

# A study on the Dehydration Performance of the Plate and Frame Pervaporation Module Unit for Aqueous Organic Solution

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Pervaporation technique has been recognized as an energy efficient method for separating azeotropic mixtures such as an aqueous 95wt% ethanol and iso-propanol(IPA) solution because of its high separation efficiency and permeation rates. Therefore, in recent years there has been increased interest in the use of membrane separation process[1,2].

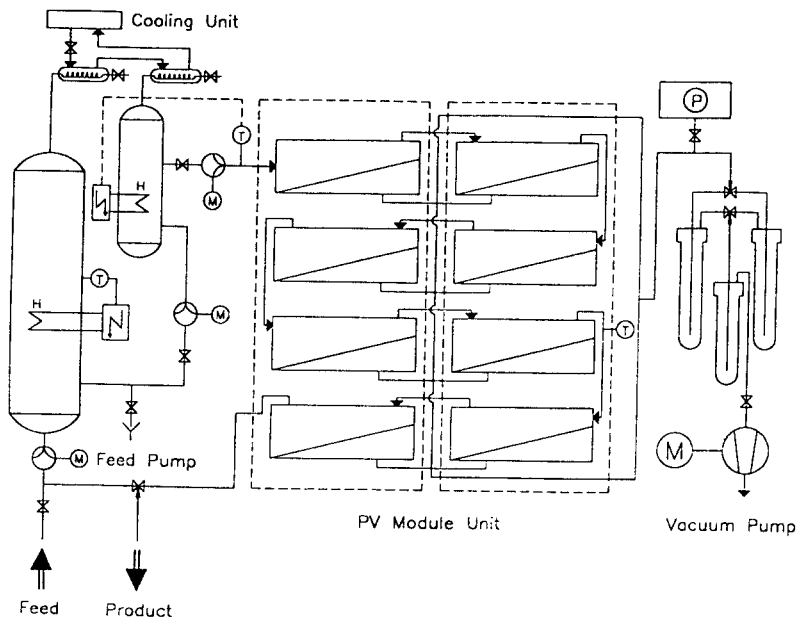
However, in order to apply the membranes on a technical scale, a large membrane area is normally required. Figure 1 shows the schematic drawing of pervaporation module used in this study. Most industrial pervaporation units in use today consist of plate and frame module. This kind of module is used typically for solvent dehydration. In this work, the performance of a pervaporation plate and frame module for a given application was investigated by the dehydration membrane and the module dimensions.

The membrane area of used plate and frame module was about 2,260cm<sup>2</sup>. The dehydration membrane was prepared by casting or coating a polymer solution on the glass plate or the nonwoven fabric. These polymer solutions were highly absorbent polymeric materials with high hydrophilic. Table 1 shows the permeation and separation performance of the dehydration membrane for module applications with the operating conditions and specifications.

These experimental results indicated that the dehydration membrane would be very effective to apply on a pervaporation pilot unit for a selective separation of water from water-organic solvent mixture systems.

## References

1. R.Y.M.Huang, Memb. Sci. Techn. Series, 1, 497 (1991).
2. G.H.Koops, J.A.M.Nolten, M.H.V.Mulder and C.A.Smolders, J.Memb. Sci., 81, 57 (1993)



H : heater P : pirani gauge T : thermometer

Fig. Pervaporation process unit of the plate and frame module.

TABLE I . Pervaporation module unit operating conditions and specification

### Operating conditions

Feed circulation rate : 100 l /hr

Feed temperature at module inlet : 60°C

### Specification

Membrane area : 2,260 cm<sup>2</sup> (in 2 stages)

Module type : Plate & Frame type

Solvent : IPA

Feed concentration : 98.94 wt%

Product concentration : 99.62 wt%