

Introduction of the acid regeneration device

HANGZHOU MARGARITA COMPANY LTD

catalogue

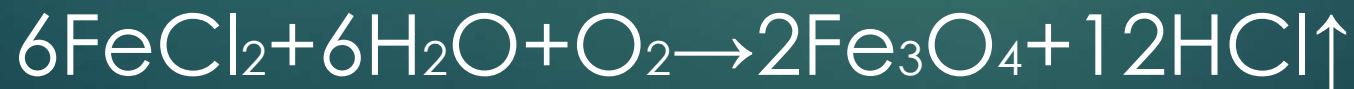
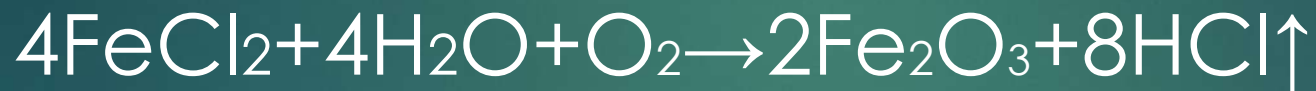
- 一、酸再生装置适用范围Scope of application of the acid regeneration device
- 二、酸再生装置流程和原理Process and principle of acid regeneration device
- 三、酸再生装置产品Products of acid regeneration device
- 四、酸再生环保指标Environmental protection index of acid regeneration device
- 五、酸再生装置运行费用Operation cost of the acid regeneration unit

一、酸再生装置能做什么 The purpose of the acid regeneration device energy

- ▶ 钢铁行业冷轧板/硅钢片酸洗废盐酸的再生 Regeneration of cold rolled plate / silicon steel sheet in steel industry
- ▶ 钢丝绳酸洗废盐酸的再生 Regeneration of the waste hydrochloric acid in steel wire rope acid
- ▶ 钢管酸洗废盐酸的再生 Regeneration of the waste hydrochloric acid in steel pipe acid washing
- ▶ 氯化法钛白行业盐酸浸出液的再生 Regeneration of titanium chloride acid ach in in chloride chloride
- ▶ 采用氯化钴进行氧化钴粉末的生产 Cobalt chloride is used for cobalt oxide powder production
- ▶ 采用氯化物生产各种金属氧化物（各种金属氯化物的盐酸再生） Various metal oxides (hydrochloric acid regeneration of various metal chlorides)

