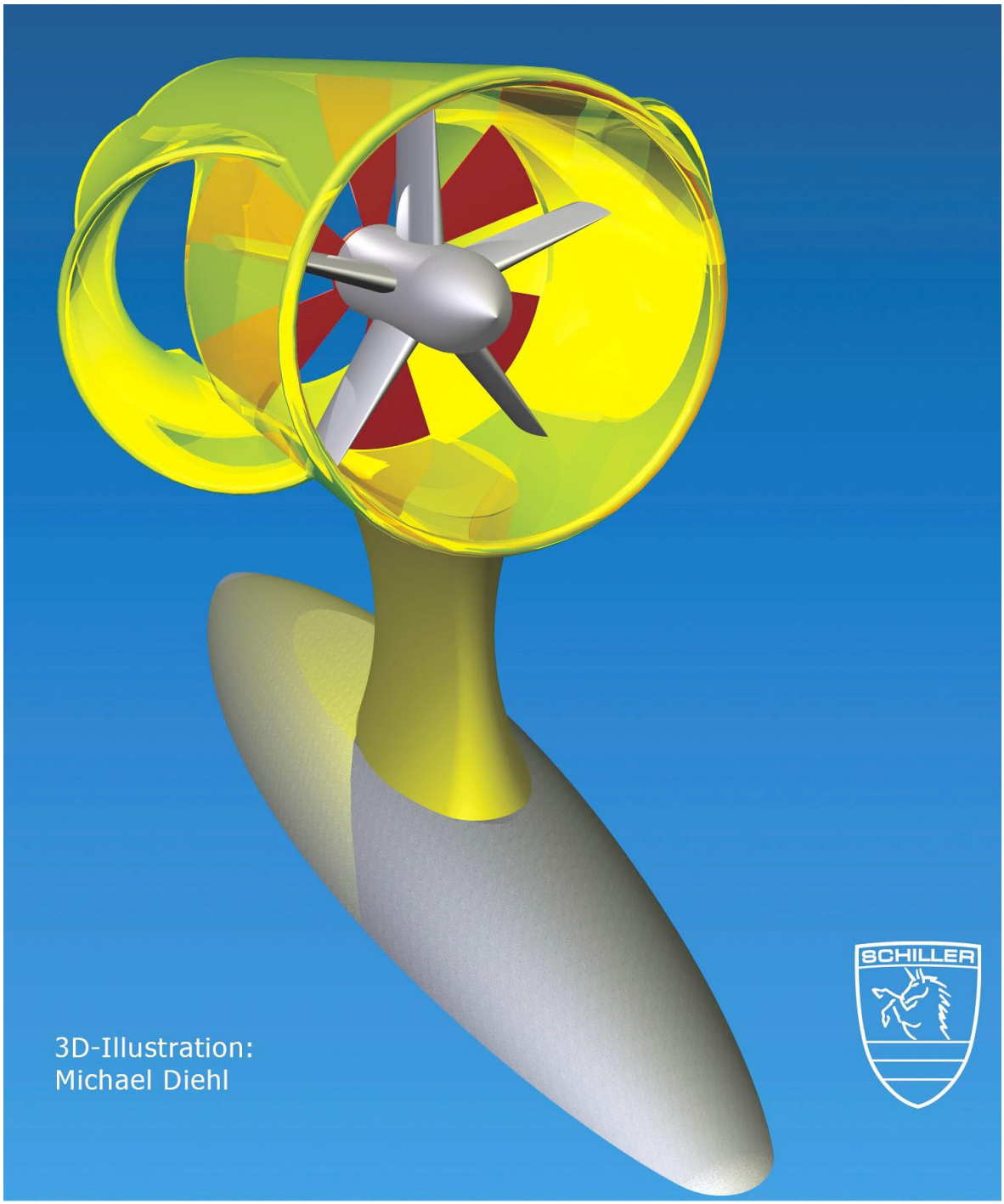
SCHILLER GmbH Energy & Power Systems

Sustainable Underwater Turbine
Electricity, affordable, clean and safe



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Information to Coversheet:

The Coversheet shows a SUT with 4 meter turbine diameter.

