

# De-ashing of Liquid Glucose by Tulsion<sup>®</sup> Resins



## Overview

Liquid Glucose (LG) and Dextrose are obtained from starch, which in turn is derived principally from maize. Starch is also produced from potatoes, rice, taro etc. In India, two types of seeds are used to produce starch viz. maize and tapioca. When starch is hydrolyzed with mineral acids or enzymes or both, it is converted to glucose. This glucose contains objectionable impurities such as ash, color bodies and proteinaceous materials. In order to meet specifications laid down by many end-users of LG / dextrose, it is necessary to remove these impurities. Normally glucose is supplied as liquid glucose having a concentration of 85 % w/w while dextrose is supplied as a white crystalline powder. LG is normally obtained by acid hydrolysis of starch while dextrose is obtained by hydrolysis of starch using an enzyme as a catalyst. The coloring bodies' formations are more in the case of acid hydrolysis of starch as compared to that of enzymatic hydrolysis. Ion exchange resins thus find applications in the starch industry mainly for de-colorization and demineralization of LG / dextrose.

## Impurities Associated With Starch Syrup

Impurity	Effects
Fiber	As fiber is insoluble, it will not allow starch to become hydrated.
Protein	Produces off flavors and colors.
Colorants	Natural colorants like flavonoids, melanin and chlorophylls imparts color to the syrup.



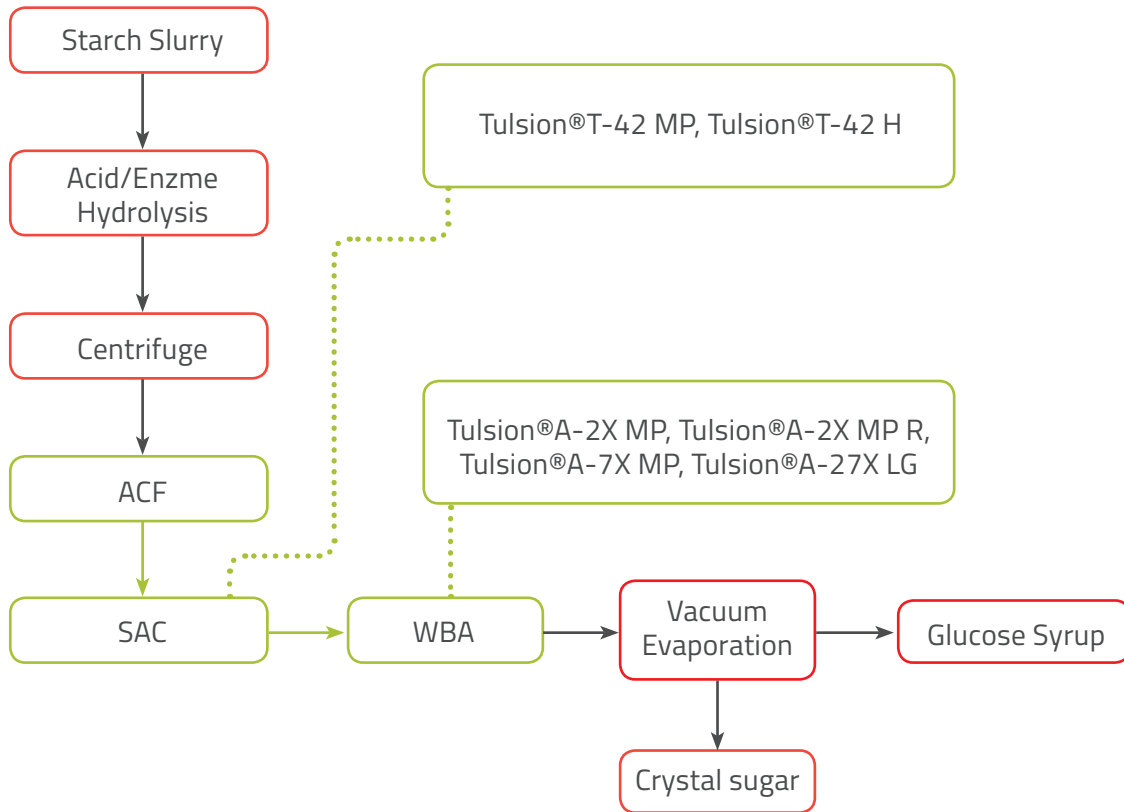
These impurities are removed using Tulsion® range of resins to achieve high quality liquid glucose.

