

# ***new* MBR Multiple Bioreactors and Sterile Plant AG**

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## **Experienced, Traditional Swiss-Quality, Custom-made, Innovative Bioreactor (Fermentation) Plants**

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**Abstract:** The facilities of the *new* MBR Multiple Bioreactors and Sterile Plant AG are a state of the art, high Swiss-quality biotechnology plant building in a 150 m<sup>2</sup> engineering office at Zürich-Oerlikon, a 500 m<sup>2</sup> stainless-steel workshop and a 100 m<sup>2</sup> clean assembly room at the Technopark Zürich. The engineering is executed by skilled and experienced engineers on several CAD computer stations. The workers at the workshops are highly skilled craftsmen, who work according to the CAD plans (isometric piping drawings, etc.) to manufacture and assemble our state of the art, high Swiss-quality bioreactor plants. The shops are equipped with state of the art fabrication equipment and machines, such as Orbital welding machines, etc. to attain high Swiss-quality, and to guarantee this high quality we have all the necessary state of the art inspection equipment such as a Boroscope (internal pipe inspection from eye or photo-camera or video-camera), ferrite measurements, surface roughness measurement device, etc. Before leaving the workshop all equipment is subjected to a FAT (factory acceptance test) under supervision of the customers' inspectors, during which the equipment is tested with clean steam (clean steam generator, from purified water), clean water (from a purified water column), clean filtered air (air compressor) for all customer-specified functions.

**Keywords:** Bioreactors · Fermenters · Fomstop® · *new* MBR Multiple Bioreactors and Sterile Plant AG

### **History**

*new* MBR Multiple Bioreactors and Sterile Plant AG was founded by five engineers who had each worked between 10–20 years with the companies MBR AG and Chemap AG, which ceased trading in 1992 and 1993 respectively. These engineers decided to apply their experience, extended know-how, motivation, and contacts to found a new biotechnological apparatus-building company with the name *new* MBR Multiple Bioreactors and Sterile Plant AG in 1993.



Fig. 1. *new* MBR AG offices

### **Location**

*new* MBR Multiple Bioreactors and Sterile Plant AG offices (Fig. 1) and work shops (Fig. 2) are situated in the heart of Zürich in Zürich-Oerlikon and Technopark Zurich. Both locations are easily accessible in a few minutes from the airport Zürich Unique Airport, Zürich main station by train, or by car from the motorway.

### **Concept**

The concept of the ten-year-old *new* MBR Multiple Bioreactors and Sterile Plant AG is, since its foundation, to sell with the help of our large experience and know-how, engineering- and production equipment according to the newest state of the art technologies and '*Swiss Quality*' for the biotechnology market, such as bioreac-

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Fig. 2. new MBR AG workshops

tors (fermenters) plants for bacteria- and cell-culture applications, up- and down-stream equipment, with the necessary newest state of the art instrumentation- and control systems, as well as computer control systems for our customers in the pharmaceutical, food, and biochemical fields, and research companies and universities all over the world.

We at *new MBR* Multiple Bioreactors and Sterile Plant AG place great emphasis on close co-operation with the customer from the start of a project. In addition to our standard product range, *new MBR* takes pride in being able to assist the customer with tailor-made solutions for building bioreactor (fermenter) plants for bacteria- and cell-culture applications, up- and down-stream equipment, with the necessary newest state of the art instrumentation- and control systems, as well as computer control systems.

In addition former customers of MBR AG and Chemap AG are provided with maintenance services, spare part delivery, modernization and product-specific adaptation of older bioreactors and fermentation plants.

Extensive know-how, application experience and flexibility in conjunction with a high degree of motivation and self-initiative of the personnel are the most important factors for the success of *new MBR* Multiple Bioreactors and Sterile Plant AG.

*new MBR* Multiple Bioreactors and Sterile Plant AG also follows a new way of business (out-sourcing) in this field, which means we are working as a 'joint venture' with two other companies (Instr.&Control and Plantbuilder) on a project with a total workforce of over 40 persons. This business structure provides efficient productivity, the necessary flexibility and last but not least the required quality.

## Products

The product range of *new MBR* Multiple Bioreactors and Sterile Plant AG is almost the same as that of the previously highly regarded MBR AG and Chemap AG.

The product range starts with autoclavable benchtop Laborbioreactors (1000 ml up to 10,000 ml) and free-standing sterilizable Laborbioreactors (<2000 ml) to complete industrial-type Bioreactor plants (>50m<sup>3</sup>). The sterilizable Laborbioreactors (<2000 ml up to 10,000 ml) are available as benchtop (Fig. 3) and free-standing (Fig. 4), fixed or mobile with wheels, or floor-mounted units. The larger Bioreactor (Fig. 5–7) units are skid-mounted, free-standing on the floor.

All units are available for bacteria culture applications with powerful stirring sys-



Fig. 3. Benchtop Laborbioreactor



Fig. 4. Laborbioreactor



Fig. 5. Pilot bioreactor

tems, with Rushton turbines or high viscose mixers or others (design dependent on the application) for high oxygen transfer and for cell culture in batch mode with low shear force stirring systems, with a marine propeller or four-bladed slanted impeller or others (design dependent on the application), as well as for cell culture in continuous (perfusion) mode with a fluidized bed or a separate top drive rotating sieve and a low shear force stirring system, with a bottom drive four-bladed slanted impeller. The separation of the two drives is a **key design feature** of the *new MBR* continuous (perfusion) mode cell culture Bioreactors, as the cells require low shear force stirring with low RPM whereas the rotating sieve has to run at higher RPM to perform a good hold back of the cells during perfusion and to reduce the blocking of the sieve from cell secretion. In addition the *new MBR* design with the rotating sieve, installed inside the bioreactor (fermenter) vessel, offers a great advantage over the outside loop systems with pipes, valves, pumps, etc. available on the market, which can cause additional sterility problems and service costs.