At the Coasts of Scotland such device can provide an average power output of 500 kW.

At a 20 hours operation per day this unit produces around 10.000 kWh.

With an guaranteed Feed In Tariff of 0.22 Euro per kWh, this results in an income of 2,200 Euro per day.

At an operation of 360 days per year results in an income of 792,000 Euro per year.

Under such conditions the breakeven point can be reached within the first year of operation.

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The Sustainable Underwater Turbine (SUT)

The SUT was developed to provide an efficient electricity supply for the grid. Its designers focused on robust construction, simple series production, easy handling, low maintenance, high efficiency, and low production cost.

These goals were achieved by using the own patents for the permanent magnet axial flow machine (PAM). In the SUT, a PAM does not require gearing and can be implemented in a slim construction model. Therefore the turbine wheel and the generator are the only mechanically movable parts.

For the SUT to be able to function well at low water levels and low current speeds the outer (mantle) turbine was provided with additional Venturi equipment, which feeds accelerated water into a common diffuser space behind the turbine, where it is generating a low pressure level. The result is an accelerated current in the turbine, ensuring a high energy yield.

Aside from direct power generation the SUT can also be used for producing fresh water for urban and agricultural regions. Thanks to the SUT, vast coastal areas, which are currently unusable for agriculture due to lack of water, can be irrigated in a sustainable and safe manner.

The demand for energy, in particular for electrical energy is growing worldwide. More than two thirds of the world's population are living in coastal regions or near rivers. SUTs can help build CO2 neutral power grids and ease the load on overloaded power networks.

The modular construction of these plants permits a rapid series production and installation on location. They can also be quickly expanded depending on power demand.

The SUT consists of an outer (mantle) turbine with downstream Venturi equipment, generating low pressure behind the turbine wheel. This increases and accelerates the water flow through the turbine and creates operating conditions similar to those known from Kaplan turbines. A dam or similar is not required.

Venturi devices are positioned laterally of the actual turbine inlet so that the water of the Venturi devices does not need to flow through the turbine, but still contributes its energy to help increase energy levels in the turbine.

This design accelerates the water current in the turbine, which means a significantly increased energy yield, while the physical aggregates do not need to be expanded.

Due to the combination of different techniques and production processes the SUT is designed to be a mass product and, thanks to its low weight and manageable size, it can be used in many places of the world.

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Turbine casings and wheels are manufactured in series production by means of a vacuum infusion process and using fibre glass materials, including biological resins.

The generator casing is manufactured in the same manner, resulting in a cost efficient manufacturing process with high throughput cycle. The plant is assembled on site from several modules and the transport to the installation site is therefore quite simple.

The final setup depends on the conditions found on site. Thanks to its modular system the machine can be adapted to local requirements without causing delays.

Depending on its installation site, an SUT will be provided with various anchorings. Fixation on a bridge extension arm and floats are a cost-effective solution, which is, in the absence of under-sea cables, also suitable for river beds and in sea areas with little swell.

One solution for under-water anchoring is fixing the plant to a mast rammed into the seabed. In deeper waters the SUT can be installed on a sinkable float, which can be refloated if required for maintenance work.

Special anchoring becomes necessary if the sea current exploited has seasonally variable depths. In that case an installation suspended in the water with a seabed anchoring will be suitable.

For maintenance purposes the SUT will generally be refloated and the work carried out on land. In order to keep outage times to a minimum, SUTs due for maintenance will be exchanged for serviced turbines on site.

The entire inside and outside of the SUT is specially coated with a product both preventing algae growth and reducing friction resistance at the same time.

This coating has been applied to the Queen Mary II and has successfully prevented algae growth and barnacles for the last 44 months.

Depending on the site of its installation the SUT is equipped with various devices to avoid causing damage to the natural habitat. The turbine inlet is always covered by a domed netting to guide fish and flotsam past the turbine.

For the protection of microorganisms and, for example, coral seed, the pressure conditions in the turbine are designed to prevent damage to these life forms.

If the sea current carries a lot of sand the SUT will be covered in a special heavy-duty coating to minimize impact, scratches, and wear and tear.

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