二、酸再生装置流程和原理 Process and principle of acid regeneration device

1、主要反应方程式 The main reaction equation is the



净化废酸 Purify waste acid



废酸 waste acid



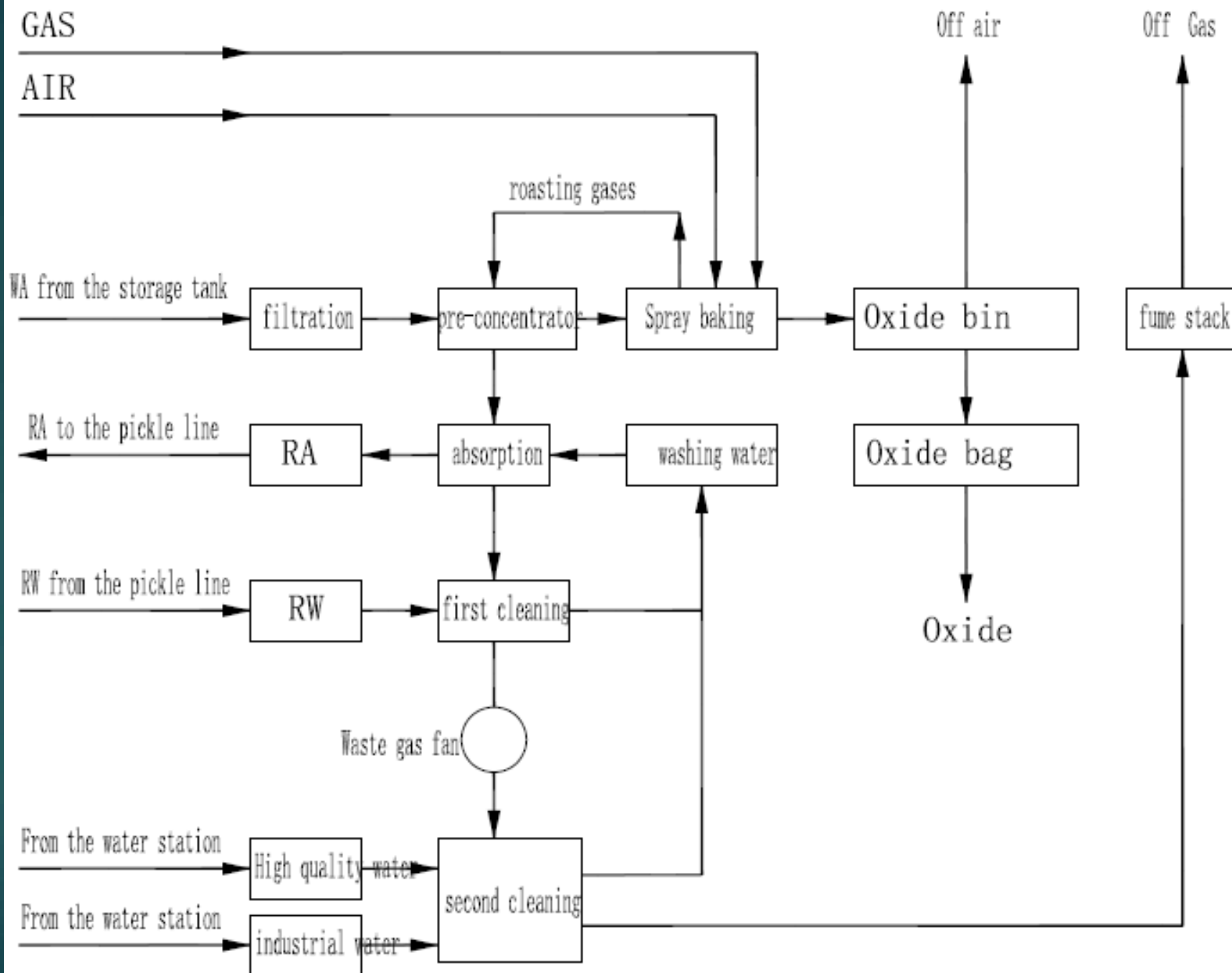
压滤泥饼 Filter mud cake



再生酸
regenerati
ve acid

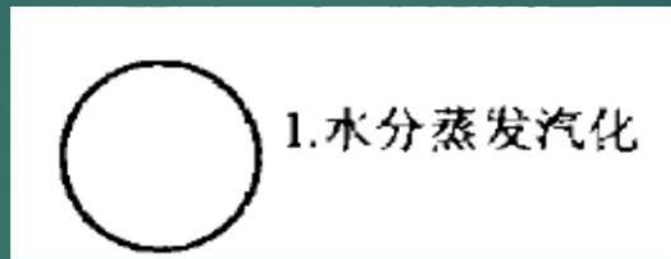


氧化铁粉 Iron oxide powder

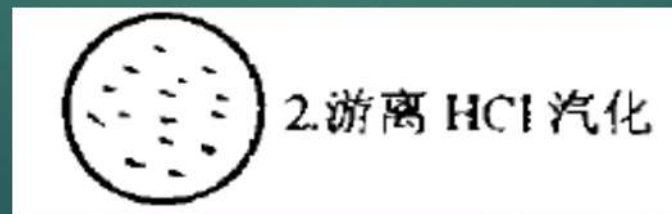


2、焙烧炉中的反应过程Reaction process in the roaster

▶ 2.1、水分蒸发汽化Water evaporation vaporization

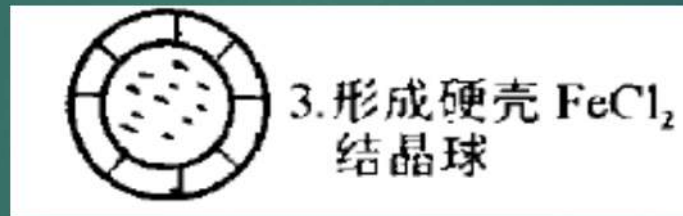


• 2.2、游离的HCl汽化Free hcl is vaporized

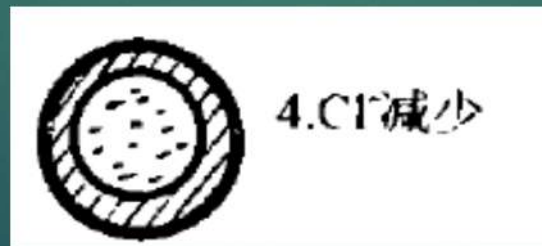


2、焙烧炉中的反应过程Reaction process in the roaster

- 2.3、形成硬壳 FeCl_2 结晶球Form a hard-shell FeCl_2 crystalline sphere

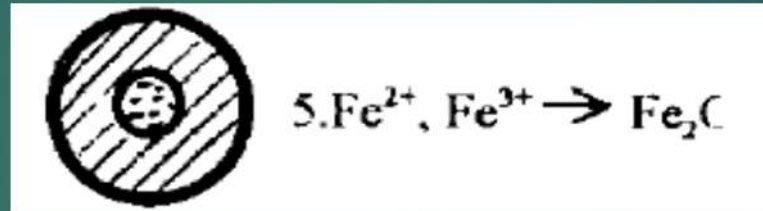


- 2.4、Cl-离子减少Less Cl-ions

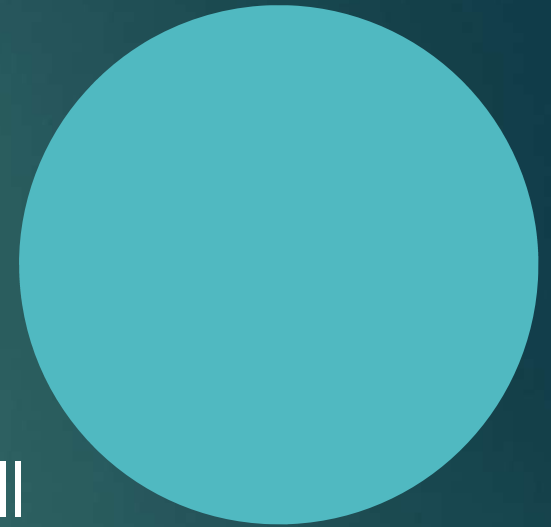


2、焙烧炉中的反应过程Reaction process in the roaster

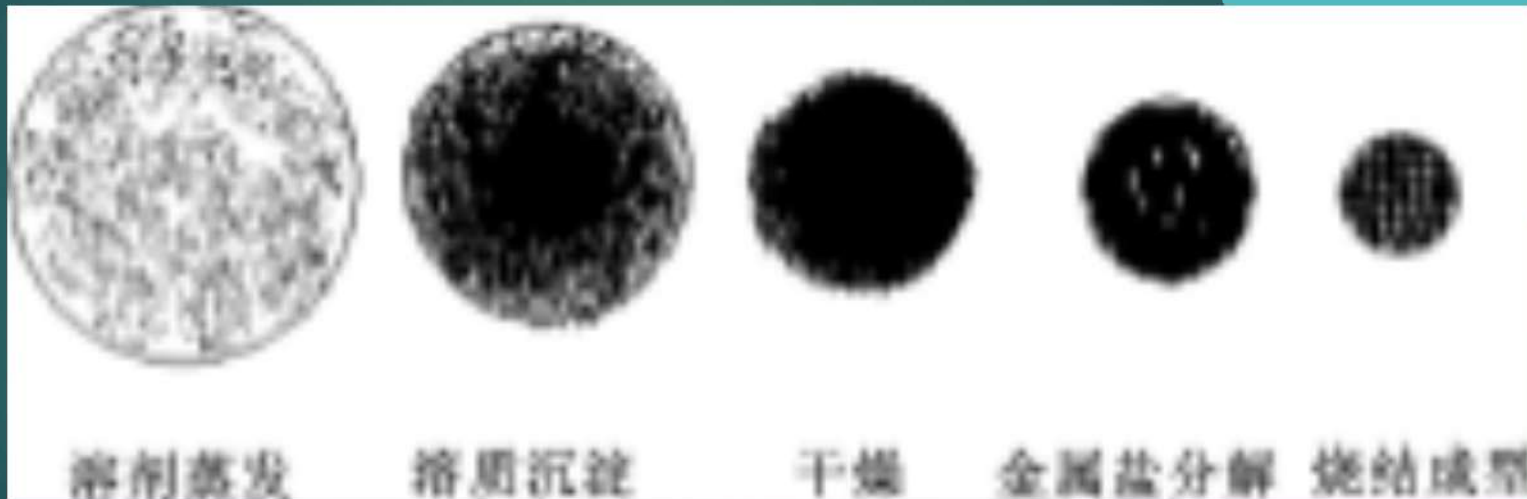
- ▶ 2.5、形成Fe₂O₃
Forming the Fe₂O₃



- 2.6、形成空心球Form a hollow ball

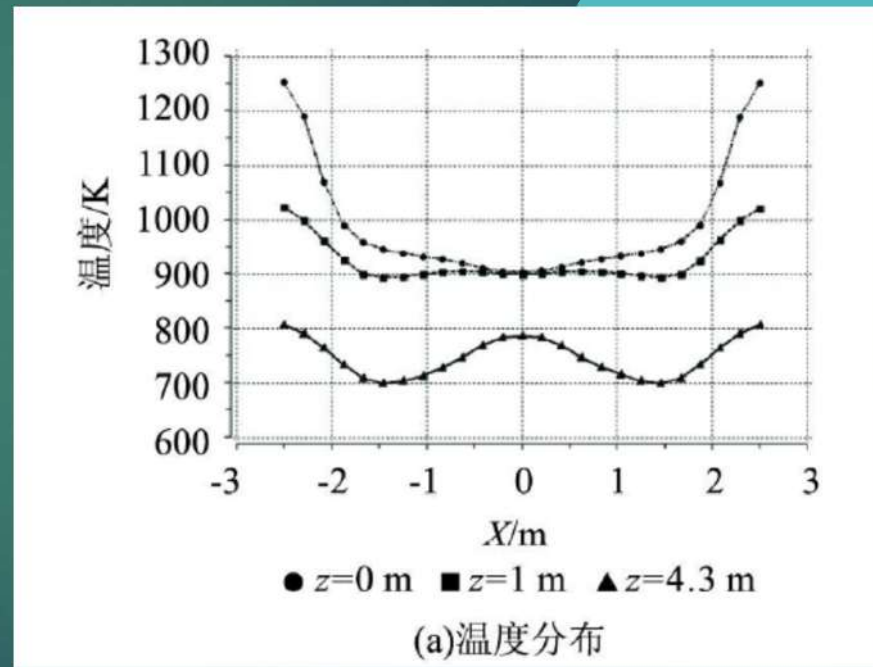
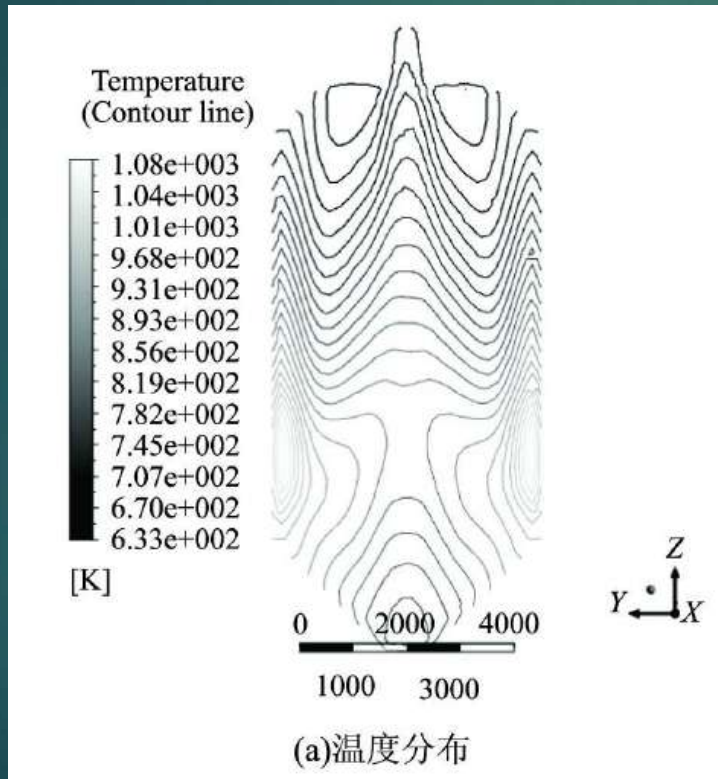


喷雾热分解过程中粉末形成过程示意图 Schematic diagram of the powder formation process during the spray thermal decomposition process



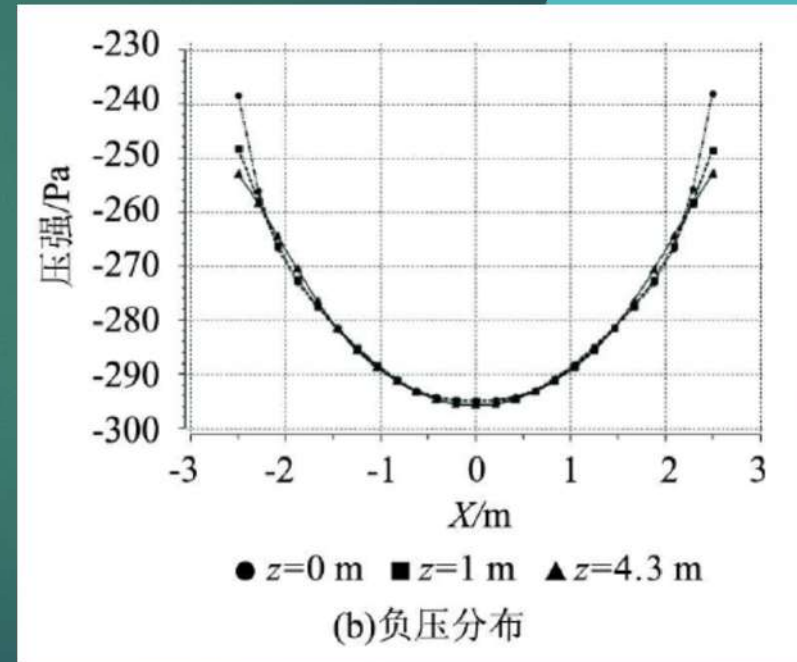
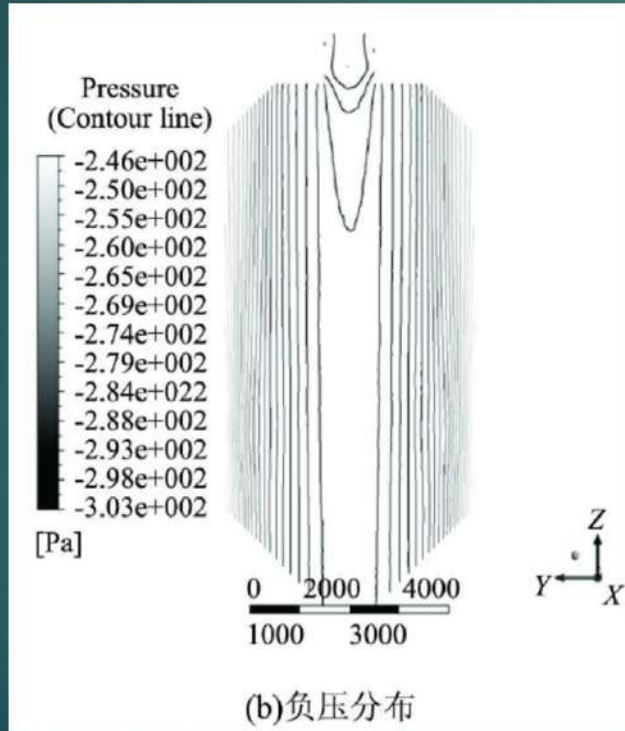
3、焙烧炉内温度、负压、流速、O₂含量分布 Distribution of temperature, negative pressure, flow rate and o₂ content in the roasting furnace

▶ 3.1、焙烧炉内温度分布 Temperature distribution in roasting aster



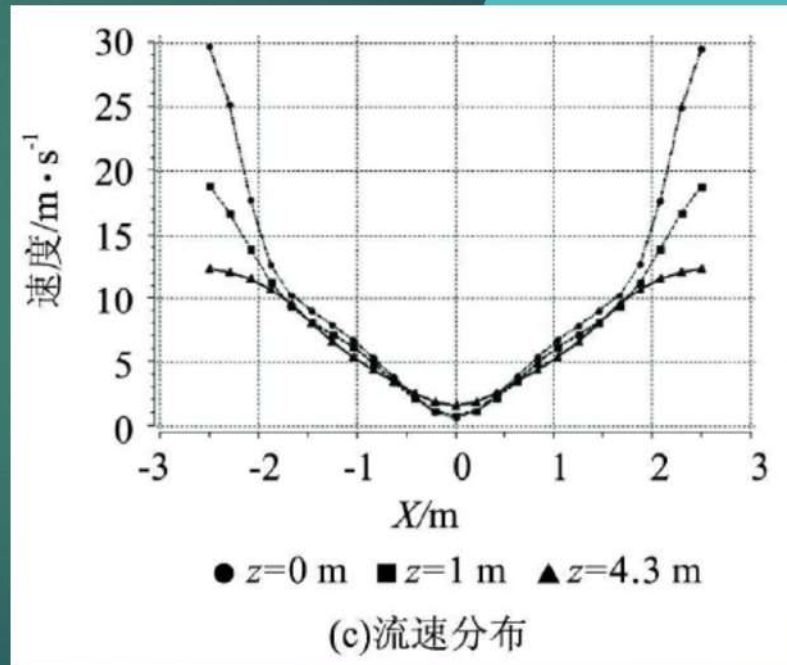
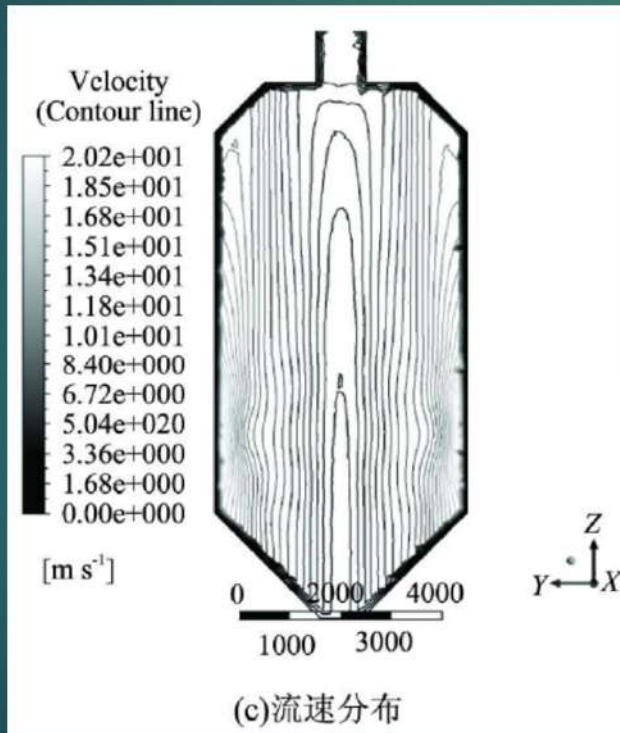
3、焙烧炉内温度、负压、流速、O₂含量分布 Distribution of temperature, negative pressure, flow rate and o₂ content in the roasting furnace

