



# RECIRC IN ACTION

## New Russian RAS dedicated to sturgeon production

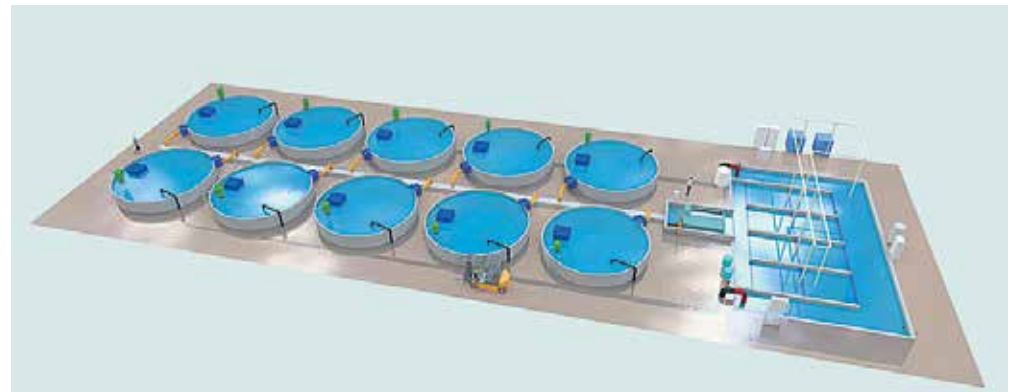
**T**he Russian city of Kostroma is located at the confluence of the Volga and Kostroma Rivers, about 700km northeast of Moscow. It has a population of about 270,000.

Kostroma is a famous Russian tourist centre with a strong cultural background and a very beautiful, old city centre. It was selected by the firm Ribnoe chosjajsstwo as an appropriate site for a recirculating aquaculture system dedicated to the production of Siberian sturgeon (*Acipenser baerii*). Ribnoe is a subsidiary of Topaz: a global player (2000+ employees) in the gold and jewelry industry (<http://topaz-russia.ru/>).

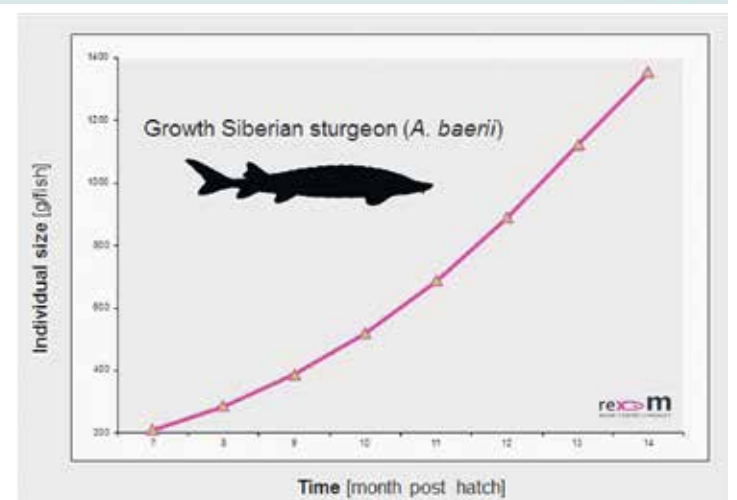
At this point Ribnoe has nine employees, and besides the new development in Kostroma, has 240 ha of ponds that produce carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*) and big head carp (*Hypophthalmichthys nobilis*) for recreational fisheries and commercial production (<http://ribnoe44.ru/>).

### GERMAN DESIGN

The Kostroma production system was designed by the firm of EMF Lebensmittel-technik-Anlagenbau GmbH, which was until quite recently, a successful, export-oriented company based in Nienburg/Weser about 150km south of Hamburg, Germany.



Schematic diagram showing the general arrangement of the Ribnoe plant.



The graph showing the growth rate observed in RAS systems by Matthias when he was plant manager for Caviar Creator and AquaOrbis, and production manager (AquaOrbis, Emirates Aquatech).

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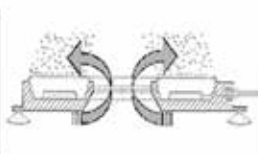


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# Beluga - Caviar

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Construction of the plant, which started in July 2015, was done by Ribnoe together with several sub-contractors (e.g. PP-tanks, ozone installation), based on engineering drawings and technical documentation from EMF, for a total investment of 50 million rubles (\$US 707,000). Unfortunately, EMF declared insolvency in late 2015, when the Kostroma project was almost complete.

