

To :  
 In attention : Commercial department  
 Data : 2014  
 Referring : DFR Systems' presentation

### S.C. DFR Systems S.R.L.

DFR Systems is a private company which is operating since 1996. Its main activity is the production and commercialization of water treatment and purification equipments. DFR Systems is continuously developing the range of products it offers to the clients. DFR has been producing equipments for water disinfection with UV for domestic/industrial use and compact wastewater treatment plants since January 2005.

Our list of clients is already very large, including the majority of Romanian local water authorities and famous companies in all fields of work (hotel, business/construction, food, alcoholic, beverages and soft drinks, industrial).

Our company policy is focused on having serious and strong partners (suppliers), so that the products and equipments commercialized by DFR are of the highest quality with the best quality - price ratio. The technical and logistical support is promptly offered by DFR. With the help of suppliers and employees, DFR Systems offers a range of equipment including:

- compact wastewater treatment plants;
- vacuum sewage systems;
- vacuum evaporators;
- water systems with ultraviolet disinfection;
- pneumatic stoppers for intervention;
- chlorination water systems;
- modular water tanks;
- grills and screening systems;
- pumps for clean or industrial waste;
- consulting and research in water/wastewater treatment.

#### 1. COMPACT WASTEWATER TREATMENT PLANTS - COMPACT WW

“Compact WW” modules use fixed biofilm technology – Mobile Artificial Support (“Suport Artificial Mobil” - SAM). SAM purification/treatment technology is using as basic principle the development of a very large population of bacteria on small plastic elements. Moving bed systems comprise all biofilm processes with continuously moving media, maintained by high air or water velocity or mechanical stirring. The biofilm carrier material (media or biomedica) is selected based on size, porosity, density and resistance to erosion. By using a material with a large specific surface area ( $m^2/m^3$ ) high biological activity can be maintained using a relatively small reactor volume. Small parts made of special materials with density close to the density of the water are immersed into the bioreactors. The biofilm carriers are kept in suspension and even mixed with the help of air bubbles generated by the aeration system. This type of support is very effective because it does not clog and unlike rotary contactors does not require additional energy consumption. The basis of the process is the biofilm carrier element which is made from polyethylene. The elements provide a large protected surface area for the biofilm and optimal conditions for the bacteria culture to grow and thrive. The biofilm that is created around each carrier element protects the bacterial cultures from operating excursions to yield a very robust system for those industrial facilities loaded with process fluctuations.

It should be noted that only  $1 m^3$  of SAM provides  $850 m^2$  exposed surface for microorganisms fixing.

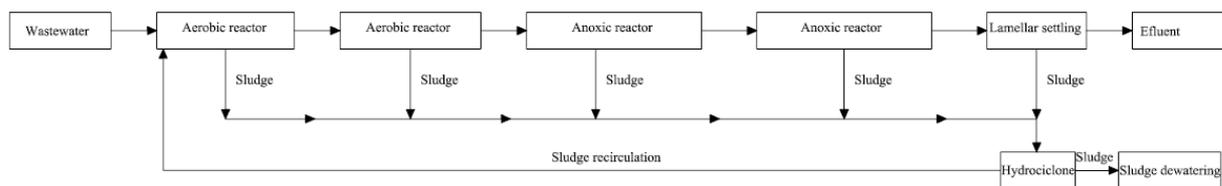
**Advantages of COMPACT WW:** minimum footprint, fully automatic operation, modular construction, technology with fixed biofilm, biofilm carrier guaranteed for 20 years, adaptability shock load, very little sludge production, low investment, minimal labor force, rapid installation and easy,

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steady performance, meets EU standards; reduced operating costs, organic load can be increased by 500% for the same volume of the bioreactor, can be used in almost all type of tanks (shape and size), and efficient method for upgrading existing wastewater treatment plants from various sources (food, pulp/paper, pharmaceuticals, textiles, beer, refineries), significant savings for design and civil engineering, there is no sludge recirculation, clogging or flushing.

