Technology of Isoprenol (3-3-1)production

- --Process against non-catalyst, non-solvent, non-three-waste-discharge
- Gas-phase synthesis by high pressure

Technology of Isoprenol (3-3-1)production

- The plant is in the continuous production, which is controlled by DCS. The major production units are :powder transportation, synthesis, distillation, storage for raw materials and package of final products. The auxiliary units included in diathermic oil, refrigeration and torch.
- The fixed number of staff of plant is 50 persons.
- The output for plant can be from two hundred thirty million to three hundred twenty five million RMB, out of which its profits can be one hundred million to one hundred fifty million.

Table 1 Major Economic technologic index over plant

- The plant for capacity of 5000 tons will cover an area of 20,000M2. The land requisition refers to the table 1.

No.	item	unit	Q'ty
1	Land requisition in total	M2	20,000
2	Land requisition for buildings and structures	M2	7350
3	Architecture coefficient	M2	36.75

Production Capacity

- Production capacity for isoprenol (3-3-1)plant (5,000t/y)
- Total investment in plant is one hundred thirty million RMB, based on 8,000 hour in operation, 5.000t/y in capacity and 60%-110% in operation flexibility. It refers to Table 2:

- Table 2: Plant production capacity

No.	product	Production capacity (t/y)	Remarks
1	Isoprenol (3-methybut-3-en-1-ol)	5,000t/y	Final product

Variety of raw materials, auxiliaries and their names, quantity and storage

- Variety of raw materials, auxiliaries and their names, quantity and storage
- Names, quantity and supply sources for main raw materials
- Kinds of raw material, quantity and their supply necessary for plant. It refers to table 3

Table 3: Consumption of major feed stock

No.	Name	Unit	Q'ty	Supply	Remark
1	Paraformal dehyde (PFA)	T/Y	1980	Out-sourcing	
2	Isobutylene (ISB)	T/Y	3582	Out-sourcing	
3	Caustic soda	T/Y	4.65	Out-sourcing	42%(WT)

Table 4:Specification of feed stock

- Specification for raw material of plant refers to table 4
- Paraformaldehyde (PFA)

No.	Name	Unit	Specification
1	purity	% (wt)	>=91.0
2	water	% (wt)	<=8.5
3	methanol	% (wt)	<=0.4
4	others	% (wt)	<=0.05

- Table 5: Specification of isobutylene

No.	Name	unit	specification
1	Purity	% (wt)	>=99.9
2	C4 content	% (wt)	<=0.05
3	others	% (wt)	<=0.05

- Table 6: Specification of caustic soda

No.	Name	Unit	specification
1	purity	% (wt)	>=42.0
2	Nacl	% (wt)	1~1.1

Table 7: Turnout of product

- Table 7: Turnout of product

No.	Product	Production capacity (T/Y)
1	Isoprenol (ISP)	5000

Table 8: Specification of isoprenol (ISP)

- Table 8: Specification of isoprenol (ISP)

No.	item	Specification % (wt)
1	purity	>=98
2	water	<=0.1

Storage and package

- Storage and package
- Isobutylene, one of raw materials, is by outsourcing. It is loaded in tank-truck, transported into loading area of plant and sent to isobutylene raw material tanks by isobutylene pump then .There are two raw material storage tanks with volume of 180M³ each in the plant . Paraformaldehyde packed by bags are

Table 9: Storage equipment for raw materials, intermediates and final product

- Also by outsourcing, are transported by trucks to raw material package warehouse with storage volume of 80 tons. 5,000tons ISP final product, loaded in barrels stored in final product warehouse for sales. There are 4 intermediate tanks in the volume of 200M³ each for ISP storage.
- Table 9: Storage equipment for raw materials, intermediates and final product

No.	name	type	Volume of storage tank (M^3)	Quantity of tanks (set)	Quantity of storage tank (t)	Operative temperature (℃)	Operative pressure (MPaG)
1	isobutylene	Pressurized horizontal tank	180	2	192.95	Room-temperature	0.06/0.34
2	ISP	Dome-roof tank	200	4	546	Room-temperature	Normal pressure
3	Caustic soda	Dome-roof tank	10	1	9.3	Room-temperature	Normal pressure
4	paraformaldehyde	bagging	-	-	80	Room-temperature	Normal pressure

- Market analysis
- ISP is major raw material for synthesis of high efficiency water-reducer in the type of carboxylic acid
- Only producers overseas for ISP are BASF and Japanese Showa Electric. The annual output was less than twenty thousands tons before the year of 2000.