The top and bottom drive seals are available with the well known, strong *new MBR* designed magnetic couplings, which



Fig. 6. Production bioreactor



Fig. 7. Bioreactor plant

are in operation and highly appreciated by our customers for absolute sterility and specifically designed in mind for long-term (months) sterile operations as required for long-term fermentation in cell culture applications. The **new MBR designed** magnetic couplings are designed to allow the customer to clean (CIP) the vessel interior effectively without removing the magnetic coupling from the vessel. The **new MBR** Bioreactors are also available with single mechanical seal systems or double mechanical seal systems with a separate sterile steam condensate overpressure system or sterile lip seal system.

Another well-known and appreciated product that **new MBR Multiple Bioreactors and Sterile Plant AG** can offer to the customers is the efficient **new MBR-designed Fomstop®** (mechanical foam absorber system) with a special turbine design and variable RPM control, for cell culture applications which require a smooth handling of the cells trapped in the foam and to be returned to the fermentation broth. The **new MBR-designed Fomstop®** (mechanical seal system) is also available with a standard turbine design for bacterial culture applications and chemical industrial applications to separate effectively the foam into the gas phase which escapes through the vent and fluid which is moved back to the process fluid.

Beside the standard components which come with the **new MBR** Bioreactor, we provide our customers with a wide range of essential components such as: BL3 design Bioreactors with double O-rings and steam barriers and exhaust gas incinerator; airlift Bioreactors, fixed-bed Bioreactors, plant-cell Bioreactors with top and bottom stirrer

systems with the **new MBR-designed** magnetic coupling or single mechanical seal or double mechanical seal system with a separate sterile steam condensate overpressure system or sterile lip seal system; custom-made mobile (< 600 l) or stationary (> 750 l) mixing-/ holding-/ sterile-tanks and plants, which are used for media-and product-preparation, as well as other applications with infrastructural features according to customers' requests; media filtration units; autoclavable- and online sterilizable-sampling system with multifunctional valve and sample containment from 100 ml up to 20,000 ml; mobile transfer systems with multifunctional valves and connections; manufacturing of special elements for the sterile technology according to customers specification; SIP (steaming in place) and CIP (cleaning in place) systems; ultra- and micro-filtration units; homogenizer units; centrifugal separator units; freeze dryer units, chromatography column systems, etc.

All of the listed equipment is delivered with newest state of the art instrumentation and control systems, as well as computer-control systems starting with: **Control version I:** the modular analogue control units (Fig. 3) with a wide range of control loops such as RPM, temperature, pH, DO, redox, antifoam, weight, airflow and gasflow, reactor pressure, cell density and many other features including parameter registration, computer-aided parameter remote control and data visualization; **Control version II:** PLC (HMI) control (Fig. 4–6) with real-time, multitasking operating system, mainly based on Siemens Simatic-S units with modular extensions, customer-specific applications for control hardware, network implementation, field bus standards to master computer (SCADA), process software for sequences, sensor calibration, data logging, user defined recipe software, etc.; **Control version III:** industrial computer (SCADA) control concept with powerful real-time software providing fast control-loop scanning, drivers for interface boards, alarm handling on different independent action levels and alarm history, different password levels for high operation security, management for complex operation, data storage, interlock checks, process monitoring, operation protocols, historical data evaluation, event logging for quality assurance, audit trail review, stored data transfer to WINDOWS application; **Sensors:** the newest state of the art parameter sensors of all brands according to customers' specification.

For all above listed equipment **new MBR Multiple Bioreactors and Sterile Plant AG** provides service, maintenance, spare parts and start-up assistance.

Our spare-parts department has over 25 years experience in this field and we provide efficient service when it comes to finding the correct spare part or solution to your problem. Further we have a wide-ranging stock of spare and wear-out parts for our Bioreactors (fermenter) plants for bacteria- and cell-culture applications, up- and down-stream equipment, with the necessary newest state of the art instrumentation- and control-systems, and computer-control systems.

**new MBR Multiple Bioreactors and Sterile Plant AG** can also provide spare-and wear-parts, as well as modification to existing plants of Chemap AG and MBR AG, which ceased trading in 1992 and 1993, respectively, as our company employs technical personnel who previously working for Chemap AG and MBR AG.

Further professional start-up and installation experts as well as regular service visits pave the way for a trouble-free production. We have installation experts at our customers' disposal on an international level. Customer satisfaction is the most important element in the reliable service **new MBR AG** can offer.

All our equipment and plants are supplied with the necessary documentation and testing documentation during FAT (factory acceptance test), SAT (site acceptance test), IQ (installation qualification test), OQ (operational qualification test), PQ (process qualification test), etc., to help our customers achieve the necessary validation of the plant as quickly as possible.

## International Customers

In the ten years **new MBR Multiple Bioreactors and Sterile Plant AG** has been operating since it's foundation, **new MBR Multiple Bioreactors and Sterile Plant AG** (founded by technical personnel formally of Chemap AG and MBR AG) and its personnel can proudly look back at the large numbers of Bioreactor (fermentation) equipment and plants from 1 liter to many thousand liter capacity, that have been produced so far by **new MBR Multiple Bioreactors and Sterile Plant AG** and are working satisfactorily at our customer sites, well-known companies in the pharmaceutical-, food-, biochemical fields, and research companies, institutes and universities all over the world.

For further information you can contact **new MBR Multiple Bioreactors and Sterile Plant AG's** website: [www.newmbr.ch](http://www.newmbr.ch).

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