▶ 3.2、焙烧炉内负压分布 Negative pressure distribution in the roasting furnace



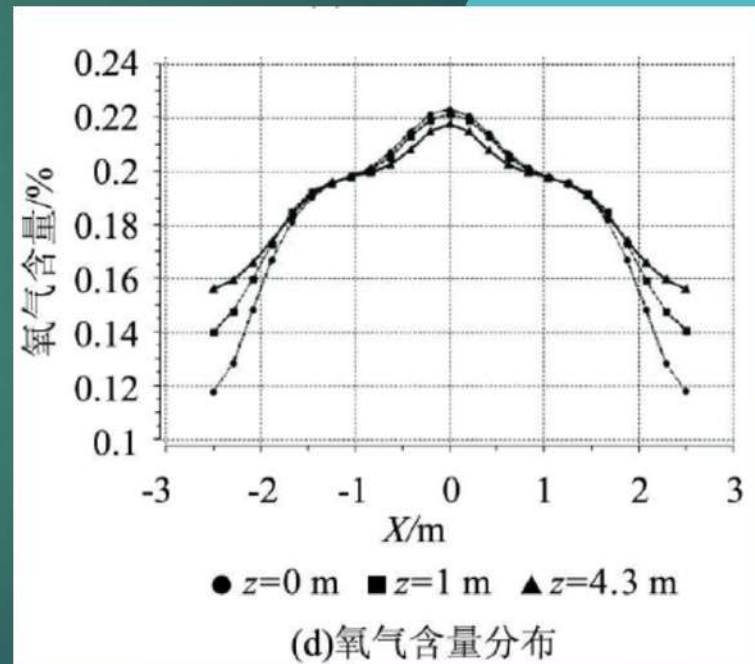
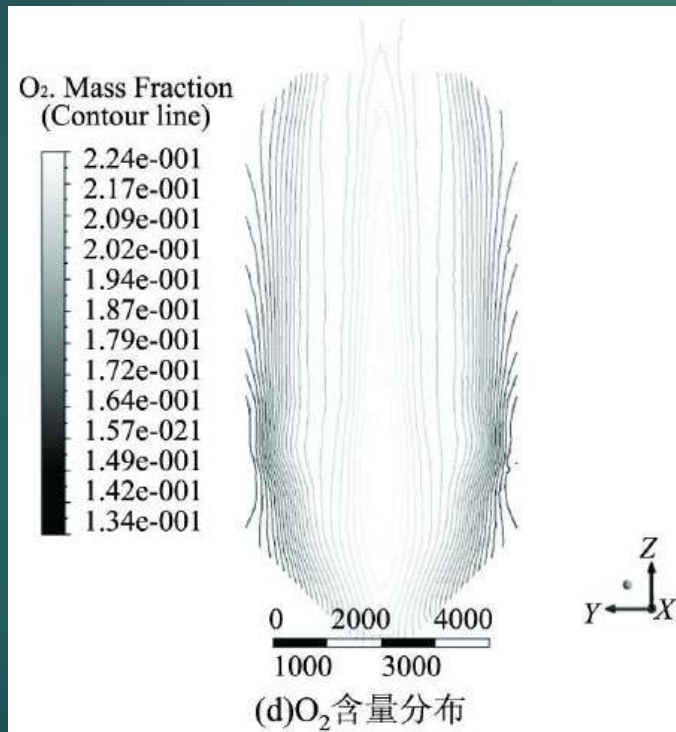
3、焙烧炉内温度、负压、流速、O₂含量分布 Distribution of temperature, negative pressure, flow rate and o₂ content in the roasting furnace

▶ 3.3、焙烧炉内流速分布 Flow rate distribution in roasting aster



3、焙烧炉内温度、负压、流速、O₂含量分布 Distribution of temperature, negative pressure, flow rate and o₂ content in the roasting furnace

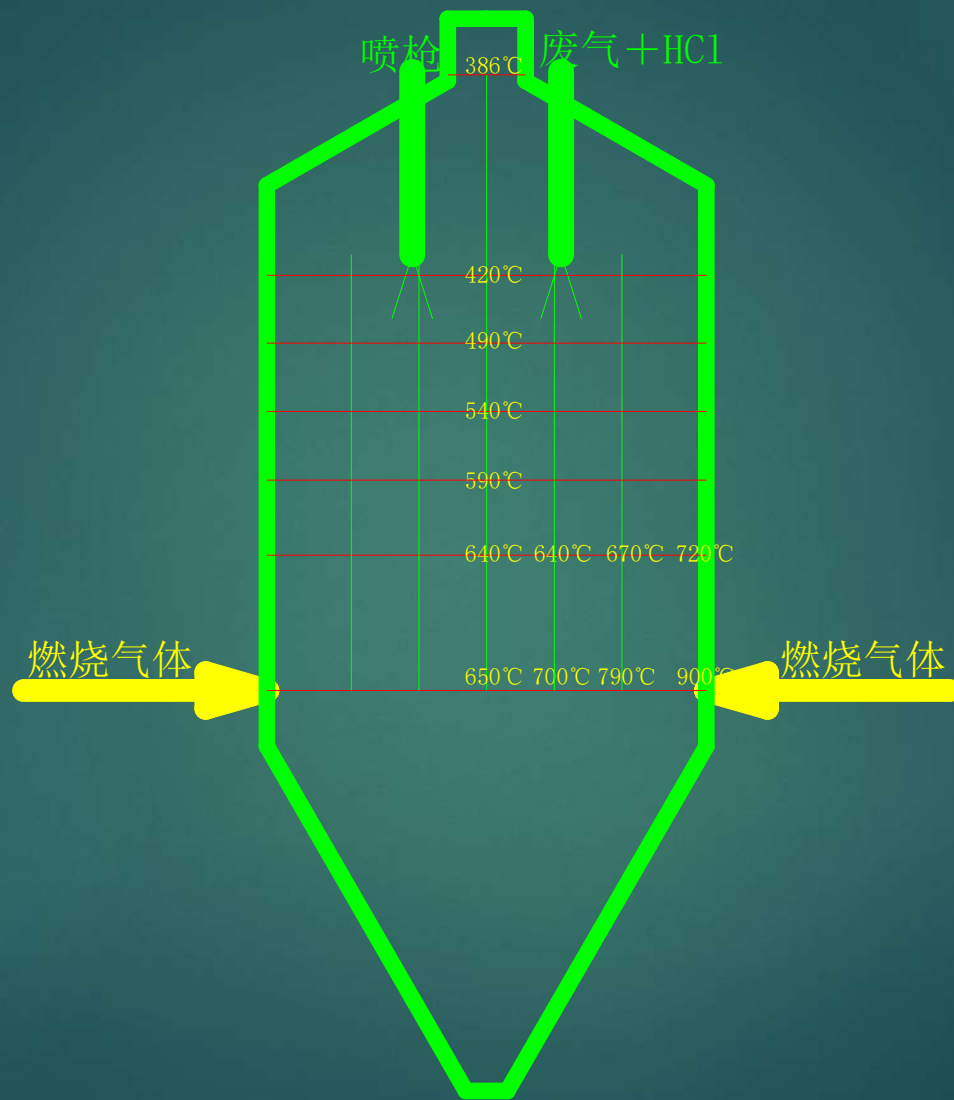
▶ 3.4、焙烧炉内O₂分布



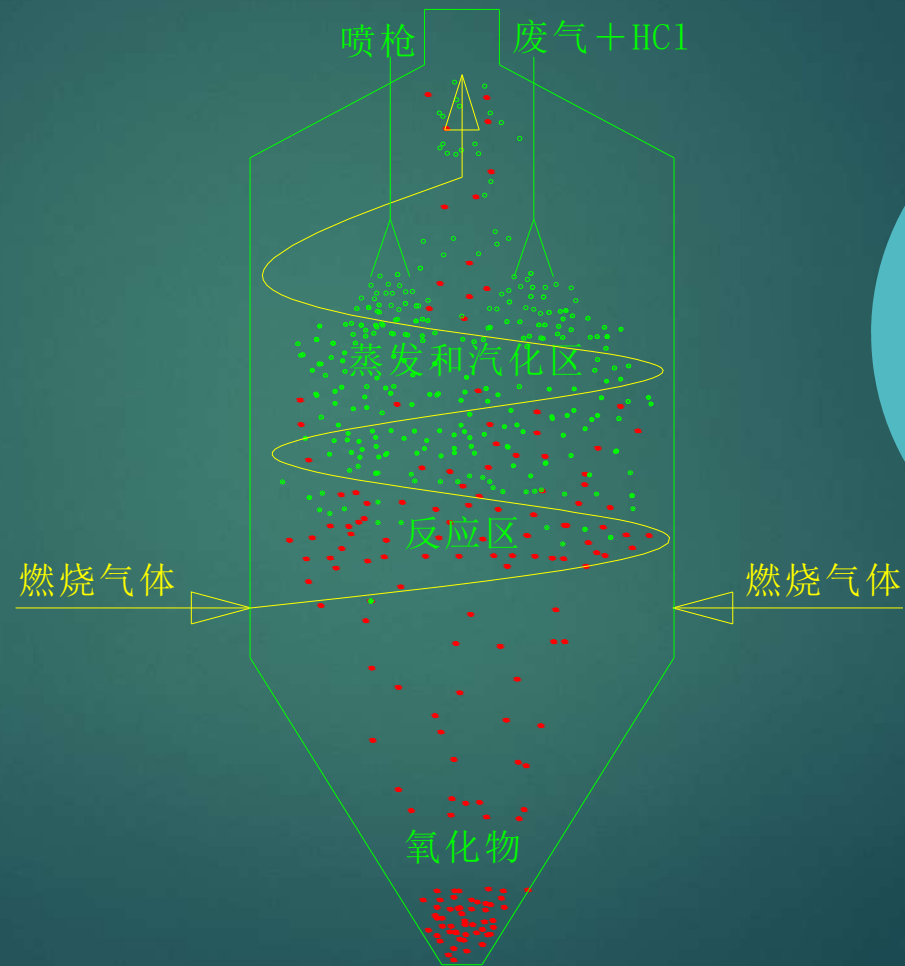
3、焙烧炉内温度、负压、流速、O2含量分布 Distribution of temperature, negative pressure, flow rate and o2 content in the roasting furnace

