

Taking steps to meet the wideranging demand for membranes

by Alex Yelshin

With the realisation that it lags behind the West in the development of membranes and membrane equipment, a recent conference in the USSR highlighted the steps being taken to meet the growing demand. Our correspondent reports on what took place

In the town of Divnomorsk during April 1989, an all-Union conference 'Creation and Development of Membrane Technology' took place. There were discussed the results of recent investigations into reverse osmosis (RO), microfiltration (MF) and ultrafiltration (UF) as well as the results of electrolysis and membrane gas separation. Considerable attention had been paid to the development of membranes and to designing equipment for their manufacture.

The conference was divided up into four sections:

- RO, MF and UF;
- Gas separation;
- Electrolysis and membrane distillation;
- Machines and plants for membrane manufacture.

This report highlights the discussion that took place in the first and last sections.

In the final section, a wide variety of processes using membranes were considered. In particular, there were waste water purification; a problem of using prefiltration to increase membrane life when

working with MF and UF; emulsion separation; separation of electrolyte multicomponent solutions; polysulphone hollow fibres for the filtration of biological solutions; the problems of optimising UF apparatuses having membranes in the form of hollow fibres and natural water purification.

Among the particular problems concerning membrane technology utilisation there was discussed the problem of waste water UF purification from dyes in textile production where cellulose acetate membranes of the UAM type and polyamide membranes of the UPM type were used. UF fractionation and concentration of technical lignosulphates, and utilisation of inorganic membranes to galvanic waste water purification, have been also considered.

Water-alcohol solutions of aromatics were separated by the RO method, in which Soviet-made MGA-100 type membranes were used. The retentivity obtained was 90% for aromatics and 86% for alcohol.

In one of the reports, pressure fluctu-

ations for more intense UF was examined. Pressure fluctuation (pulsation) has been super-imposed on the constant working pressure component. By mathematical method it was shown that it was possible to obtain resonance pulsation frequencies which should make separation much more intensive.

It is worth mentioning the report on the MF of liquids in the production of high purity substances, by B M Vorotintsev, N H Ogmulov, P N Drozdov and others (Institute of Chemistry of Academy of Sciences of USSR, Gorky) where silica filters were used. Silica was produced from high-purity silicon chlorides. Total concentration of metal impurities in the filter material was about $7 \times 10^{-6}\%$ by its mass. Filter porosity was 45-70% and the capacity of the 0.15m thick filter was: water-up to $2\text{m}^3/\text{m}^2\text{h}$ atm and acetone up to $6\text{m}^3/\text{m}^2\text{h}$ atm. Filtration of particulate latex suspension with particle size over 0.08 micron with the initial concentration of 10^8 particles/ml had shown that the amount of particles was below the identification level of laser ultramicroscopes (ie less than 10^3 particles/ml).

It should be mentioned that cellulose acetate membranes of the UAM type with immobilised antibodies on them were used as sensitive elements of immunoelectrodes to identify different viruses and proteins.

As mentioned above, great attention was paid to membrane manufacture; eg there was a report about the manufacture of semi-permeable membranes in the form of polyurethane hollow fibres. Hollow fibres made it possible to achieve

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LETTER FROM CHINA

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Westfalia – celebrating 35 years success in China

by Gu Minyuan

Shanghai Chemical Machinery Plant, Shanghai, China

The West Germany company Westfalia Separator has been supplying filtration equipment to China since 1955. Over the years, the relationship between the two parties has blossomed and strengthened. Our correspondent charts the company's progress in China

On a day of February, when it was drizzling, I had an interview with Bernhard Meis, director of Westfalia Separator (China) Ltd, in Shanghai. He told me that the export trade held an exceedingly important position for Westfalia, which had made good progress in the development of business relationships between it and China companies.

Westfalia – a recognised expert in the technology of centrifugal separation and agricultural engineering based on machinery for milk processing – supplies machines of high quality made in Germany. They include 150 or more kinds of separators in several hundred designs. It is, thus, in a position to offer solutions for the special problems of customers.

The company places the same importance on providing a reliable after-sales service as it does on the quality and

design of the original equipment. This is achieved by carrying out a comprehensive plan of training the company staff and by keeping in constant contact with its partners and customers all over the world.

Long-term Relationships

Early in 1955, Westfalia delivered the first laboratory centrifugal separator to a mineral oil processing company in China. The relationship between Westfalia and China has continued for 35 years.

From the middle of the 1950s to the end of the 70s, China ordered a variety of machines from Westfalia for the food and pharmaceutical industries, and 1980 marked the trend of further development in the trade relations between the two parties. Westfalia provided China with centrifuges for clarification and de-

watering of mineral oil on ships and, afterwards, with all kinds of separators for food processing, production of edible oil, milk processing and products of yeast and starch, and also with extractors for the pharmaceutical industry.

Some 700 units of the company's centrifuges have been imported into China so far. They are completely accepted because they have proved their high quality and reliability. Feeling duty-bound to help the broad ranks of its customers in China, Westfalia tries its best in its full-scale technical consultation service and efficient after-sales service. In 1988 the subsidiary company, Westfalia Separator (China) Ltd, was set up to strengthen these services.

With more than 7,000 people on its staff, North China Pharmaceutical Corp in Shijiazhuang, Hebei Province, mainly produces a variety of antibiotics. In this factory there are 13 Westfalian TA60 extractors, used in the production of antibiotics and, in addition, there are two CA366-290 special type decanters, employed for direct extraction of whole fermentation broth.