**The technological flux applied on COMPACT WW modules**

The biodegradation reactors are realized in 4 stages, for an increased efficiency of the wastewater treatment: 2 stages for the aerobic treatment, 1 anoxic stage for nitrogen removal and a final stage of mechanical settling for suspended solids disposal (figure 1). The first two tanks contain *biofilm carriers* and *aeration systems* with medium bubbles. The aeration system is made from stainless steel. In this bioreactor complex processes take place and the organic matter is decomposed to partial fractions such as carbon dioxide and water molecule. Compartment no. 3 also contains *biofilm carriers*, but it is *not aerated* and here, with the help of a *mixer* (necessary for mixing the wastewater and biofilm carriers) the nitrogen compounds are reduced (denitrification). Inside compartment no. 4 is realized the separation of suspended solids, which are evacuated as sludge. A *lamellar settling* was conceived for better separation efficiency.



**Figure 1.** The technologic flux applied on COMPACT WW modules

These compartments are completed by an equipment room, where the main equipments used by the compact WWTP (blower, sludge pump, flow meter, evacuation pump etc.) are housed.

All the four bioreactors are tapered; in this way the sludge collection at the bottom part of each bioreactor is facilitated. The sludge is automatically and periodically collected and is directed to the hydrocyclone where it is separated into two phases depending on the density. The dense mineralized sludge is sent to the specific dewatering sludge equipment. Lower density and mineralized sludge also known as "active sludge" is directed back into the first bioreactor following a new biological treatment cycle to complete mineralization. In addition it provides an important contribution to maintaining the microorganisms population in the bioreactors. The whole wastewater treatment process is fully automatic. Due to the large surface and fixing exposure area offered by SAM, all biological processes are about 5 times faster and more efficient than conventional systems. Furthermore the footprint of the equipment is significantly reduced.

The compact WWTP is a new and innovative concept. In order to protect the new developed technologies, SC DFR Systems SRL holds the patent no. 123 174 entitled "Mobile artificial support biofilm fixing, a method and installation for wastewater treatment". The researches conducted for the development of the Compact WW range were realized as a result of a research project completed under the program PN II – Innovation. The mark "COMPACT WW" is also protected by DFR Systems SRL.

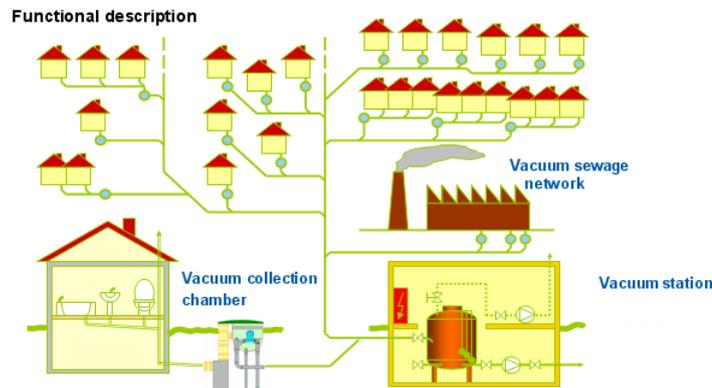


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**2. VACUUM SEWER SYSTEMS**

Vacuum sewer systems (figure 2) are essentially mechanized systems for wastewater transport. Unlike typical gravity sewers, it uses differential air pressure to transport the wastewater and all the sewer mains are under vacuum (under negative pressure). The vacuum sewer system operates usually as follows:

- Wastewater is drained from a house to a collection chamber by gravity.
- Once the wastewater reaches a predetermined volume within the waste water collection sump, the hydrostatic pressure activates a pneumatic controller. This controller pneumatically opens a vacuum valve which is the interface between the vacuum system and the collection sump. When the valve is open the wastewater is evacuated into the sewer.
- The wastewater is then transported through the collection network until it reaches the vacuum station.
- At the vacuum station the wastewater is collected in collection vessels and then pumped to its final destination using forced pressure mains.