- ▶ 3.5、焙烧炉内各主要点的温度、流速、负压 Temperature, flow velocity and negative pressure of the main point in the roasting furnace

位置 position	温度 temperature /°C	负压 subatmospheric pressure/Pa	流速 velocity of flow/m·s-1	备注 remarks
XY平面	750.42	-266.99	13.60	
炉膛平面 firepot	667.01	-273.87	11.11	
酸枪喷嘴平面 Sour gun nozzle	471.88	-273.86	9.07	
Outlet of furnace top 炉顶出口平面	386.67	-299.94	4.37	



3.6、反应示意图 Schematic diagram of the reaction

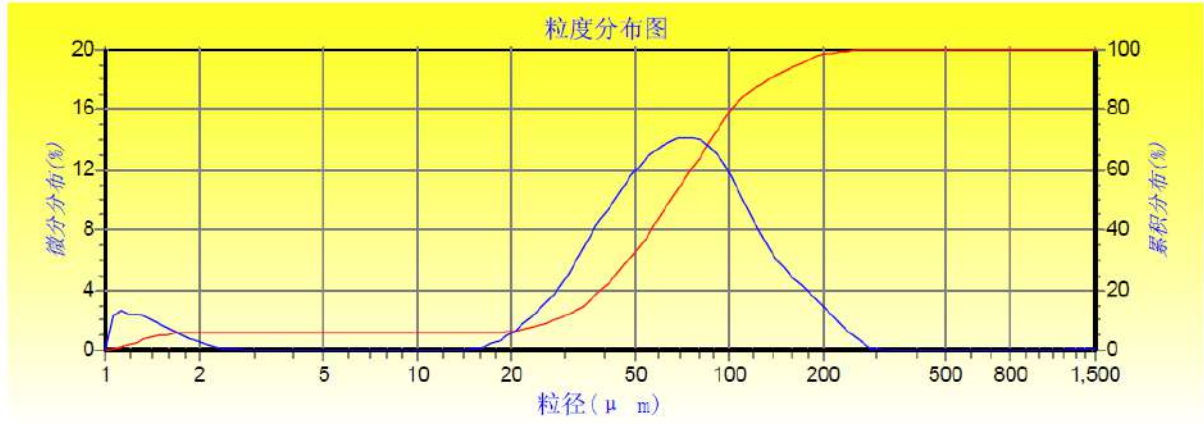


焙烧炉喷枪雾化效果Foatomization
effect of baking aster



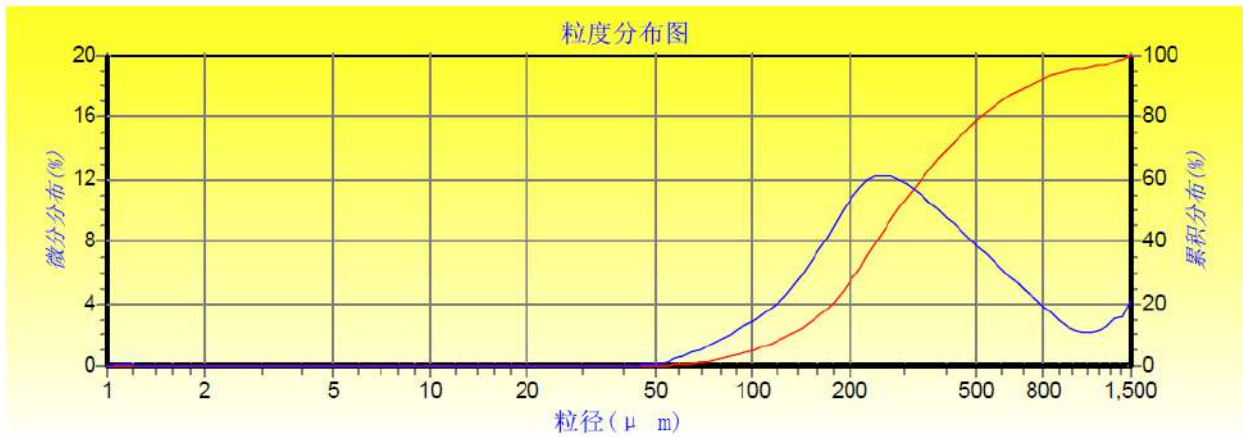
粒度特征参数

D(4,3)	74.81 μm	D50	65.07 μm	D(3,2)	16.00 μm	S.S.A.	0.38 sq.m/c.c.
D10	27.46 μm	D25	42.95 μm	D75	94.36 μm	D90	135.48 μm



粒度特征参数

D(4,3)	371.06 μm	D50	283.06 μm	D(3,2)	195.18 μm	S.S.A.	0.03 sq.m/c.c.
D10	131.13 μm	D25	193.13 μm	D75	455.06 μm	D90	716.37 μm





焙烧炉现场照片 Photo of roasting site

4、双旋风除尘器Double cyclone dust collector

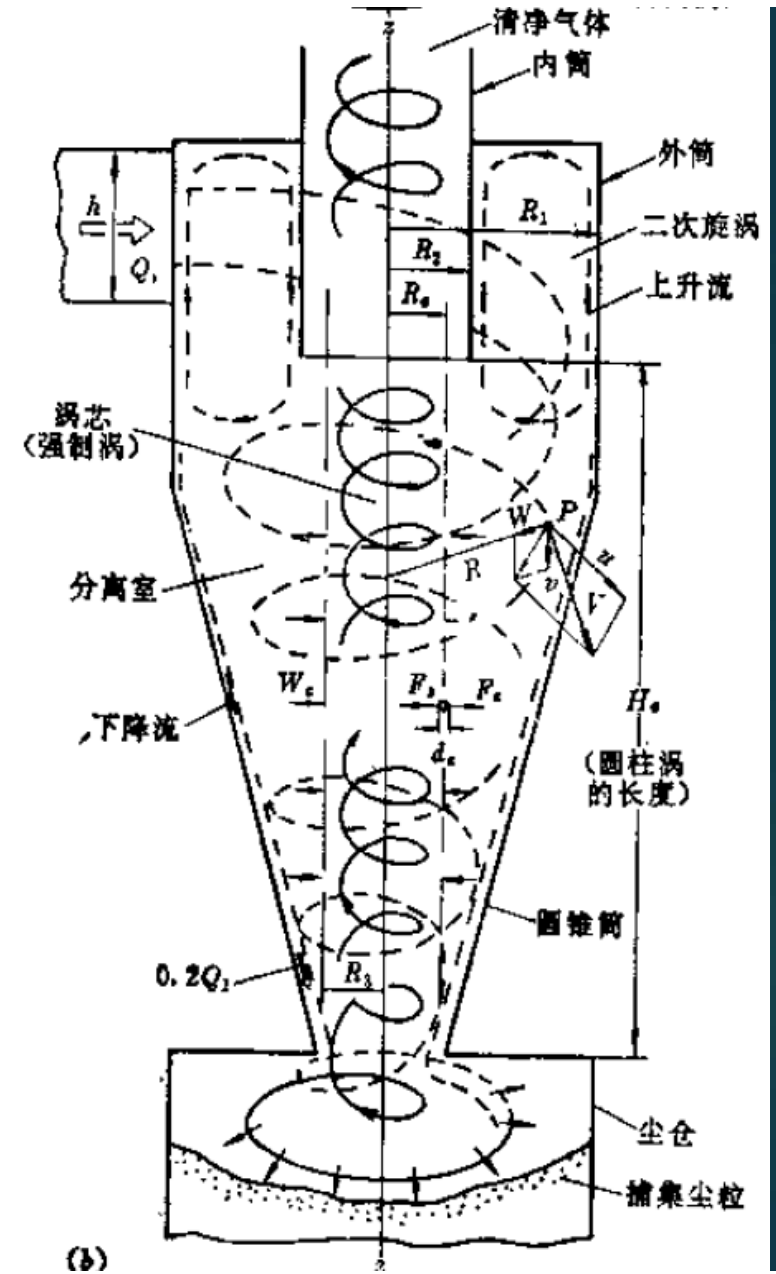
▶ 4.1、工作原理operational principle

旋风除尘器的除尘原理是使含尘气体作旋转运动，由于离心力的作用，尘粒沿筒壁旋转下降，净化的气体通过排气管排出。分离下来的尘粒则通过排尘口进入下部的卸尘装置。The dust removal principle of cyclone is to make the dust gas rotate. Due to the centrifugal force, the dust particles rotate and fall along the cylinder wall, and the purified gas is discharged through the exhaust pipe. The separated dust particles enter the lower dust discharge device through the dust discharge outlet.

酸再生装置中，旋风除尘器收集到的铁粉进入焙烧炉中。In the acid regeneration device, the iron powder collected by the cyclone collector enters the roasting furnace .

