

# **ALLUMETTE**

## **Context:**

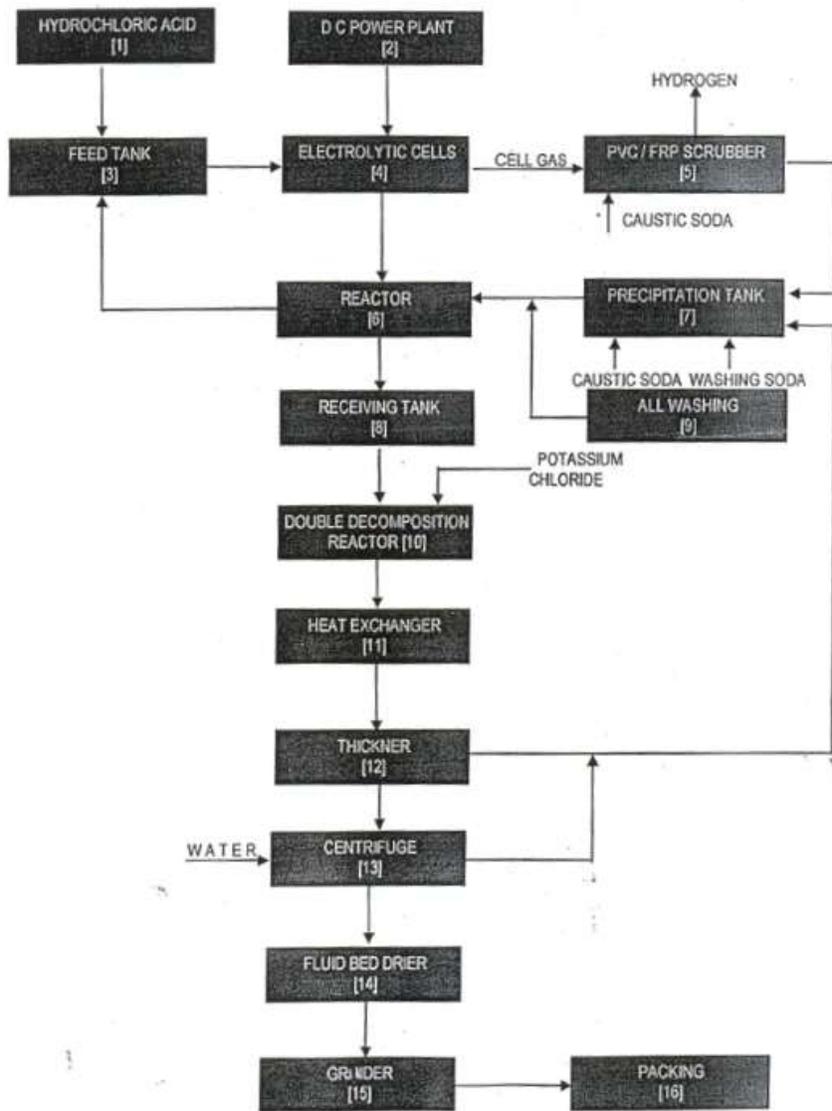
A matchstick is a length of cord impregnated with chemicals and allowed to burn continuously. It is a very commonly used consumer product and is the part and parcel of every household.

The coated end of a match, known as the match head, contains Potassium Chlorate as the active ingredient. Potassium Chlorate, when manufactured, is in the form of powder. The crystals formed undergo a centrifuging process and the centrifuged crystals are then subsequently dried in a rotary drier. The dried material is then fed to the pulverizer to form particle size of 300 Mesh (75% of the powder passing through 300 Mesh). The material (at 60°C to 65°C) is suitably packed in HDPE woven sacks, protected with interior polythene coating and stitched to prevent leakage of powder, and then sold to Safety Match industries.

## **Manufacturing process of Potassium Chlorate:**

Acidulated solution of Sodium Chloride is fed into the cells where electrolysis is carried out in the presence of D.C. Current. Hydrogen gas evolved is discharged into the atmosphere after scrubbing. The electrolyte from the cells is taken to reaction tanks. From the reaction tank, solution is pumped through a heat exchanger for removal of heat and circulated back to the tank for temperature maintenance. Part of this solution steam is fed into double decomposition tank where Potassium Chloride is added for conversion. Converted solution is cooled in the heat exchangers and the slurry is allowed to settle through tanks where the crude Potassium Chlorate salt settles down and the clear solution is taken back to process through precipitation tanks. The crude salt with various impurities are centrifuged, washed to remove various impurities. The processed wet salt is dried in fluid bed drier and pulverized and then packed.

# Flowchart:



Potassium Chlorate specifications as per IS: 708-1970:

S. No.	Characteristics	
1.	pH value	5-8
2.	Moisture, percent by weight, Max.	0.05
3.	Insoluble Matter, percent by weight, Max.	0.05
4.	Chlorides(as Cl), percent by weight, Max.	0.10
5.	Potassium Chlorate(as $KClO_3$ ), percent by weight, Min.	99.25
6.	Perchlorates(as $KClO_4$ ), percent by weight, Max	0.15
7.	Sulphates(as $SO_4$ ), percent by weight, Max.	0.03
8.	Bromates(as $BrO_3$ ), percent by weight, Max.	0.15
9.	Grit	free from grit

## **PROBLEM STATEMENT**

In powder form, Potassium Chlorate is highly susceptible to absorption of moisture from the atmosphere. This triggers the tendency to form lumps which get hardened with the lapse of time. In about one month time, it gets caked and its subsequent powdering involves wastage of labor.

Present your innovative solutions to prevent the caking of Potassium Chlorate and hence to sustain it in free-flowing nature.

Clearly explain

- The method
- Cost involved
- Feasibility of the method proposed
- Highlight of your idea