During 1985 to 1989, China imported over 25 sets of edible oil refining equipment from Westfalia. The first was brought into operation in Tianjin in September 1985. The remainder were installed

a UF velocity of distilled water of 100ml/m²h mm Hg. The inner diameter was 200-1400 micron, and wall thickness 60-80 micron.

Some reports were dedicated to the main aspects of the design-construction bureau 'Plastmash,' based in the town of Krasnodar, which develops equipment for fluids separation by means of membranes. The Plastmash bureau is engaged in the demineralisation of artesian mineral water; water desalination; galvanic production wash water purification and development of equipment for biological synthesis.

To demineralise artesian mineral waters containing up to 4g/l of salts, an RO plant was recommended for series production. The plant capacity was 50m³/day, and it had hollow fibres as membranes. Technical documentation for demineralised water production having a capacity of 100m³/day was available.

There were also offered membrane blocks of various sizes for making apyogenic water; the capacity of the blocks was up to 5m³/h.

Plastmash also offered complete sets of the following equipment for production of membranes from 300,000 to 100,000m²/year:

- Equipment with the capacity of 300,000m²/year of RO carrier-based cellulose acetate membranes having selectivity of not less than 95% and water permeability 830-850l/m² day;
- Equipment to produce 150,000m²/year of carrier-based ethyl cellulose membranes by the dry-method, the membranes being used to make cartridge filter elements;
- Equipment to produce 100,000m²/year of asymmetric membranes for blood

oxygenation, the membranes having increased O₂ and CO₂ permeability.

In the opinion of the Plastmash specialist it will be possible to cut down considerably the amount of membrane filter elements and plants that have to be imported.

To conclude it should be mentioned that to put membrane technology into industrial operation in the USSR, and to overcome the amount it lags behind developed countries in the west, some inter-republic and inter-branch programmes on the problems of membrane technology have been developed.

The main difficulties in programme fulfilment are the problems of manufacture of equipment and the technology of the high-quality membrane production. The latter problem is linked with raw material quality. Nevertheless there is considerable progress in this field.

At present, the USSR has a wide and unsatisfied market for selling membranes and membrane technology, ranging from the electronics industry, medicine and microbiology to potable water demineralisation, and priority should be given to potable water demineralisation. It is in this field that the common effort of membrane equipment manufacturers in the USSR and the west can have the most humane results, to ease the problems of potable water for people who live in the Aral sea region and in the USSR republics where irrigation is widely used in agriculture.

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mainly in Beijing, Shanghai, Harbin, Nanjing, Shenyang and Jiamusi. These units were jointly supplied by Westfalia and international engineering companies to meet the requirements of the edible oil refining industry of China. The outputs of these edible oil factories are respectively 50, 100 or 180 tons per day.

In August 1985, Westfalia delivered the first separator installation to the Workers Peasants Alliance Starch Plant in Tianjin, which is a 4-stage corn starch refining factory. The installation included five DA40-46-016 nozzle type disc centrifuges, five SPA200 deforming pumps and five BSB 100 rotary brush strainers.

In recent years, Westfalia has supplied decanters and other kinds of equipment to China's beverage, wine and soft drink industries. Here these are mainly used for beer, tank bottoms, grape wine, fruit juice, coffee and soya milk. The machines are running at full speed in more than 40 factories, located in the provinces of Guangdong, Henan, Inner Mongolia, Liaoning, Shangdong, Jilin, Zhejiang, Anhui, Fujian, Shanxi, Hebei, Guangxi, Hubei, Heilongjiang, and the Xinjiang Uygur Autonomous Region, the capital Beijing and the world-famous big city - Shanghai.

Communications

To let China know Westfalia better, Westfalia published a 129-page book titled as a 'Report' in Chinese, where an introduction to Westfalia Separator AG and some

of the fields of application of the machines, installations and processes are given. In addition, the Chinese language non-periodic publication *Information & News* from Westfalia is welcome. Both publications are free of charge and available on request.

Exhibitions in China help Westfalia to establish new relations. The company is a regular exhibitor at nearly 100 fairs, shows or exhibitions held in different parts of the world every year, including those in China. In 1989 Westfalia participated in the AchemAsia exhibition in Beijing which was jointly organised by Chinese and West German authorities.

Exchange visits are said to make a market. A number of Chinese delegations have been invited to visit Westfalia factories in West Germany. It was in West Germany that Westfalia and the staff members of Dongguan Sugar Refinery, Guangdong Province, had discussions on the installation of a yeast factory, and Westfalia's last round trade talks about the lysine project were held with a delegation from Fujian Province. Westfalia was glad to show its technology and it was really a great treat to many Chinese people.

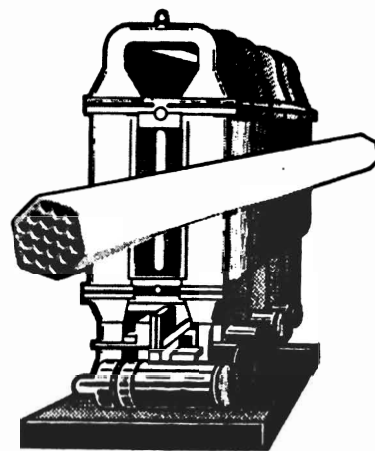
When Ms Gu Xiulian, previous Governor of Jiangsu Province, visited the headquarters and main factory of Westfalia Separator in Oelde with an economy-trade delegation, she said, 'Seeing is believing. Now, my comrades and I are to extend the existing contracts.' 顾敏元

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