In the beginning of April 2015, Matthias Mahnke, who had designed the system, and had developed the concept, layout, costing and marketing when he was employed as an aquaculture project engineer for EMF, established his own company ("REX-M" – REcirc EXPert, Matthias Mahnke).

For the start-up of the RAS, Matthias was re-engaged by Ribnoe in Kostroma to coordinate the final installation of his "RAS baby," and complete the production management plans, including the management software, system descriptions, etc.

### SYSTEM DESCRIPTION

The RAS is one of a line of standard recirculation systems that Mahnke had designed and built over a 1.5 year period with EMF, and it was fitting that he would be engaged to bring the system into production. The system descriptor – GO50-CCS – indicates it is a growout system designed to produce 50 tonnes/yr in a Circular Current Standard (RAS).

Water for the plant can be sourced from two wells on site. Both deliver water with quite high sulfate concentrations. One also has very high iron content that requires de-ironing, and will not be used initially.

The water treatment system is designed to handle up to approximately 250kg of feed per day, but according to the production plan the maximum loading is not likely to exceed 180kg/d.

At the time of writing the production tanks and the mechanical, biological and physical water treatment systems were already installed and working successfully, with the chemical treatment system planned for immediate installation.

The tank room contains ten 33 m<sup>3</sup> tanks (5.5m in diameter





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Ribnoe's new sturgeon growout plant at Kostroma, Russia.



L to R: Jurij Kabalinov, Matthias Mahnke and Pavel Poshivalov.



Moving bed biological reactors receive screened water directly from the drum filter.



Ten 33 m<sup>3</sup> growout tanks.



Microscreen drum filter receives water from the growout tanks.

@ 1.4m water depth for a total volume of 330m<sup>3</sup>. Recirculation is by two vertical propeller pumps (each with a capacity of 70-l/sec giving a total exchange rate of 1.5-fold/h (40 min replacement time). A single micro-screen drum-filter @ 60 µm, will remove most suspended solids.

The physical water treatment comprises three systems:

- Aeration and degassing is by air pumps delivering 500 m<sup>3</sup>/h;
- Oxygenation and degassing is by ten mechanical oxygenators, each delivering 900 g O<sub>2</sub>/h;
- Disinfection is by two open-channel UV units, each with a capacity of 750W.

Biological treatment again comprises three systems:

- There are six moving bed biological reactors (MBBR) (13 m<sup>3</sup> each) 41% filled with packing of 767 m<sup>2</sup>/m<sup>3</sup> specific surface area;
- A single fixed bed bead filter bioreactor (FBBR) with a capacity of 13 m<sup>3</sup>/h; and
- 6 m<sup>3</sup> of packings will be placed in form of up-flow FBBRs in the area of the ozone reactor-II.

Chemical treatment: The ozonation system can deliver 200 g/h via a bypass pressure reactor and with two downstream reactors to handle the total flow. Dosing/pH-stabilization is effected from a compact dosing unit of 500 l capacity containing a 5%-suspension of Ca(OH)<sub>2</sub>.

#### TEMPERATURE CONTROL

A well-water storage tank will be placed inside the building, and temperature

control will be done via room temperature. RASs warm themselves using heat generated by the machinery, and exothermic reactions in the biofilter. Siberian sturgeon grow relatively quickly, and will grow from 200 to 1400g in seven months at the anticipated temperatures of 18-20°C.

#### PRODUCTION PLANS

The first batch of 8000 200-g Siberian sturgeon, purchased from Konakowo, were scheduled to be stocked in April 2016. Konakowo is a subsidiary of the all-Russian scientific institute of fish culture located near Moscow and is growing Sterlet (*A. ruthenus*), Siberian sturgeon (*A. baerii*) and Russian sturgeon (*A. gueldenstaedtii*) under direction of Russian ichthyologist Nadja Kosovkova. Ribnoe plans to stock batches of juveniles, four times per year for an annual harvest of 40-45 tonnes of 1.4kg sturgeon.

Feed will be sourced from Biomar. Most fish will be sold alive, and some will be smoked on site.

Ribnoe plans to expand their RAS operations at Kostroma by adding a hatchery, a weaning unit, a nursery, a second grow out system, autumn/spring-systems, winter systems and depuration systems to enable production of 2 t/a of caviar; (two-cycles of ovulated caviar and one traditional cycle), and grow European catfish (*Wels = Silurus glanis*) in two 30 ha ponds in the outlet from the caviar farm. These will form part of the pre-discharge water treatment system for the Kostroma site.

For more information contact Matthias at: [mm@rex-m.de](mailto:mm@rex-m.de)

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