**Figure 2.** Vacuum sewer system components

There are specific components of this system that makes the collection system operate by vacuum. The three major components of a vacuum sewer system are:

- collection chambers (with valve chamber, pneumatic vacuum valves and valve controllers)
- vacuum sewer lines (including specific fittings)
- central vacuum station (with vacuum vessel, vacuum pumps, sewage pumps, valves, level and pressure sensors, control panel)

Advantages of the vacuum sewer system comparing with the gravitational sewer system:

- no manholes required: no possibility of throwing rubbish into the sewer;
- no flushing tanks required: significant water saving;
- reduction in maintenance & operating equipment infrastructure;
- no ground water pollution: no exfiltration;
- no storm and no ground water infiltration: lower loads for the STP;
- smaller sewage treatment plants possible;
- low maintenance works to be done.



Vacuum sewer system



Gravity sewer system

**Figure 3.** Vacuum sewer system vs. the gravitational sewer system

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**3. VACUUM EVAPORATORS – Eco technology for the treatment of industrial wastewater, from our Italian partner C&G Depurazione Industriale Srl.**

C&G technology can help to:

- REDUCE the consumption of water as required by your activity, by treating the effluent and putting water suitable for industrial activity back into the system.
- REDUCE up to 90%, the costs by simply “concentrating” those substances which have to be sent for disposal. The concentration, or the reduction of the volume, can reach 20 times the original volume. (For example: 1,000 liters: 20 times = 50 liters of concentrate).
- ELIMINATE any risk of incurring sanctions from the Authorities responsible for environmental protection.
- RECOVER raw materials.

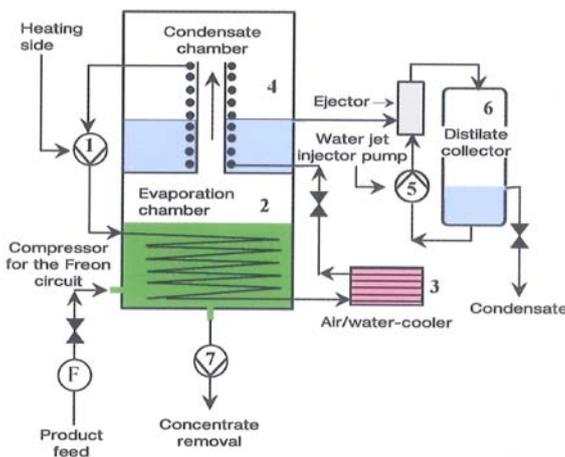
**ADVANTAGES OF C&G EVAPORATORS**

- Extremely compact construction
- Fully automatic working cycle, eliminating the need for observation
- Run on any energy source available
- Low energy consumption
- Total absence of fumes or smell
- Constant parameters of the resulting effects
- 24 hour performance
- Custom designed to meet specific requirements



**Figure 4.** Evaporator V-NT Series

The C&G machine takes advantage of the principle of boiling in vacuum conditions, and is fed by an electric current or other alternative energy source, which, through a refrigerating cycle and relevant heat pump, allows the distillation to take place at low costs.



- 1 – cooling compressor for refrigerant gas
  - 2 – boiling chamber
  - 3 – heat exchanger, by air or water
  - 4 – condensation chamber
  - 5 – pump for the ejector
  - 6 – tank for the distillate
  - 7 – discharge pump for the concentrated sludge
- Figure 5.** Components of the evaporators

The system can be either non-stop or at time intervals, and is fully automatic due to a series of safety devices which intervene with light-signals in the case of malfunctioning. The compressor for the Refrigerant gas is sealed and auto-lubricating and its duration is equal or longer to that of the life of house-refrigerator or an air-conditioner.

**SPECIFIC APPLICATIONS SECTORS**

- Galvanic
- Oily emulsions
- Graphic arts, industrial printing inks
- Wine making
- Pharmaceutical
- Alimentary

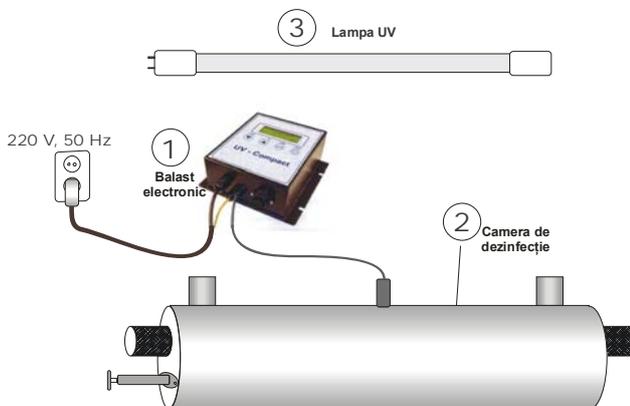
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**4. WATER SYSTEMS WITH ULTRAVIOLET DISINFECTION**

Recent studies show that chemical disinfection (with chlorine) may have adverse effects to the detriment of the public health and the environment. In addition, chlorine corrodes the metal pipes and affects the smell and taste of water. However, the most serious problem resulting from the chlorine utilization is caused by remaining residue products in the water.

