

Dust Extraction by Means of Multiclones

Installation 3

For each producer 2 multiclones arranged in series.
Primarily the multiclones contained $6 \times 5 = 30$ tubes.

New multiclones:

Producer 1	since	June 1,	1941
" 2	"	" 1,	1941
" 3	"	" 9,	1939

Sizes of a multiclone:

$6 \times 5 = 40$ tubes having a diameter of 150 mm are inserted into tubes of 250 mm diameter.

The inner tubes are twisted at the end.

Gas inlet: $500 \times 2,165$ mm width in the clear = 1.0825 m^2 .

Gas outlet: the same sizes as gas inlet.

Gas collecting box (at the top): Height 806 mm, cross section 2.94 m^2 , volume 2.37 m^3 , length 1355 mm, width 2,165 mm.

Middle box: Height 2,100 mm, cross section 2.94 m^2 , volume 6.16 m^3 .

Exit (dust extraction): Height, 1,800 mm, cross section at the top, $1,355 \times 2,165$ mm, at the bottom 300×300 mm., volume 2.13 m^3 .

Total volume of a multiclone 10.68 m^3

cross section of the 40 inner tubes 0.71 m^2 .

Operating data

Temperatures of the gas 80-175°C., operation must be performed above the temperature of the dew point in order to prevent water condensation and choking. Dew point temperature 70-75°C. Efficiency 90-95% with 2 multiclones in series depending on the output, decreases to 75-80% if the tubes are demolished.

Velocity of the entering gas	Time passage of the gas for each multiclone	Efficiency
7 m/sec.	1.5 sec.	95%
to 14 m/sec.	0.7 sec.	85-90%

Durability of a multiclone 2-3 years
Dust content g/m^3 after the multiclones of

Year	Producer 1	Producer 2	Producer 3
1939	14.5	18.3	
1937	21.9	25.7	
1938	45.9+	23.0	16.2
1939	39.7++	25.6+	10.9
1940	18.9	22.5	

+ = multiclones demolished, repaired.

Examples of the efficiency of the multiclones.

Nov. 1940) warm gas volume $12,000 \text{ m}^3/\text{hr}$. Winkler-gas producer
Jan. 1941)
with 200 g/m^3 dust and $105 \text{ g}/\text{m}^3 \text{ H}_2\text{O}$.

Actual gas volume at 120°C., saturated. 20,500 m³; h = 7.37 m³/sec.
 Velocity of the entering gas = 6.8 m/sec.
 Contact time in each multiclone 1.45 sec.
 Dust content before the multiclone 263 g/m³
 " " after " " 13.3 "
 Efficiency 94.9%

January 1941- average gas volume 13,500 m³ Winkler gas or producer.
 March 1941- with 290 g/m³ dust and 412 g/m³ H₂O
 Velocity of the entering gas: 8.06 m³/sec. or 7.45 m/sec.
 Contact time in each multiclone 1.32 sec.
 Dust content before the multiclone 290 g/m³
 " " after " " 29.6 g/m³
 Efficiency 89.8%

Course of the dust content:	g dust/m ³ water gas
Before the multiclones	200-300
After " "	20-30
After the gas receiver	0.4-1.0
" " " condenser	0.16-0.25
" " disintegrators	0.004-0.005
Crude gas blower	0.002-0.005
	average -- 0.003

Properties of the multiclone dust:

H ₂ O %	1-2
Carbon %	40-45
Net calorific value	4000-4500 kcal/kg.

Sieve analysis:

Sieve opening mm.	Residue %
0.5	0.00
0.3	0.20
0.2	0.74
0.12	1.50
0.10	0.50
0.09	1.00
0.08	3.50
0.075	0.30
0.060	0.87
0.060	91.39

Bulk density- 520 kg/m³
 Difficult to moisten with water
 Explodes under certain conditions

Application of the recovered dust:

1. Manufacturing of coke briquettes (a) mixed with other fuels or binders. (b) by sintering.
 2. As boiler feed stock.
 3. For the phenol extraction from waste waters:
 1 ton multiclone dust extracts 12kg phenols. 1 ton slag from the Winkler producer extracts 4 kg. phenols. 1 ton slag from the boiler house extracts 2 kg. phenols.
- Movement and transportation: Horizontal Redler conveyors and boiler-pumps are suitable. Bucket conveyors are not suitable due to an enormous wear and tear.