Market analysis

- At the earliest years the product was applied in Flavor Industry and Pharmaceuticals industry. Coming into the century of 21 and with the development of cement additives industries, particular for the development of high performance and high active of water-reducer it has been, in swift and violent, development. Polycarboxylic Acid-based graft copolymer

Market analysis

- Water conservancy project etc. It is now gradually replacing the water reducer fabricated by naphthalene, Malone, FM, melamine, etc. ISP in final performance is more better than functions of other heterogeneous graft copolymers.
- Our country is a big country among developing countries. Infrastructures are now blossomed, particularly for high-

Market analysis

- Has became the aim of research studied by research centers over world. Such a water-reducer is high for water-reduce efficiency, cement strength-enhanced, fluidity, anti-slump. There is no discharge of three wastes and environment protection, widely having applied in construction industry, for example, bridgework, high speed rail tunnel and

Market analysis

- Speed rails, the subway, bridges, tunnels, dams, nuclear power stations. Consumption of water reducer could be sharply increased. As the aim of the twelfth Five-year Plan water reducer at the base of polycarboxylic acid (20% solid contents) has not only the volume of market is around four million six hundred fifty thousand – six million one hundred

Market analysis

- Thousand tons, but also it has been in the growth as 20% in further development. There was only one producer of ISP in the domestic with the capacity of 5000tons, for which the capacity is now total only for his own use, at a result other domestic customers have to buy it at high price from Germany and Japan. As incomplete statistics the import volume per year was

Market analysis

- Around thirty thousand tons, so it has been huge to restrict the expanding water reducer at top grade. In 2013 ISP (3-2-1 and 3-3-1)has fifty and sixteen thousands of imported volume in statistics by the Customs.

Price forecast

- Price forecast
- As ISP has been almost depending on import domestic price ISP seems to be high. On investigating the current market the price was in the range of 36000~46000yuan/ton
- Price of raw materials, powers (tax-out)
- Table 10: price of raw materials, powers

Table 10:Price for major feed stock and powers

No.	Name	Unit	Price (yuan)
1	Isobutylene	Ton	14000
2	Paraformaldehyde	Ton	5600
3	Caustic soda at 42% (wt)	ton	615
4	Fuel gas	Nm3	2991
5	Circulation water	ton	0.40
6	Electric power	Kw-h	0.54
7	Instrument air	Nm3	0.15
8	Nitrogen	Nm3	0.20
9	Steam at low pressure	ton	134