Advantages of using UV systems: bacteria and viruses destruction rate of 99.9% (ultra resistant viruses that cause diseases such as meningitis, hepatitis B and polio are destroyed); do not alter the water quality; do not form residues or ancillary products; do not affect the smell or taste of water; do not lead to the formation of corrosive substances; compact design with easy installation and easy integration into existing systems; no chemical risks, being an organic method, simple and natural, similar to solar UV rays.

a. *MyUV water systems disinfection* (fig. 6). MyUV systems (a trade mark of DFR Systems) are exclusively addressed for the treatment of cold tap water through the UV exposure. DFR SYSTEMS is the unique producer for this type of equipments in Romania.



**Figure 6.** The main components of a MyUV disinfection system.

- (1. Electronic ballast with multifunction display, UV sensor cable and connector cable for lamp connecting;
- 2. Disinfection chamber made from stainless steel; 3. UV lamp)

The UV disinfection process quickly and safely destroys germs, viruses, bacteria, spores, fungi, algae and other micro-organisms. The physical-chemical properties of the treated water, such as color, smell, taste, or pH, remain unchanged.

b. *Berson In-line wastewater systems disinfection.* In Figure 7 a UV lamp for wastewater treatment is shown. Unlike the system for tap water treatment, this system is mounted perpendicular to the direction of water flow within the pipe.



**Figure 7.** Medium pressure UV lamp

The main element of the BERSON system (made in Netherlands) is the high performance of UV lamps that are longtime guaranteed, independent of water temperature and are superior to conventional lamps. Special control panels were designed and the lamps efficiency is improved with these “smart” panels. Consequently, the lamps have a much longer expected life than conventional ones.

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### 5. PNEUMATIC STOPPERS FOR INTERVENTION (fig. 8)

Our pneumatic stoppers (figure 8) are suitable to temporarily plug any type of pipe (metal, concrete, PVC, GRP etc.) and, thanks to their perfect seal, isolate a pipe section from possible residual gas and liquids which could interfere with line maintenance and repair works.

- Type 'F' typical use is that of temporarily plugging low pressure gas lines.
- Type 'G' typical use is that of temporarily plugging metal pipes (pipelines, gas mains etc.).
- Type 'H' typical use is that of temporarily plugging metal pipes (pipelines, gas mains etc.) to be serviced in the presence of flammable gas and liquids at medium pressure, this type of pneumatic stopper having no metal parts.
- Type 'FOG/N' suitable for the temporary plugging of circular pipes, like sewer lines, aqueducts, drainage lines etc.
- Type 'FOG/S' is suitable to be used for pressure tests on the pipe.

In order to improve the sealing process the stoppers are provided with special rubber stuffing. The stoppers can come in contact with water, sewage fluids or with any other non-corrosive liquids. The maximum operating temperature is 50°C. Their sealing ability and their extremely low weight make the pneumatic stoppers to be very easy inserted in both front line of the pipes and through any available opening inside the pipes we want to seal. Once inserted into the pipe and placed in position enough air must be pumped inside the stopper so as the sealing will be perfect. The water pressure in the pipe can reach 70% of the inflation pressure of the stopper (max. 2 bar).



Figure 8. Pneumatic stoppers

### 6. CHLORINATION WATER SYSTEMS

S.C. DFR Systems S.R.L. is a distributor for REGAL products (vacuum gas chlorination systems – figure 9) provided by Chlorinators Incorporated, which is currently world leader due to its products with the best quality/price ratio. *Simplicity is one key to reliability* – and the REGAL design is more simple and more efficient than any other comparable unit. It has only 68 parts – up to 60% fewer than competitive units. The design is so simple and logical that very little time is needed for learning how to use and service it. Key components of the system which the reliability and safety of the system depend on are **GUARANTEED FOR LIFE!**

The maximum capacity of chlorine supply is 40 kg/hour with a minimum capacity of 1/20 of the maximum capacity.