## Typical Inlet Feed Quality For Liquid Glucose (LG)

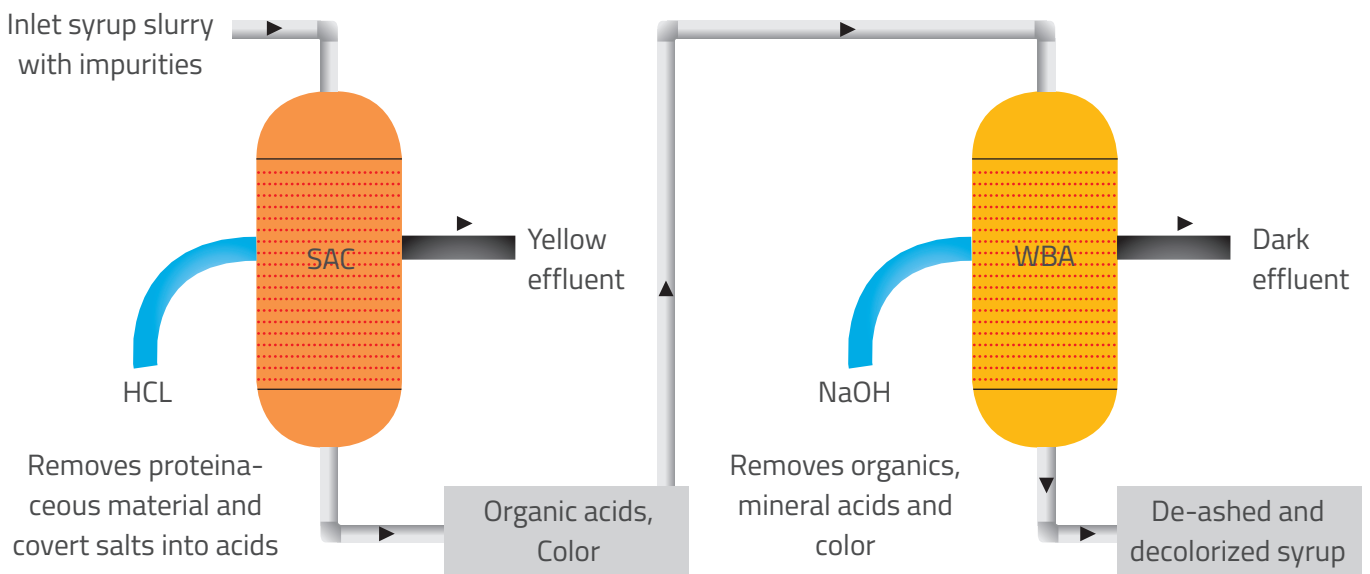
Parameter	Quality
Dry Solids	30-34 %
Ash	0.6-0.8 %
Color	400-600 ICUMSA
pH	4.5
Polarization	>99.8



## Typical Refining Process



Abbreviations: SAC- Strong Acid Cation | WBA- Weak Base Anion | MB- Mixed Bed | ACF- Activated Charcoal Filter



Process flow for liquid glucose de-ashing

## Product Guide

Resin Type	Product	Suitable for
Cation	Tulsion®T-42 MP	High capacity resin with good physical and chemical stability. Used for de-ashing and achieving low conductivity.
	Tulsion®T-42 H	High bead strength and used for efficient color removal with organic acids purification.
Anion	Tulsion®A-2X MP	Extremely durable resin used for de-ashing liquid glucose
	Tulsion®A-2X MP-R	High porosity & high capacity weak base anion resin as compared to A-2X MP
	Tulsion®A-7X MP	Exceptionally high operating capacity with low rinse requirements
	Tulsion®A-27X LG	Specially designed weak base anion resin suitable for liquid glucose applications
Adsorbent	Tulsion®PCP-1200	Acts as a polishing unit for efficient removal of color, odor and taste.

Note: All the products are food grade (FG).

## Different Treatment Schemes

Treatment Scheme	Suitable for
ACF-> SAC-> WBA	Primary scheme for de-ashing
ACF-> SAC-> WBA-> SAC-> WBA(Primary + secondary)	Take care of impurities leaking from the primary scheme. Used for better removal of impurities
ACF-> SAC-> WBA-> Special color removal unit	De-ashing with de-colorization
ACF-> SAC-> WBA-> MB	Removal of residual ash and color

## Typical Operating Conditions



Parameters	Unit	Values	
		Cation	Anion
Resin bed depth(Minimum)	mm	1000	1000
Operating temperature (Normal)	°C	60	60
Service flow rate	BV/hr	2 to 5	2 to 5
Regenerant		HCl	NaOH/Na <sub>2</sub> CO <sub>3</sub> /NH <sub>4</sub> OH
Regenerant concentration		7%	5%
Regeneration level	g/l	80-100 g/l HCl	80-120 g/L NaOH 100-150 g/L Na <sub>2</sub> CO <sub>3</sub> 100-140 g/L NH <sub>4</sub> OH
Regeneration time	min	60	60
Slow rinse	BV	2	2
Fast rinse	BV	1 - 2	2 - 4

## Do's & Don'ts of Operation

Parameter	Do's	Don'ts
Temperature	Operating temperature should be less than 80°C	Should not be >80°C
Cross-regeneration	Cation- After every 10-15 cycles, proteins adsorbed onto the cation resin should be removed by using NaOH Anion- During cycle, organics acids are adsorbed onto the anion resin that can be removed using NaOH or HCl solution	Should not exceed more than 15 cycles
Backwash	After every cycle, backwash should be given for 60 minutes (minimum) until clear water is observed. Backwash water temp <50°C	
Rinsing	Ensure proper rinsing time for the removal of excess chemical during regeneration	Should not start cycle without proper rinsing
Influent suspended solids	Nil	
Cation outlet	pH should be monitored at a regular interval	

## Liquid Glucose Applications

Liquid Glucose is used in confectionery canned foods, dairy products and even in medicine. Dextrose finds main application in medicines, cough syrups and dextrose injections. It is major ingredient in hard-boiled candies as it prevents crystallization and imparts cohesiveness.



## Advantages

### **Economical:**

Tulsion® resins are economically priced and are effective than those of traditional granular carbon.

### **De-ashing with color removal:**

Tulsion® resins used for de-ashing process, can also be utilized for efficient color removal from the syrup. It is an added advantage for the customer whose primary requirement is color removal.

### **High flow rates:**

This method can be operated at much higher flow rates. Thus, less heavy vessel is needed for given liquor flows. Also, shorter retention times reduce liquid glucose degradation during de-ashing.

### **Easy & hygienic operation:**

The resin process is easily handled and can also be automated depending upon customer requirement. The regenerant and resins are contained inside a closed vessel, so the process is more hygienic than other de-ashing processes.

### **Low cost operation:**

Regeneration is carried out with inexpensive chemicals so cost of operation is low with no additional processing cost.



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