4.2、示意图diagrammatic sketch

除尘效率efficiency of dust collection :
50~60% (10 μ m)



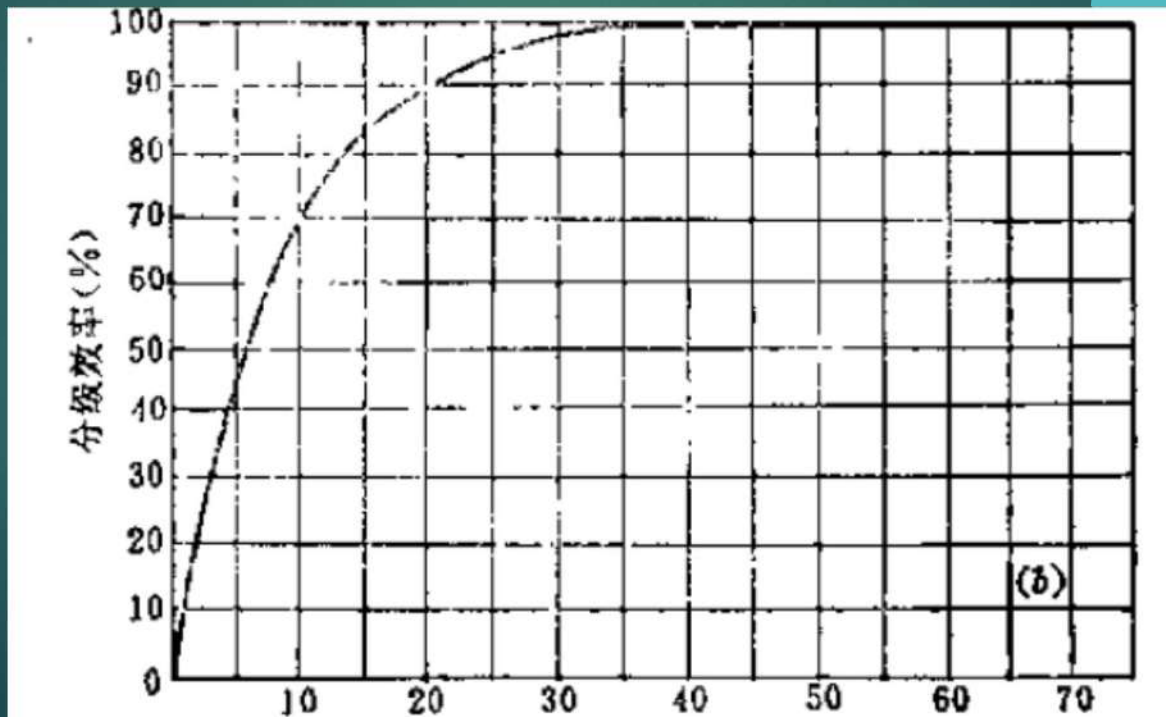
4.3、旋风除尘器特点Cyclone collector features

- ◆ 设备结构简单、造价低； The equipment structure is simple and low in cost
- ◆ 没有传动机构及运动部件，维护、修理方便； No transmission mechanism and moving parts, convenient maintenance and repair
- ◆ 可用于高温含尘气体的净化， $350\sim 550^{\circ}\text{C}$ ； It can be used to purify high temperature dust gas, $350\sim 550^{\circ}\text{C}$.
- ◆ 可承受内、外压力； Can withstand the internal and external pressure
- ◆ 可干法清灰，可用它回收有价值的粉尘； Dry dust cleaning, it can be used to recover valuable dust
- ◆ 除尘器内敷设耐磨、耐腐蚀内衬后，可用于净化含高腐蚀性粉尘的烟气。 The asion resistant and corrosion resistant lining can be used to purify the flue gas containing high corrosive dust

但，阻力损失大，一般在 $1000\sim 1500\text{Pa}$ 之间，且不能捕捉小于 $5\mu\text{m}$ 的粉尘小粒子。 However, the resistance loss is large, just between 1000 and 1500 p a , and small dust particles less than $5\mu\text{m}$ cannot be captured

4.4、特性参数characteristic parameter

最大处理烟气量 Maximum amount of flue gas m ³ /h	可出去最小粒径及除尘效率 Can go out of the minimum particle size and dust removal efficiency	pressure loss 压 力损失 pa	使用最高温度 Use the highest temperature °C
85000	10um (50~60%)	250~1500	350~550





双旋风分离器现场照片 Double Cyclone separator Field Photos

5、预浓缩器及分液器Pre-concentrator and liquid splitter

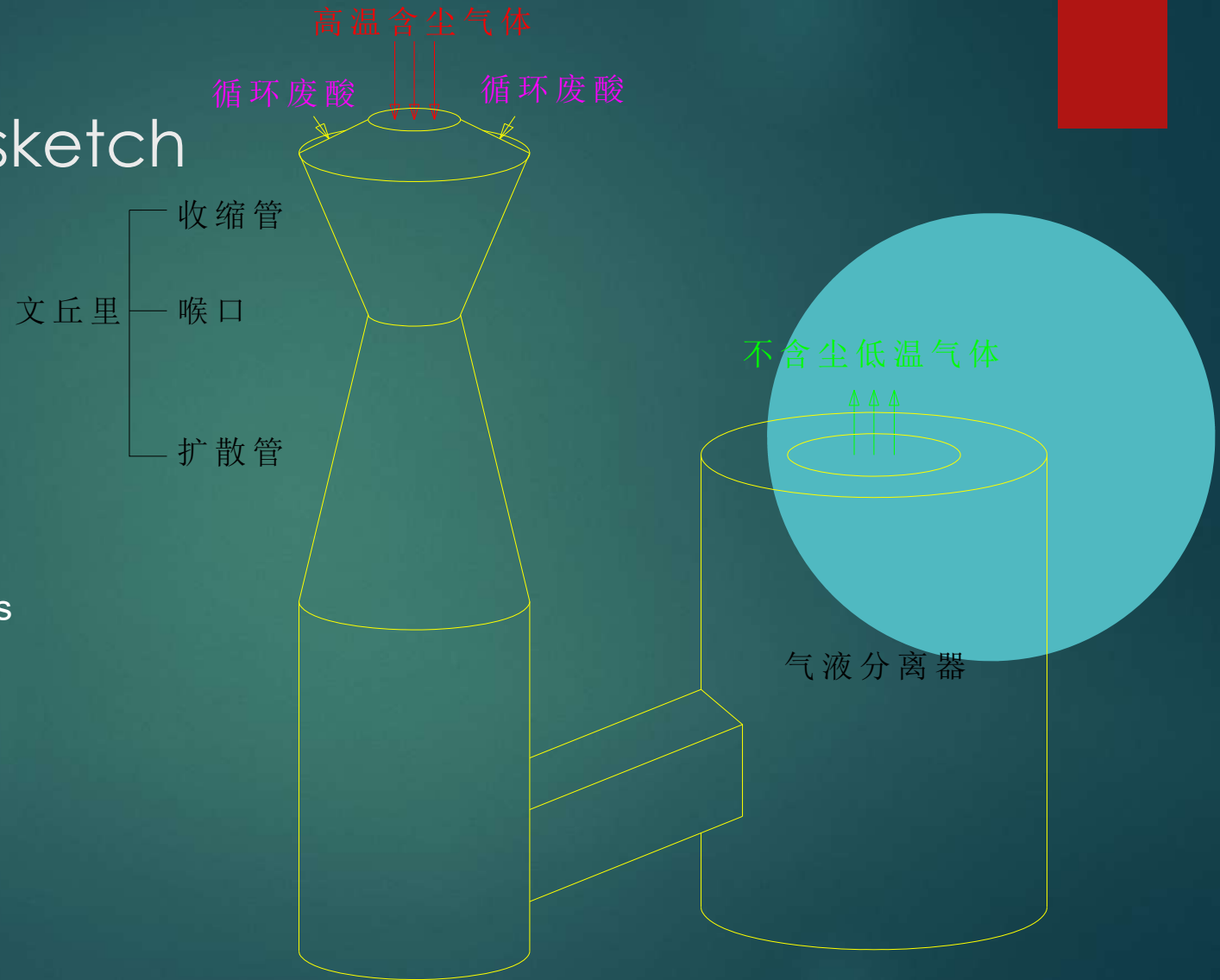
▶ 5.1、工作原理operational principle

主要由文丘里（有收缩管、喉管和扩大管三部分）和旋风分离器组成。 It is mainly composed of Venturi (with contraction tube, throat tube and expansion tube) and cyclone separator

含尘的气体进入收缩管，流速沿管逐渐增大，雾化的废酸和高温含尘气体接触，通过废酸中水分的蒸发而使高温气体降温，同时尘粒被润湿。进入扩大管后，流速逐渐减小，尘粒相互粘合，使颗粒增大而易除去。最后进入旋风分离器，由于离心力的作用，水与润湿的尘粒被抛至分离器的内壁上并向下流出器外，净制后的气体则由分离器中央管排出。 The dust gas enters the shrinkage pipe, and the flow rate gradually increases along the pipe. The atomized waste acid contacts with the high temperature dust gas, cooling the high temperature gas through the evaporation of water in the waste acid, and the dust particles are lubricated. After entering the expansion tube, the flow rate gradually decreases, and the dust particles adhere to each other, so that the particles increase and easy to remove. Finally into the cyclone separator, due to the centrifugal force, water and lubricated dust particles are thrown into the inner wall of the separator and flow out of the separator, after the net gas is discharged by the central pipe of the separator.

5.2、示意图 diagrammatic sketch

在文丘里中完成雾化、凝聚过程
在分离器中完成脱水过程
Complete the process of
atomization and condensation in
ventur
Complete the dehydration process
in the separator

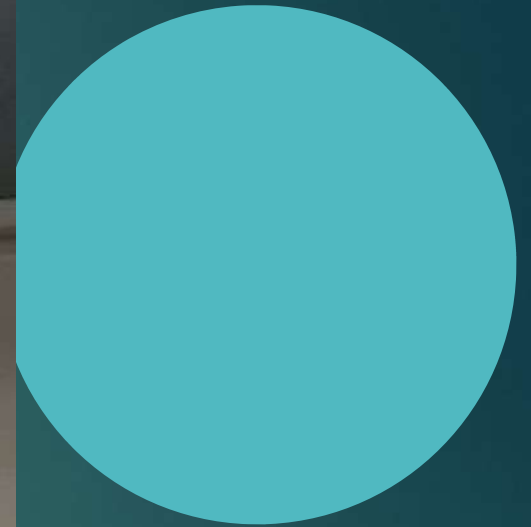




文丘里Venturi Ti-
0.2Pd段section



文丘里Venturi Ti-0.2Pd段section



文丘里Venturi Ti-0.2Pd段section



2019-1-24 15:35

5.3、文丘里特点Venturi characteristics

- ◆ 设备结构简单、除尘效率高； Equipment structure is simple, high dust removal efficiency
- ◆ 有除尘和降温作用； Have the dust removal and cooling effect
- ◆ 可捕捉0.1um以上的粉尘； Capture the dust above 0.1um
- ◆ 缺点是阻力损失大； The disadvantage is the large loss of resistance

6、塔设备tower（吸收塔和洗涤塔Absorbers and detergents）

▶ 6.1、工作原理operational principle

利用吸收剂将混合气体中一种或数种组分（吸收质）有选择性的吸收分离过程称作吸收。参与吸收过程的吸收剂和被吸收剂分别为液相和气相。伴随着吸收过程的进行，必然发生气相到液相，液相到气相的传质过程。分为物理吸收（无明显化学反应）和化学吸收（有明显化学反应）。The selective absorption separation process of one or several kinds of components (absorbing matter) in the mixed gas is called absorption. The absorbent and the absorbent involved in the absorption process are the liquid and gas phase, respectively. With the absorption process, the gas phase to liquid phase, liquid phase to gas phase mass transfer process inevitably occurs. It is divided into physical absorption (without obvious chemical reaction) and chemical absorption (with obvious chemical reaction).