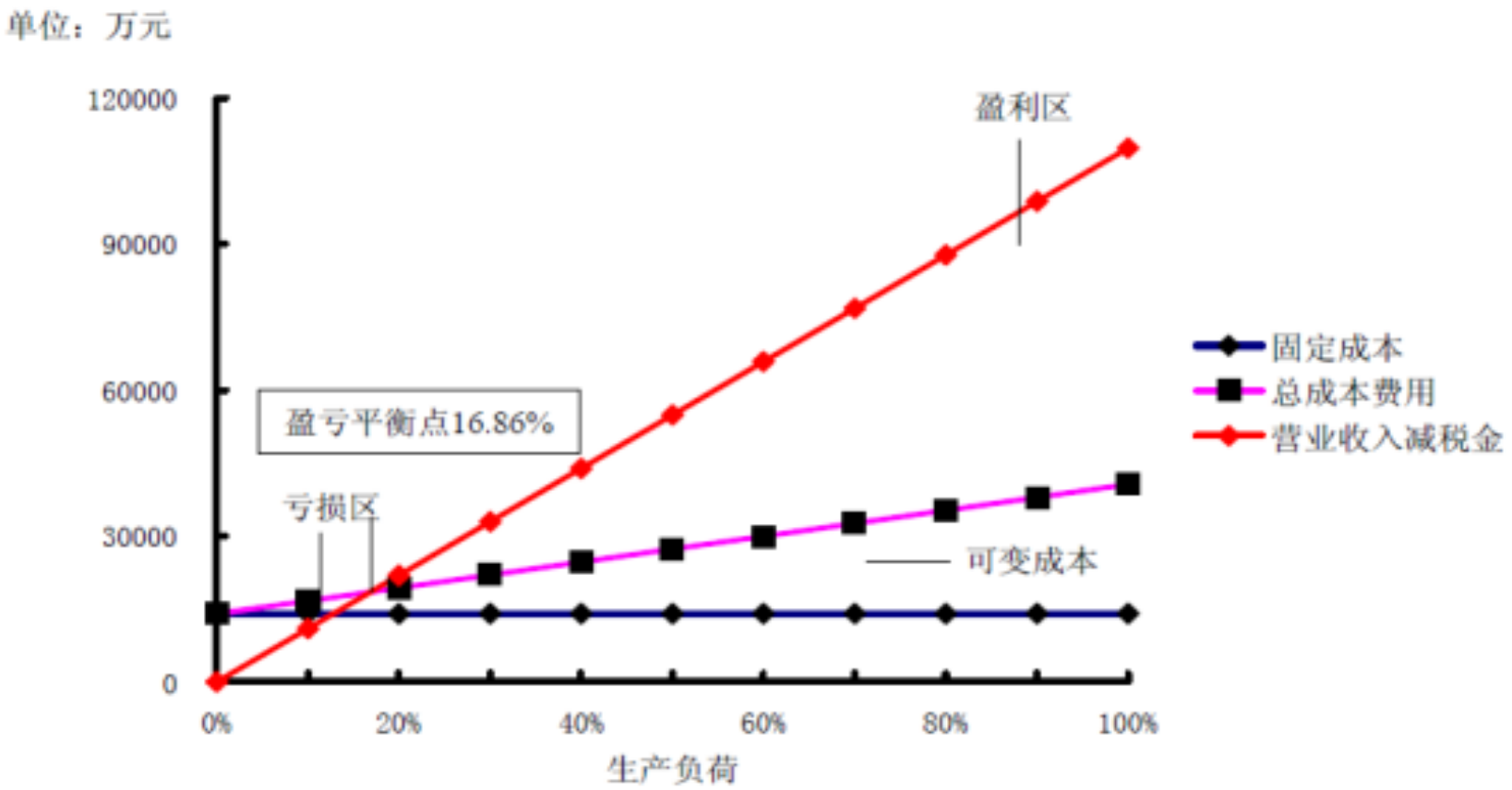
Estimation for cost of unit production

No.	item	unit	Price (yuan)	Quota for Consumption	Annual consumption at 100% load	Cost per unit (yuan)
1	Raw materials and auxiliaries	ton				12320.615
1.1	Isobutylene	ton	14000	0.72	3581.5	10080
1.2	paraformaldehyde	ton	5600	0.40	1983	2240
1.3	42% caustic soda	ton	615	0.001	4.65	0.615
2	Fuel and power					3379
2.1	Fuel gas	ton	2991	0.38	1920	1136.58
2.2	Circulation water	ton	0.40	1008.95	504475	403.58
2.3	electricity	Kw-h	0.54	1496.00	7480000	807.84

Estimation for cost of unit production

No.	Item	unit	Price (yuan)	Quota for consu mption	Annual consump tion at 100% load	Cost per Unit (yuan)
2.4	Instrument air	Nm3	0.15	480	2400000	72.00
2.5	nitrogen	Nm3	0.20	2048	10240000	409.60
2.6	Steam at LP	ton	134.00	4.10	20512	549.4
3	Personal costs					
4	Depreciation cost					
5	Repair charge					
6	Other manufacturing expense					
7	Production cost					15699.615

盈亏平衡图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亏损区
可变成本
固定成本
总成本费用
营业收入减税金
0%
20%
40%
60%
80%
100%
生产负荷

敏感性分析图