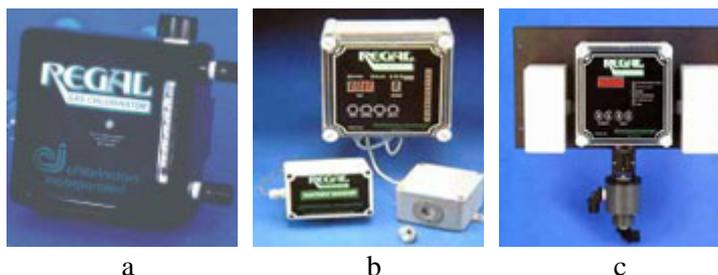


Figure 9. a) Vacuum chlorinator; b) Chlorine leak detector; c) Intelligent valve for chlorine dosing

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ISO 9001 REGISTERED C.1725.1  
ISO 14001 REGISTERED M.699.1  
SR OHSAS 18001 REGISTERED S.432.100

**7. MODULAR WATER TANKS**

**a. Modular water tanks realized by Ekotank.** APOLLO water tanks (Figure 10) were designed specifically for harsh operating conditions and are available in a wide range of sizes. Standard models are between 6,000 and 250,000 liters, but tanks up to 2.66 million liters for special projects can be built.



Figure 10. Apollo water tanks

*EKOTANK is a leader in modular kits for water tanks because of the advantages provided by its equipments – Apollo type:* very easy to transport and install; low prices; strength and durability due to "Galvalum" coverage; single inner membrane of 3 layers of polyester fabric coated on both sides with PVC; the membrane is approved for usage in industry and agriculture, for storing drinking water ; protected against corrosion with magnesium sacrificial anodes; 8-80 V profile walls for durability and aesthetics. APOLLO water tanks require minimum preparation for installation. For tanks up to 250.000 liters a 150 - 200 mm clean, inert and compressed sand layer is sufficient. For capacities over 250,000 liters it is recommended to install on a concrete ring. Profiled and "Galvalum" protected steel walls are designed to absorb the normal movements of the earth and to minimize possible distortions of the load. Installing an APOLLO water tank is a quick and simple operation. Disassembled for transport, the water tank occupies about 1% of its storage capacity (figure 10). Standard tanks up to 250,000 liters can be installed in less than a day without problems and without special tools.

**b. Modular water tanks made by BALMORAL (figure 11):** systems for storing drinking water or water for general usage, different types of fluids or fuels.

*Horsley Bridge* type tanks are made of square galvanized steel panels, with an area of 1 or 1.22 m<sup>2</sup>, with sides especially processed with bolted joints. The structure is reinforced by steel beams. Tanks can be divided into compartments to facilitate cleaning and maintenance of a reserve (water for fire extinguish). The tank mounting is very easy and quick and it is made on the spot. Tanks can be made up to 1,220 m<sup>3</sup>. The tanks are equipped with access ladders, cover plates, inspection cover, ventilation channels etc. Modular tanks GRP Balmoral are made of fiberglass panels reinforced with polyester resins. The dimensions of the panels are 1 x 1, 1 x 0.5 or 0.5 x 0.5 m and can be pre-insulated with polyurethane foam. For high accuracy and reliability, fixing holes and bonding are given with a laser on a special machine, with a numerical order. The structure is reinforced by steel beams. Tanks can be divided into compartments to facilitate cleaning and maintenance of a reserve (water for fire extinguish). The tank mounting is very easy and quick and it is made on the spot. The mounting preparations are limited to achieving a concrete plate on which metal pillars are seated (for high modular water tanks). The tanks capacities can reach 400 m<sup>3</sup>.