酸再生装置中主要是利用水作为吸收剂，吸收液相中的HCl气体。The acid regeneration device mainly uses water as an absorbent to absorb the hcl gas in the liquid phase

碱洗塔中利用碱液和HCl发生反应进一步清除气体中的HCl气体。Use the alkali solution and hcl reaction in the alkali washing tower to further remove the hcl gas from the gas

6.2、填料塔的特点 Features of the filler tower

优点 advantage :

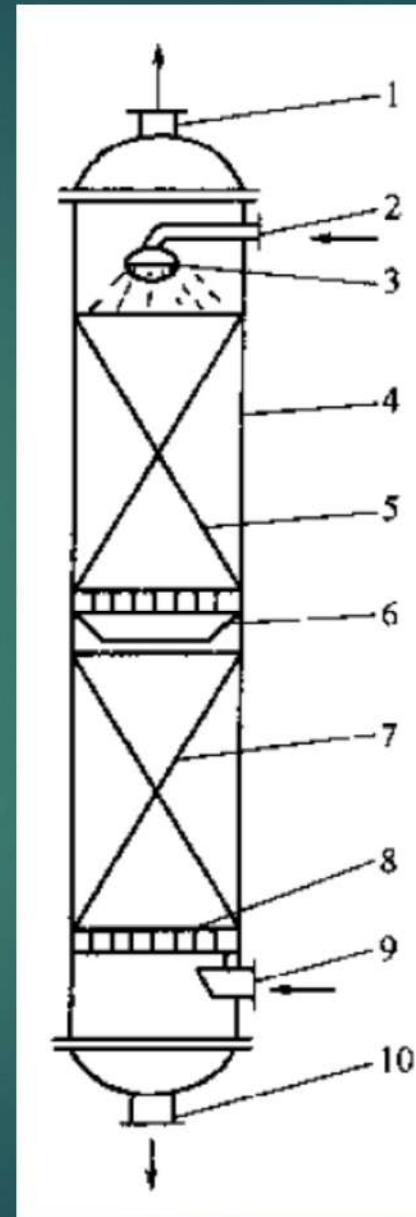
- 1、结构简单，无复杂部件； Simple structure, no complex components
- 2、适应性强，填料可以根据净化需要增减高度； Strong adaptability, the filler can be increased or reduced according to the purification needs
- 3、气流阻力小，能耗低，气液接触效果好。 Small airflow resistance, low energy consumption, and good gas-liquid contact effect
- 4、由于存在洗涤液的冷却作用，填料塔适用于较高温度的烟气净化。 Due to the cooling effect of washing liquid, the filling tower is suitable for flue gas purification of higher temperature

缺点 defect :

- 5、当烟气中含尘浓度较高时，填料易堵塞，清理检修时填料损耗大。 When the dust concentration in the flue gas is high, the packing is easy to block, and the packing loss is large during cleaning and maintenance.

6.3、填料塔packing tower

填料塔对颗粒污染物也有很好的捕集效果。在填料塔中，填料表面积很大，洗涤液将填料表面湿润，在填料中有液滴捕尘作用，但主要是通过填料所形成的液网、液膜对尘粒进行捕集，因此对液滴雾化效果无过高要求，同时对气液比、过滤风速等运行条件有较高的操作弹性。 The filler tower also has a good catching effect on particle pollutants. In the packing tower, the filler surface area is very large, washing liquid will wet the filler surface, in the filling droplet dust, but mainly through the packing formed by the liquid network, liquid film for dust particles, so the droplet atomization effect without high requirements, at the same time to the air-liquid ratio, filtration wind speed and other operating conditions have high operating elasticity.



- 1—气体出口； 2—液体入口；
3—液体分布装置； 4—塔壳；
5—填料； 6—液体再分布器；
7—填料； 8—支撑栅板；
9—气体入口；
10—液体出口

6.4、填料的选择原则 Filler material selection principle

- ◆ 较大的比表面积、较高的空隙率； Large specific surface area, higher voiding ratio
- ◆ 填料具有较大的通量，气体通过时阻力低； Fillers have a large flux and a low resistance upon gas passage
- ◆ 有较高的传质效率； There is a high mass transfer efficiency
- ◆ 操作弹性大，性能稳定； Operating flexibility and stable performance
- ◆ 能满足物系的腐蚀性、污堵性、热敏性等特殊要求； It can meet the special requirements of corrosion, pollution plugging, thermal sensitivity and so on
- ◆ 强度要高，便于塔的拆装、检修； The strength should be high, easy to facilitate the disassembly of the tower, maintenance
- ◆ 价格低廉。 price moderate

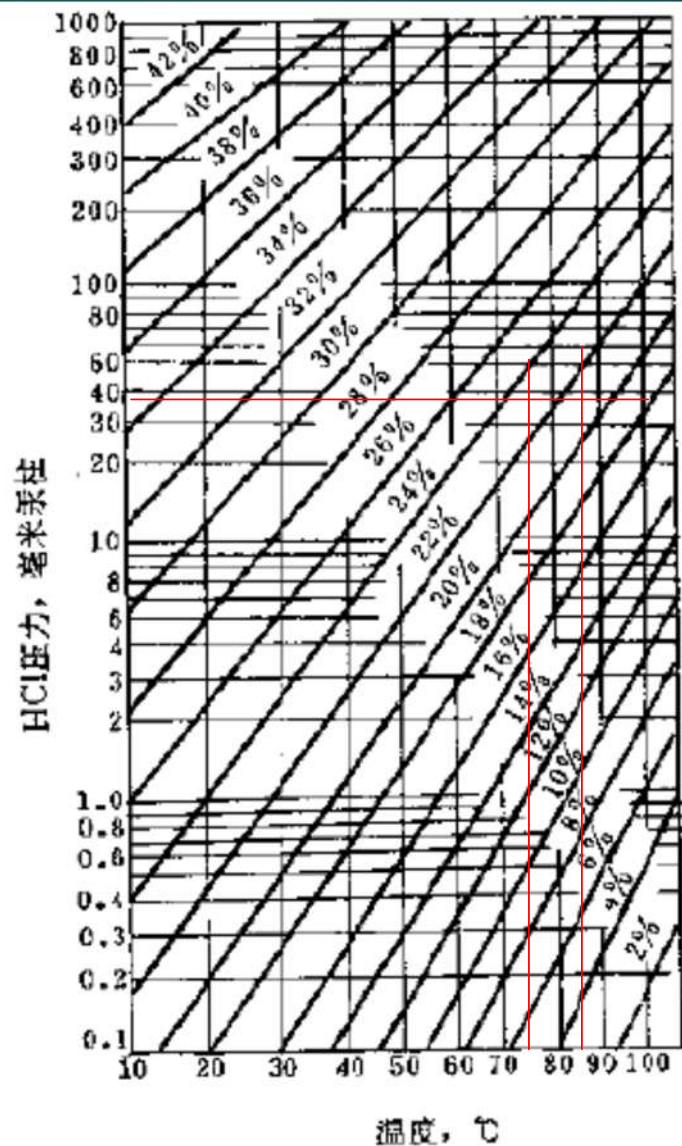
塔设备现场照片 Site photos of the tower equipment



7、自动包装机automatic packaging unit

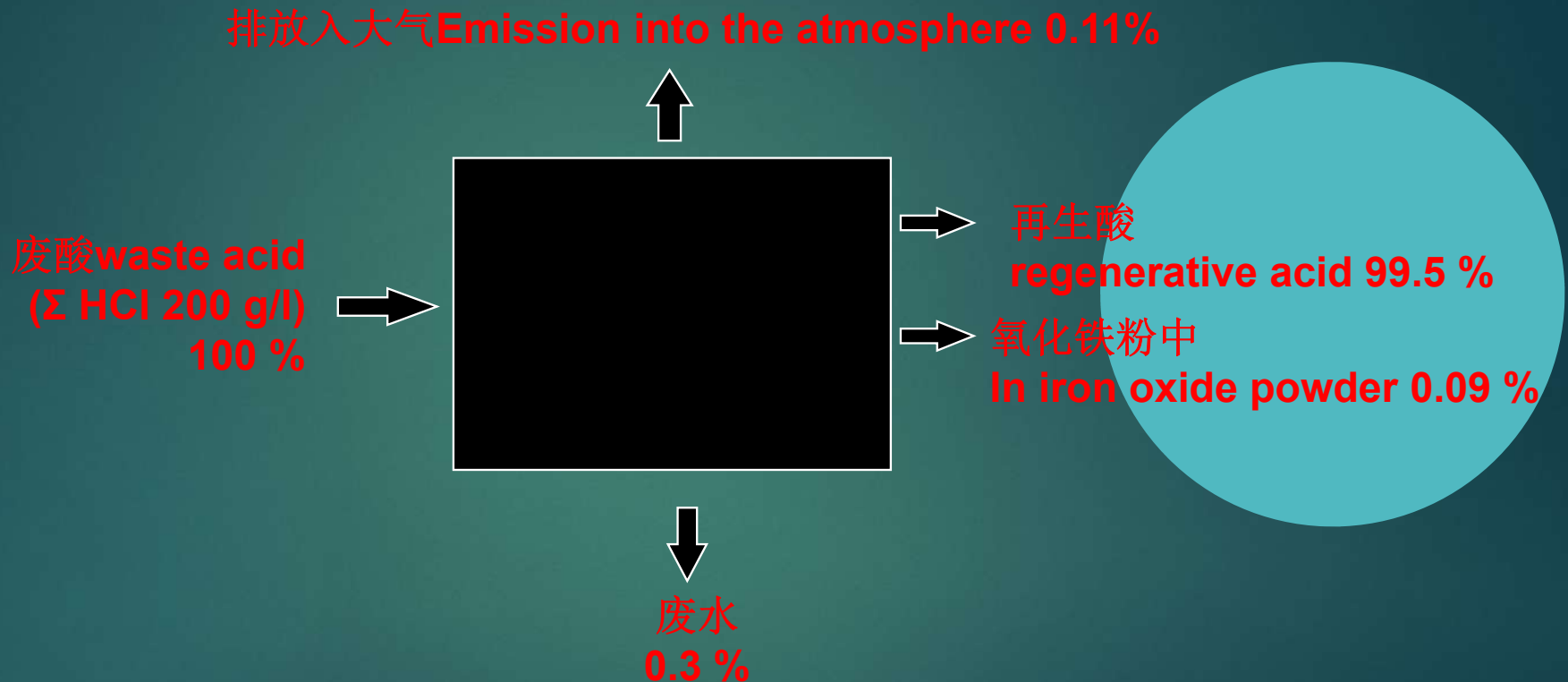


再生酸浓度、吸收温度、分压的关系图
Plot of regenerative acid concentration, absorption temperature, and partial pressure



5-1 盐酸浓度(重量%)与温度及气相氯化氢分压的关系

3、酸再生装置中HCL的平衡 Equilibrium of hcl in the acid regeneration apparatus



说明 explain: Cl-要么被回收形成再生酸, 要么进入铁粉或者环境中 The cl-is either recycled to form regenerative acid or into iron powder or the environment。进入铁粉中则影响铁粉质量, 进而影响铁粉售价 Enter the iron powder affects the quality of iron powder, and then affect the price of iron powder; 进入环境中, 则污染环境, 与建设装置目的不符 Into the environment, the environment pollution, and inconsistent with the purpose of the construction device。因此回收率高, 不仅是回收盐酸的多少, 更重要的是环保排放指标的保证。 Therefore, the recovery rate is not only the amount of hydrochloric acid recovered, but also the guarantee of environmental protection emission indicators

