Glycerin Purification
(Extracted from the Diaion Manuals pages 244 to 246)

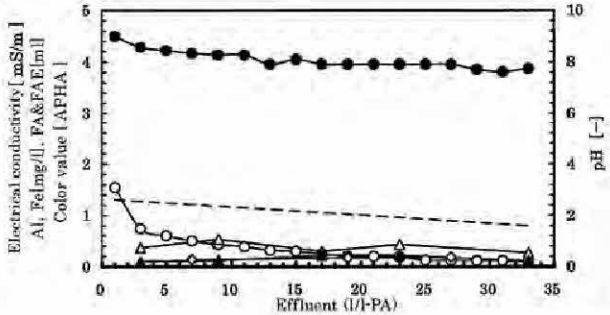
10. Glycerin Purification

Glycerin (Chemical name: 1,2,3-Propanetriol or Glycerol) is widely used in the pharmaceuticals, cosmetics, foodstuffs, tobaccos, gunpowder and others, and it is categorized from manufacturing methods into synthetic glycerin from propylene and natural one; natural glycerin has been increasing in recent years.

Natural fats, esters of glycerin (trihydric alcohol) and fatty acids are hydrolyzed to return to glycerin and fatty acids. Natural glycerin is manufactured from sweet water, a byproduct of the hydrolyzing process in the manufacturing of fatty acids, soap and natural alcohols from natural fats, e.g. beef tallow and vegetable oils. **Note: Saponification is one of the hydrolyzing reactions.* Because this hydrolyzing process uses alkali such as sodium hydroxide, the process solution includes plenty of

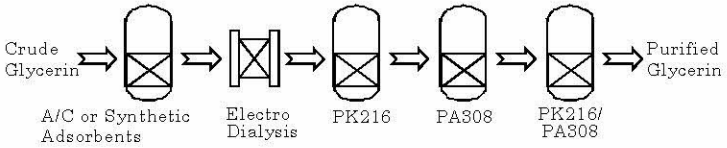
impurities; sweet water, NaCl, NaOH, Na_2CO_3 and others. Glycerin is purified in the following ways: The mother liquors are a) neutralized, b) added with aluminium sulfate, c) filtrated, d) concentrated to be crude glycerin, and at last e) distilled. Still, such purified glycerin colors a little due to thermal decomposition, in some cases have slight odor and hold fatty acids and their esters.

Highly purified glycerin is manufactured by the IER treatment with activated carbons. Such purification process flow is demonstrated in Fig.VIII-10-1. The activated carbons preceding IERs are to remove most fatty acids (FA&FAE), fatty acid esters (FAE) and other colored impurities.



[Fig.VII-10-2] Purification of crude Glycerin

IER: PK216 → PA308
Raw solution: pH=8.7, Electrical conductivity=57mS/m, Al=45mg/L, Fe=20mg/L
FA&FAE = 0.35mL, Color value = 190 APHA
○ Electrical conductivity △ Al ▲ Fe
◇ FA&FAE ● pH ···· Color value



	Before E/D	After E/D		After 2B2T	After M/B
Glycerin conc.		15～50%			
Salt conc. or Electrical conductivity	5000～6000mg/L	1000mg/L		0.1～0.2mS/m	0.01～0.02mS/m
Color value (APHA)		100		20	5
pH		7～8		7～8	6

[Fig.VII-10-1] Process flow of Glycerin Purification

IER treatment is usually carried out by combination of two-bed and

two-tower system of DIAION® PK216 and PA308 with mixed bed system of PK216 and PA308. Effective removal of impurities is accomplished at low flow rates. There are two types of colored impurities; one is adsorbed by CERs and the other by AERs. Some colored impurities cannot be desorbed sufficiently by standard regeneration methods and thus they are accumulated inside of IERs during repeated uses. Rejuvenation should be done to remove the accumulated colored impurities.

As regards to regeneration in two-bed and two-tower systems, the countercurrent regeneration has become common instead of the traditional cocurrent regeneration in order to improve the treated solution quality and the regeneration efficiency. (*Please see the details of the countercurrent regeneration in Chapter V, "Water Treatments".*) Fig.VII-10-2 illustrates the result by the two-bed and two-tower system of PK216 and PA208. [59]

Concerning synthetic glycerin, on the other hand, it contains little impurities, mainly monochlorohydrin, and its electrical resistivity is only several hundred thousand Ω·cm. Thus, the purification process is rather simple than for natural glycerin: the mixed bed system of SK1B and SA10A may be satisfactory and the IERs can be used for longer periods than in natural glycerin.