Figure 11. Balmoral water tanks

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**8. GRILLS AND SCREENING SYSTEMS**

Equipments, type MI (Figure 12), manufactured by M.A. IND SRL Italy, are used as a first step for the municipal wastewater treatment (from towns or constructions - buildings, hotels and restaurants), industrial wastewater treatment (from different types of industries) and agro-zoo-technical wastewaters (from farms or livestock for a maximum flow rate of 20 m<sup>3</sup>/h.



**Figure 12.** Equipments and screening systems

Equipment, type MI, consists of:

- body made of stainless steel pipe. The body is designed with: two connections to the treatment plant, entrance and exit ends caps, cylindrical mesh filter attached (by screws) to the bottom of the body.
- shaftless screw mounted inside the body, made of a steel pipe with metal spiral brushes that are mounted for self-cleaning;
- gear mounted on the upper end of the body to regulate the speed of rotation of the electric motor.

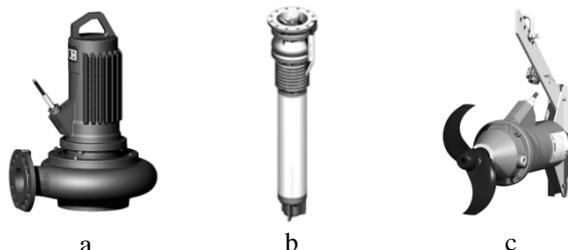
Equipment type MI, has the following functions:

- filtration of solids from the wastewater (to various sizes, depending on the filter used);
- transportation of the retained solids;
- compaction and partial dehydration of the retained solids.

MI equipments types are made with self-cleaning sieve allowing a longtime use.

**9. PUMPS FOR CLEAN OR INDUSTRIAL WATER AND WASTEWATER**

**Pumps manufactured by WILO (fig. 13).** WILO is a leading manufacturer in the field of pumps and pump systems for heating, air condition and cooling, water supply and wastewater disposal. DFR SYSTEMS is an authorized distributor for Romania. The wide portofolio includes the submersible wastewater pumps range (fig. 13.a) that are used for: pumping sewage containing faces from treatment plants and pumping stations; local drainage; water control and process water extraction etc. Figure 13.b shows the submersible pump used for: water supply from wells and tanks; municipal water supply; sprinkling and irrigation; pressure increase; pumping water in industrial installations; use of geothermal energy; use in off shore conditions etc. Product portfolio also includes compact submersible mixing systems (figure 13.c).



**Figure 13.** a) WILO pumps for industrial wastewater; b) pump for water supply; c) submersible mixer

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**TOT CE ÎNSEAMNĂ APĂ !**  
POMPE, REZERVOARE MODULARE, SISTEME DE DEZINFECȚIE A APEI CU UV, POMPE DOZATOARE DE HIPOCLORIT, CLORINATOARE  
CU VID, SISTEME DE POTABILIZARE, SEPARATOARE DE GRĂSIMI ȘI HIDROCARBURI, STAȚII COMPACTE DE EPURARE APĂ,  
ECHIPAMENTE ȘI TEHNOLOGII PENTRU EPURAREA APEI, OBTURATOARE PNEUMATICE PENTRU CONDUCTE

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*DFR SYSTEMS SRL offers full-service consulting, design services (designing of technological solutions according to customers needs), commissioning activities and "in situ" service (at the beneficiary location).*

*The DFR SYSTEMS policy is to promote their own solutions, which are constantly improved to keep up with the latest technologies and trends for water. Permanent attention to improving its products is reflected through research partnerships with leading national and international institutions. The Development&Research Department of DFR SYSTEMS is certified by ANSC with the decision number 9725/25.09.2008 (www.mct.ro).*

*During several yeas of R&D, DFR Systems has developed theoretical and experimental researches for the realization of the Compact WW range. SC DFR Systems SRL also has two patents, two patent requests and two registered marks (Compact WW and MyUV).*

*DFR Systems is collaborating with a number of other contractors in various development projects. DFR has a dynamic R&D team and it is always interested in developing new products and services for its clients. DFR Systems has been participating in research projects since 2007 and has contracted four projects in the last years, three of which having DFR as the Lead Partner.*

*The innovative results of DFR Systems have been rewarded at international salons and exhibitions.*

For additional information, orders or cooperation, please contact us:

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