前后装置烟囱对比照片 Photos of the front and rear device chimneys



改造前 Before the transformation



改造后 After the transformation

环保检测HCl含量 Environmental protection test for hcl content
6.35mg/Nm³



八一钢铁酸再生改造前后对比照片 Bayi steel acid regeneration transformation before and after the comparison of photos



成都方鑫酸再生改造前后对比照片 Chengdu
Fangxin acid regeneration and
transformation before and after the
comparison of photos



2018-12-2 15:32

黄石山力酸再生改造前后对比照片 Photos compared before and after
Huangshishanli force acid regeneration and transformation



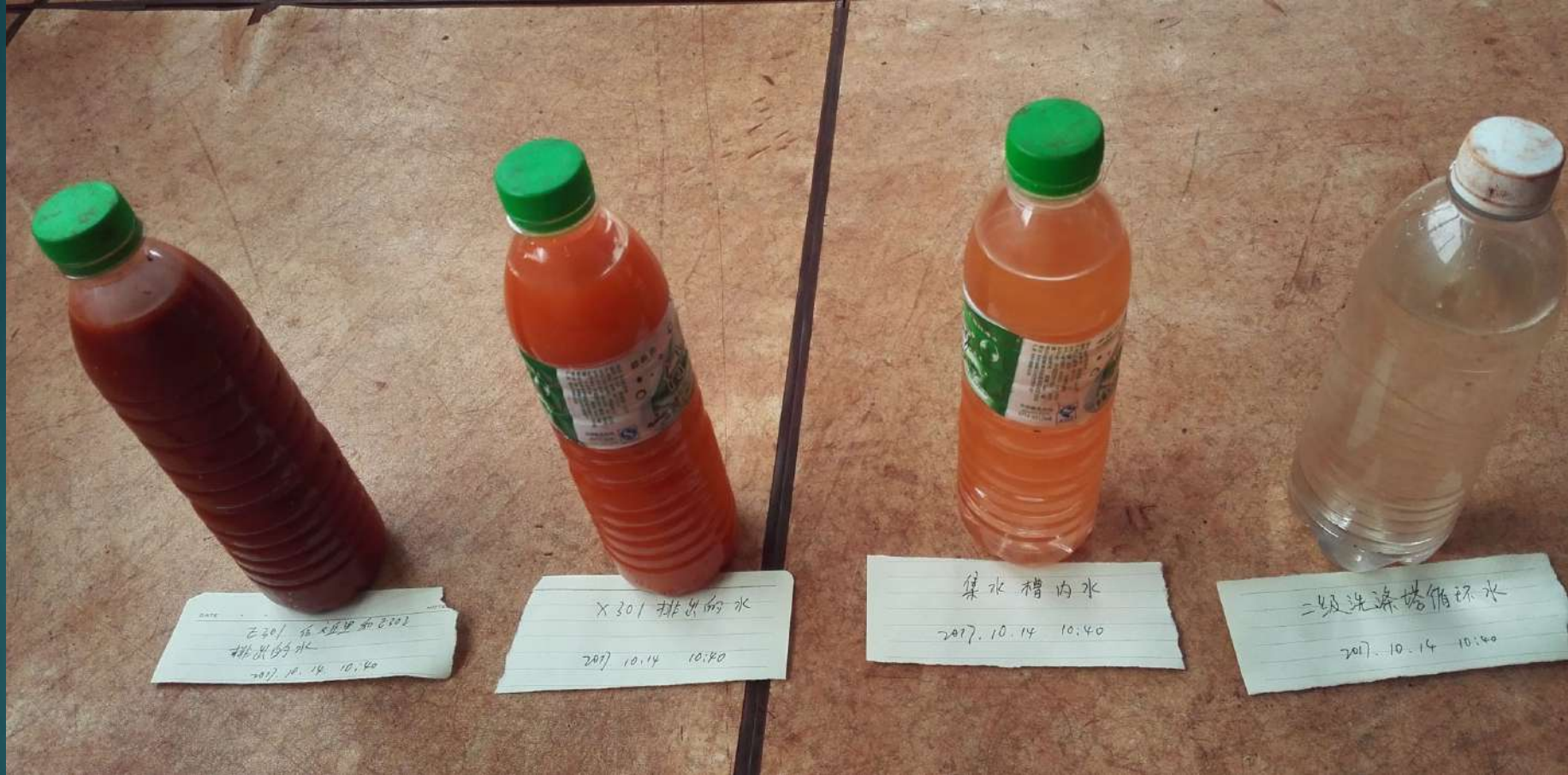
2019-3-7 17:04

黄石山力酸洗烟气改造Huangshi shanli force pickling flue gas transformation



2018-11-5 16:39





在301在罐里和8102
排出的水
2017.10.14 10:40

X 301 排出的水
2017.10.14 10:40

集水槽内水
2017.10.14 10:40

二级洗涤塔循环水
2017.10.14 10:40

宝钢黄石检测报告单Baosteel Huangshi test report form

表二 酸再生焙烧炉排气筒（22米）出口废气检测结果

样品编号	氧含量(%)	排气流速(m/s)	排气含湿量(%)	排气温度(°C)	排气流量(Nm ³ /h)	颗粒物实测浓度(mg/m ³)	颗粒物排放速率(kg/h)
BGFQ170725G101	11.3	1.5	9.2	36	3266	14.39	0.047
BGFQ170725G102	11.8	1.1	9.3	37	2303	12.60	0.029
BGFQ170725G103	11.5	1.9	9.5	37	3983	12.05	0.048

样号	排气流速(m/s)	排气温度(°C)	排气流量(Nm ³ /h)	氯化氢排放浓度(mg/m ³)	氯化氢排放速率(kg/h)
BGFQ170725G104	1.5	36	3266	5.93	0.02
BGFQ170725G105	1.1	37	2303	6.35	0.01
BGFQ170725G106	1.9	37	3983	10.60	0.04

五、酸再生装置运行费用 Operation cost of the acid regeneration unit

- 1、酸再生装置运行已知条件为国内某大型钢厂实际运行取费。 The operation condition of the acid regeneration device is known for the actual operation cost of a large steel mill in China
- 2、酸再生装置能力以7500L/h为例。 The capacity of the acid regeneration device was exemplified at 7500l / h
- 3、以满负荷酸操作运行6700h/年进行计算。 Calculate at 6700h / year
- 4、废盐酸铁离子浓度120g/l, ΣHCl 浓度200g/l。 The waste iron hydrochloride concentration was 120g / l and the hcl concentration was 200g / l.

某钢厂7500L/h酸再生废酸核算 A steel mill 7500l / h acid regeneration device accounting

2015年

厂别	废酸量 (m3)	铁红 (吨)	每吨铁红所需废酸量 (m3)	每立方废酸产生铁红量 (m3)
一冷	45000	5562	8.09	0.12
二冷	80000	11712	6.83	0.15
三冷	42000	6086	6.90	0.14
总厂	167000	23359	7.15	0.14

原始数据

厂别	投入 (万元)										产出 (万元)		处理费	
	人工	备件	维保	小板条	氨水	絮凝剂	滤布	折旧	能耗	成本合计	铁红	收益合计	年均	每m3废酸
一冷	91	433	85	0	0	0	0	550	476	1635	445	445	1190	264.46
二冷	103	354	81	168	50	4	10	1212	779	2761	937	937	1824	228.00
三冷	66	407	84	0	0	0	4	316	345	1222	487	487	735	175.04
总厂	260	1194	250	168	50	4	14	2078	1600	5618	1869	1869	3749	224.51

调整数据

厂别	废酸量 (m3)	投入 (万元)										产出 (万元)		处理费	
		人工	备件	维保	小板条	氨水	絮凝剂	滤布	折旧	能耗	成本合计	铁红	收益合计	年均	每m3废酸
一冷	45000	91	217	85	0	0	0	0	440	413	1246	445	445	801	177.90
二冷	80000	103	177	81	168	50	4	10	970	709	2272	937	937	1335	166.83
三冷	42000	66	204	84	0	0	0	4	253	275	885	487	487	398	94.87
总厂	167000	260	597	250	168	50	4	14	1662	1397	4402	1869	1869	2534	151.72

报计财部数据

厂别	投入 (万元)										产出 (万元)		处理费	
	人工	备件	维保	小板条	氨水	絮凝剂	滤布	折旧	能耗	成本合计	铁红	收益合计	年均	每m3废酸
一冷	197	515	144	0	0	0	0	630	413	1899	332	332	1567	345.99
二冷	282	424	95	418	78	4	11	1313	709	3334	955	955	2379	312.52
总厂	479	939	239	418	78	4	11	1943	1122	5233	1287	1287	3946	325.00

注：能耗包括水、电、气。其中水费占比2%，电费占比20%，燃气及蒸汽占比78%。

序号 sequence number	项目名称project name	数值numerical value	单位unit	备注			
1	生产能力capacity	7500	L/H				
2	装置数量	1	套				
3	燃气名称Gas name	混合煤气mixed gas					
4	燃气热值Gas calorific value	2000	KCAL/Nm3				
5	混合煤气mixed gas	0.4028	元yuan/Nm3	某钢厂实际价格			
6	电价The price of electricity	0.6638	元yuan/kWh				
7	工业新水Industrial new water	5	元yuan/ m3				
8	生活水Life water	5	元yuan/ m3				
9	循环水circulation water	0.5	元yuan/ m3				
10	脱盐水desalted water	20	元yuan/ m3				
11	漂洗水Rinse Water	0.5	元yuan/ m3				
12	余热水	0.5	元yuan/ m3				
13	压缩空气compressed air	0.09	元yuan/Nm3				
14	氮气nitrogen	0.21	元yuan/Nm3				
15	NaOH价格	3	元yuan/kg				
16	废 水 处 理 费 Waste water treatment price	25	元yuan/ m3				
17	土地租赁费Land lease fee	3	万元ten thousand yuan/亩mu·年year。				
	占地cover an area of	2.43	亩mu	长（米）	56	宽（米）	29
18	新酸价格New acid price	330	元yuan/m3				
19	氧化铁粉价格Price of iron oxide powder	1300	元yuan/吨ton				
20	总投资total investment		万元ten thousand yuan				
21	年固定折旧维修等	75	万元	维修费用按照??万/立方废酸量均摊			10
22	年固定费用	150	万元	年固定费用按照??万/立方废酸计算			20

计费条件Billing conditions

废酸生产消耗费用Waste acid production and consumption costs

序号	项目名称	单位	消耗定额		单价(元yuan)	年成本
			每小时hour	每年year		(万元ten thousand yuan)
一	原材料raw material					
1	燃气gas	Nm ³	2700	18090000	¥0.40	¥728.70
二	公用工程					
1	电electricity	kWh	450	3015000	¥0.66	¥200.14
2	脱盐水desalted water	吨ton	3.75	25125	¥20.00	¥50.25
3	漂洗水Rinse Water	吨ton	3.75	25125	¥0.50	¥1.26
4	生活水及工业水 Domestic water and industrial water	吨ton	——	——	¥5.00	
5	仪表空气Instrument air	Nm ³	525	3517500	¥0.09	¥31.66
6	NaOH	kg	24.75	165825	¥3.00	¥49.75
7	废水waste water	m ³	0.75	5025	¥25.00	¥12.56
原料消耗小计						¥1,074.31
废酸消耗（元/立方废酸）cost (yuan/m ³)						¥213.79 元yuan/m ³

