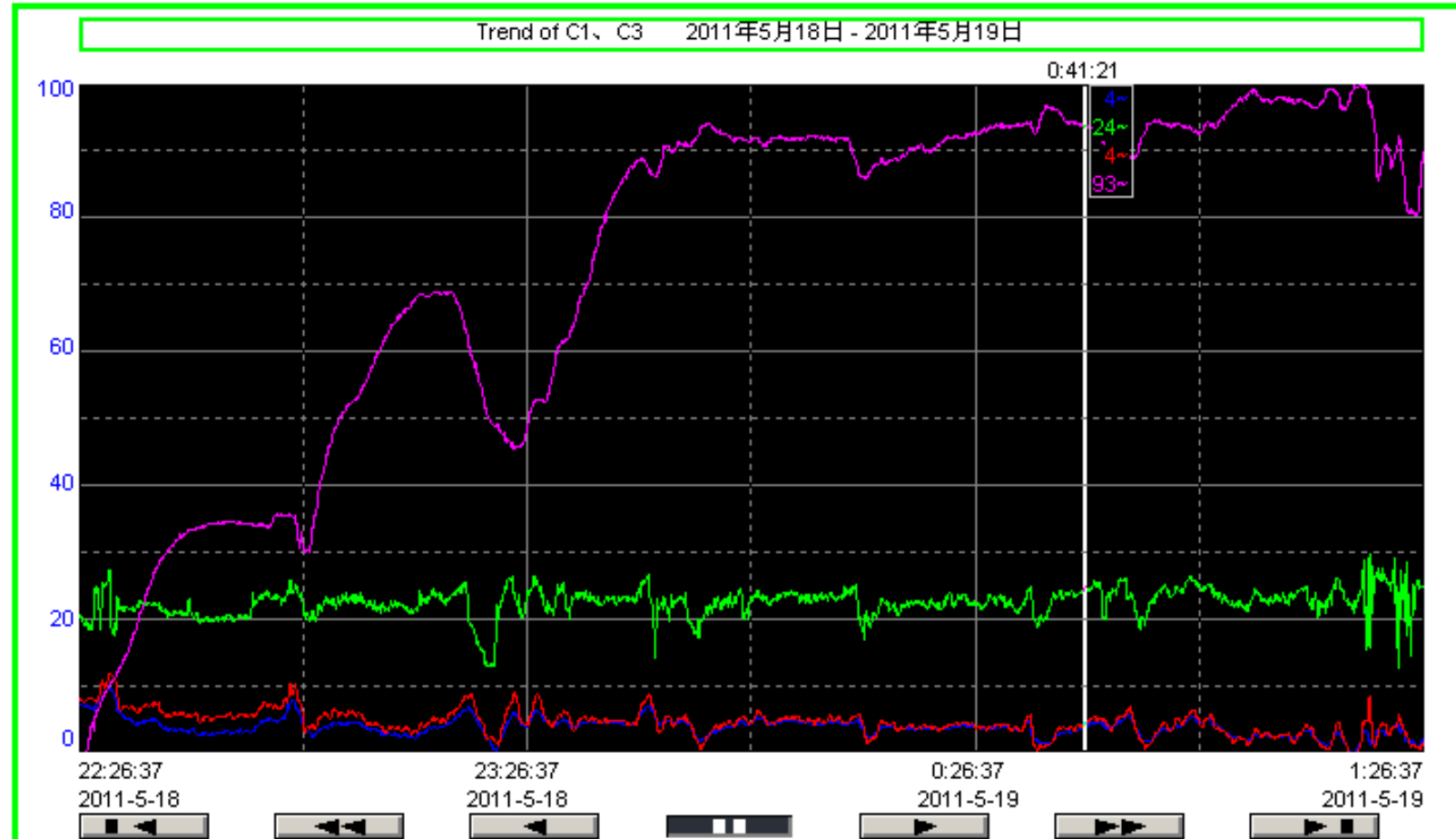
Air infiltration

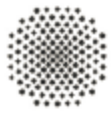




Oxy-transition

id of C1、C3 - /OxyCFB_20110426//

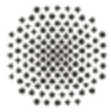




Preliminary results

Item	Unit	US Bituminous coal		Chinese Bituminous coal		Chinese Petroleum coke	
		Air-combustion	Oxy-combustion	air-combustion	oxy-combustion	air-combustion	oxy-combustion
Dense bed temperature, T2	°C	881	891	866	889	857	884
Furnace exit temperature, T7	°C	890	863	862	919	906	904
Furnace exit O ₂ concentration, C1	%	4.3	3.6	6.2	6.9	3.6	6.8
Overall O ₂ concentration, C3	%	21.0	22.2	21.0	23.4	21.0	23.1
Unburnt carbon in fly ash	%	21.4	20.8	19.6	17.5	23.8	22.6
SO ₂ concentration	ppm	1387	1783	238	615	2031	3717
SO ₂ emission	mg/MJ	1095.0	265.0	176.9	41.1	1254.0	546.0
Ca/S molar ratio		2.5	4.0	2.5	4.0	2.5	4.0
Desulfurization efficiency	%	52.7	88.5	55.7	89.7	53.6	79.8
NO concentration	ppm	283.0	348.0	236.0	319.2	171.2	322.0
NO emission	mg/MJ	104.7	24.3	82.2	28.6	49.5	22.2
CO concentration	ppm	1065.0	899.0	80.5	154.8	102.5	281.0
CO emission	mg/MJ	368.0	58.6	26.2	13.8	29.7	19.3
H ₂ O emission	%	7.4	21.1	5.3	16.3	7.1	17.4





Thanks for your attention!

