

## **Toyobo Begins Marketing of VOC Emission Treatment Systems Based on the Nitrogen Cycle Desorption Method**

*Capable of Recovering High-Volume Water-soluble VOCs  
with High-Quality Organic Solvents*

Toyobo has developed volatile organic compound (VOC) emission treatment systems based on the nitrogen cycle desorption method using its K-Filter<sup>®</sup> that is made of activated carbon fiber adsorbent material. Full-scale marketing of these systems began in April 2014.

These systems have two special features. The first is that VOCs can be recovered with high-quality organic solvents, and the second is that it can handle high volumes of emission gases. As a result of the introduction of these systems, costs can be reduced through the recovery and reuse of the organic solvents, and they will contribute to the preservation of the environment.

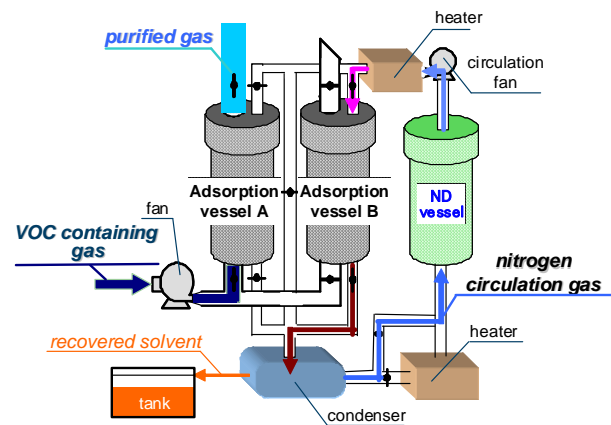
### **1. AC Equipment Business**

Toyobo is engaged in the emission gas processing related business, including the processing of VOCs emitted by industrial plants. Beginning in 1975, Toyobo began to market its K-Filter<sup>®</sup> VOC emission treatment systems (hereinafter, KF systems). These systems incorporate K-Filters and are devices that can recover organic solvents from industrial emission gases through desorption. K-Filters feature (1) a faster desorption rate and (2) more-efficient recovery and elimination of VOCs than processes that make use of general-purpose granulated activated carbon.

To date, Toyobo has supplied more than 1,300 of these K-Filter devices not only in Japan but also in Europe, the United States, and elsewhere in Asia. Toyobo's strengths in this business include its capabilities for the development of its own materials as well as its integrated development, manufacturing, and marketing services as well as the provision of user consulting and maintenance.

Toyobo is also moving forward with the development of vapor desorption KF systems to meet a wider range of needs and the development and marketing of dry process desorption KP systems for small and medium-sized installations. These new development and marketing efforts have resulted in the nitrogen cycle desorption method KF systems, which have the capacity for recovering high-quality organic solvents from high-volume emission gases, including a range of high-concentration water-soluble VOCs (such as ethyl acetate and alcohol).

## 2. Nitrogen Cycle Desorption Method KF Systems



### Nitrogen Cycle Desorption Method K-Filter VOC Treatment Systems

(Left: Exterior view of the system. Right: Process flow)

#### ● Features of the main system

- The volume of water contained in the recovered organic solvent is small<sup>\*1</sup>, and, since decomposition is restrained<sup>\*2</sup>, it is possible to recover high-quality organic solvents from emission gases, including VOCs. It is, therefore, possible to lower costs of the recovery and reuse of organic solvents.

Notes:

1. The percentage of water in the recovered organic solvents is 8.5% or less by weight (depending on the ambient humidity). This is half the percentage of the systems of competitors.
  2. The concentration of the decomposed material (acetate) is 240mg/liter, about 1/4 that of the systems of competitors.
  3. Both 1 and 2 above are the result of tests of gases containing 2,000ppm of ethyl acetate.
- Since the size of these systems can be scaled upward, they can be designed and built to process large volumes of emission gases
  - Since these systems cycle nitrogen within the process flow, the volume of nitrogen gas required is small, and energy needed to produce nitrogen can be saved, thus lowering running costs.
  - Since K-Filters are used in these systems, it is possible to remove the standard 95% or higher amount of VOCs from emission gases. This contributes to environmental preservation.
  - The adsorption material is durable, and, since its adsorption is stable, it has superior maintenance properties.
  - Field tests for this equipment were conducted in the Oyama Plant (located in Oyama City in Tochigi Prefecture) of Toho Packaging Inc. (Headquarters: Chiyoda-ku, Tokyo; President: Yuji Kawada). Many of the company representatives present expressed the opinion that the percentage of water content in the recovered organic solvents was low and that decomposition of the organic solvents was small.

- **Structure of the main system**

These systems have two K-Filter adsorption vessels for adsorption of VOC emission gases. While the VOCs are being adsorbed from emission gases by one vessel, the other vessel recovers the organic solvents from the adsorbed VOC. These systems use heated nitrogen gas to recover the VOCs, and the nitrogen gas is cycled within the system. These systems introduce a K-Filter vessel also in the recovery line (labelled as the ND vessel within the exhibit above). This vessel is used to raise and lower the temperature of the nitrogen gas and brings about the adsorption and desorption. This is the first process of its kind in the world. Through the use of this system, when the VOCs are being recovered, the concentration of VOCs in circulating nitrogen gas is lowered, and this maintains the VOC removal performance of the adsorption vessel after the VOCs are treated.

### **3. Future Outlook**

Toyobo is recommending the installation of these systems on film converters that use high volumes of water-soluble organic solvents. The sales target for 2017 is approximately ¥400 million annually.

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