废酸生产管理及维护费用 Production management and maintenance costs

序号	项目名称	单位	消耗定额		单价(元)	年成本	
			单套每小时	单套每年		(万元)	
8	开停车费用(4次/套) working and stop costs	次	¥20.64	¥82.57		¥82.57	
三	工资及附加费 Wages and surcharges	元		13	¥80,000.00	¥104.00	
四	正常维护和消耗件费用 Normal maintenance and consumables	万元 ten thousand yuan				¥75.00	
五	主要设备更换费用 Main equipment replacement	万元 ten thousand yuan				¥172.50	
六	销售费用 selling expenses	万元 ten thousand yuan				¥10.00	
七	管理费等	万元 ten thousand yuan				¥20.00	
八	土地租赁费用	万元 ten thousand yuan				¥7.30	
九	折旧	万元 ten thousand yuan				¥180.00	
	小计						¥651.38
每立方废酸费用 (元/立方废酸) cast yuan/m3						¥129.63 元yuan/m3	

废酸生产成本合计和产出费用 Total waste acid production cost and output cost

运行成本合计	万元					¥1,725.69
每立方废酸消耗总计 (元/立方废酸)						¥343.42 元/m ³

序号	项目名称	单位	产品量		单价(元)	年收入 (万元)
			单套每小时	单套每年		
1	氧化铁粉	吨	1.2525	8391.75	¥1,300.00	¥1,090.93
2	再生酸	m ³	7.5	50250	¥191.61	¥962.85
	收入估算					¥2,053.78
备注：1、氧化铁粉产量按照机组正常运行时计算；价格按照1300元/吨计算。						
2、再生酸价格由新酸价格折算而成，新酸价格按照330元/吨计算。						
再生酸价格 = 新酸价格 × 18% ÷ 30%						
产出折算：元/立方废酸						¥408.71 元/m ³

- 1、可以看出废酸装置是可以赚钱的。
- 2、需要装置连续稳定运行，经我公司装置实际测算，每次需连续酸操作运行约20天，则装置持平。
- 3、氧化铁粉质量对产出费用影响较大。因此酸再生装置应充分提高氧化铁粉质量。
- 4、废酸生产消耗为213.79元/m³，管理及维护费用为129.63元/m³。因此应加强设备的巡检和维护、注意生产操作的仔细，以减少设备的更换。

作业率的影响

单套机组运行，酸操作时按满负荷生产计算，水操作时按最低负荷生产。
低于**50%**则选择停车等待，需增加罐区和开停车费用

序号	作业率	消耗（万元）	产出（万元）	固定费用	半固定费用	利润（万元）	备注
1	100%	¥1,027.33	¥2,053.78	568.8043	¥82.57	¥375.07	
	90%	¥990.79	¥1,848.40	568.8043	¥82.57	¥206.23	
	80%	¥954.25	¥1,643.03	568.8043	¥82.57	¥37.40	
	70%	¥917.71	¥1,437.65	568.8043	¥82.57	¥-131.44	
	60%	¥881.17	¥1,232.27	568.8043	¥82.57	¥-300.28	
	50%	¥844.63	¥1,026.89	568.8043	¥82.57	¥-469.12	
	40%	¥808.10	¥821.51	568.8043	¥82.57	¥-637.96	
	30%	¥771.56	¥616.13	568.8043	¥82.57	¥-806.80	

由上表可以看出，该装置在作业率低于80%时及开始亏损。 As can be seen from the above table, the operation rate is less than 80% and the loss begins.

生产能力的影晌Impact of production capacity

单套机组操作时间和费用，非酸操作则停车

序号	操作时间	消耗（万元）	产出（万元）	固定费用	半固定费用	利润（万元）	备注
1	6500	¥996.66	¥1,992.48	568.8043	¥82.57	¥344.4330	
2	6000	¥920.00	¥1,839.21	568.8043	¥82.57	¥267.8321	
3	5500	¥843.33	¥1,685.94	568.8043	¥103.22	¥170.5877	
4	5000	¥766.66	¥1,532.67	568.8043	¥144.50	¥52.6997	
5	4500	¥690.00	¥1,379.41	568.8043	¥206.44	¥-85.8317	
6	4000	¥613.33	¥1,226.14	568.8043	¥289.01	¥-245.0067	
7	3500	¥536.67	¥1,072.87	568.8043	¥392.23	¥-424.8253	
8	3000	¥460.00	¥919.60	568.8043	¥516.09	¥-625.2874	
9	2500	¥383.33	¥766.34	568.8043	¥660.59	¥-846.3931	
10	2000	¥306.67	¥613.07	568.8043	¥825.74	¥-1088.1423	
11	1500	¥230.00	¥459.80	568.8043	¥1,011.53	¥-1350.5351	
12	1000	¥153.33	¥306.53	568.8043	¥1,217.97	¥-1633.5713	
13	500	¥76.67	¥153.27	568.8043	¥1,445.05	¥-1937.2511	
14	0	¥0.00	¥0.00	568.8043			

由上表可以看出，操作时间约少，则开停车次数越多。年酸操作时间应在5000h以上，才能保证持平。
As can be seen in the above table, the less operation time, the more open and parking. The annual acid operation time should be more than 5000h, to ensure the flat.

废酸铁离子浓度的影响 Effect of iron ion concentration of waste acid

单套机组，装置正常满负荷生产情况下		每立方废酸产量		0.167 吨（120g/l铁浓度）				每降低1g铁离子浓度每年减少收入(万元)	
序号	铁离子浓度	每立方废酸产量	每小时铁粉产量	每天产量	每月产量	每年产量	产出收入		
1	g/l	吨	吨	吨	30天	6700h	万元		
2	120	0.1671	1.25325	30.078	902.34	8396.775	¥1091.5807		
3	110	0.1528	1.146	27.504	825.12	7678.2	¥998.166		¥9.3414
4	100	0.1385	1.03875	24.93	747.9	6959.625	¥904.7512		¥9.3414
5	90	0.1242	0.9315	22.356	670.68	6241.05	¥811.3365		¥9.3414
6	80	0.11	0.825	19.8	594	5527.5	¥718.575		¥9.3414
7	70	0.0957	0.71775	17.226	516.78	4808.925	¥625.1602		¥9.3414
8	60	0.0814	0.6105	14.652	439.56	4090.35	¥531.7455		¥9.3414
9	50	0.0671	0.50325	12.078	362.34	3371.775	¥438.3307	¥9.3414	

由上表可以看出，废酸中每减少1g铁离子浓度，产出每年减少¥9.3414万元。因此，应要求酸洗线尽最大能力使用盐酸，排出较高浓度的含铁废酸。As can be seen from the above table, for every 1g of iron ion concentration reduced in the waste acid, the output is reduced by ¥93,414 million per year. Therefore, the pickling line should be required to use hydrochloric acid to discharge higher concentrations of iron-containing waste acid.

单套机组，装置生产满负荷生产时的消耗				万元			
序号	成本变化幅度	每立方消耗	每小时消耗	每天消耗	每月消耗	每年消耗	变化10%年费用变化(万元)
		元/立方	万元/小时		30天	6700h	
1	70%	¥138.3507112	¥0.103763033	¥2.490313	¥74.7093841	¥695.212324	
2	80%	¥158.1150986	¥0.118586324	¥2.846072	¥85.3821532	¥794.52837	¥99.3160
3	90%	¥177.8794859	¥0.133409614	¥3.201831	¥96.0549224	¥893.844417	¥99.3160
4	100%	¥197.6438732	¥0.148232905	¥3.55759	¥106.727692	¥993.160463	¥99.3160
5	110%	¥217.4082605	¥0.163056195	¥3.913349	¥117.400461	¥1092.47651	¥99.3160
6	120%	¥237.1726478	¥0.177879486	¥4.269108	¥128.07323	¥1191.79256	¥99.3160
7	130%	¥256.9370352	¥0.192702776	¥4.624817	¥138.745999	¥1291.1086	¥99.3160
8	140%	¥276.7014225	¥0.207526067	¥4.980626	¥149.418768	¥1390.42465	¥99.3160
9	150%	¥296.4668098	¥0.222349357	¥5.336385	¥160.091337	¥1489.74069	¥99.3160
10	160%	¥316.2301971	¥0.237172648	¥5.692144	¥170.764306	¥1589.05674	¥99.3160
11	170%	¥335.9945844	¥0.251995938	¥6.047903	¥181.437076	¥1688.37279	¥99.3160
12	180%	¥355.7589718	¥0.266819229	¥6.403661	¥192.109845	¥1787.68883	¥99.3160
13	190%	¥375.5233591	¥0.281642519	¥6.75942	¥202.782614	¥1887.00488	¥99.3160
14	200%	¥395.2877464	¥0.29646581	¥7.115179	¥213.455383	¥1986.32093	¥99.3160

原料价格的影响
The impact of raw material prices

单套机组，装置生产满负荷生产时的消耗				万元			
序号	产品价格变化幅度	每立方产出	每小时产出	每天产出	每月产出	每年产出	变化10%年产出变化(万元)
		元/立方	万元/小时		30天	6700h	
1	30%	122.613871	0.091960403	2.20705	66.2114903	616.134702	
2	40%	163.4851613	0.122613871	2.942733	88.2819871	821.512935	205.3782
3	50%	204.3564516	0.153267339	3.678416	110.352484	1026.89117	205.3782
4	60%	245.2277419	0.183920806	4.414099	132.422981	1232.2694	205.3782
5	70%	286.0990323	0.214574274	5.149783	154.493477	1437.64764	205.3782
6	80%	326.9703226	0.245227742	5.885166	176.563974	1643.02587	205.3782
7	90%	367.8416129	0.27588121	6.621749	198.634471	1848.4041	205.3782
8	100%	408.7129012	0.306534677	7.356832	220.704968	2053.78234	205.3782
9	110%	449.5841935	0.337188145	8.092515	242.775465	2259.16057	205.3782
10	120%	490.4554839	0.367841613	8.828199	264.845961	2464.53881	205.3782
11	130%	531.3267742	0.398495081	9.563882	286.916458	2669.91704	205.3782
12	140%	572.1980645	0.429148548	10.29957	308.986955	2875.29527	205.3782
13	150%	613.0693548	0.459802016	11.03525	331.057452	3080.67351	205.3782
14	160%	653.9406452	0.490455484	11.77093	353.127948	3286.05174	205.3782
15	170%	694.8119355	0.521108952	12.50661	375.198445	3491.42998	205.3782
16	180%	735.6832258	0.551762419	13.2423	397.268942	3696.80821	205.3782
17	190%	776.5545161	0.582415887	13.97798	419.339439	3902.18644	205.3782
18	200%	817.4258065	0.613069355	14.71366	441.409935	4107.56468	205.3782

产品价格的影响
The effect of product prices