

POWER PLANTS FOR NAVAL SHIPS, COMMERCIAL VESSELS & OCEAN ENGINEERING STRUCTURES

A lately observed tendency for design of submarines and other ocean exploring marine engineering facilities with substantially increased underwater endurance in compliance with more stringent environmental requirements has called for further development of non-nuclear power plants operating without inflow of atmospheric air. On the other hand, the huge experience accumulated in the course of design and update of marine power plants can be used for design and improvement of stationary power plants.

This mission has required to:

- Perform comprehensive studies devoted to development and design of air-independent power plant energy module with closed-loop internal combustion engine;
- Investigate the governing parameters for marine hybrid power plant with the use of electrochemical generators and waste-heat recovery gas turbine generators;
- Study characteristics for independent floating power plants with nuclear and gas turbine power plants;
- Develop proposals on design of nuclear thermal power stations based on the marine reactor plants with underground arrangement of radiologically hazard equipment.

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R & D OF POWER MODULE WITH CLOSED-LOOP INTERNAL COMBUSTION ENGINE FOR UNDERWATER FACILITIES

The task of power reserve increasing and service characteristics improvement for underwater facilities can be resolved by replacement of power plants (PP) running on electric batteries by the power module with closed-loop internal combustion engine (CLE) on diesel fuel and oxygen thus excluding discharge of combustibles to the environment. The air-independent power plant (APP) with CLE differs from other APP types by lower costs of construction and operation, which is one of the basic conditions for priority application onboard the underwater vehicle.

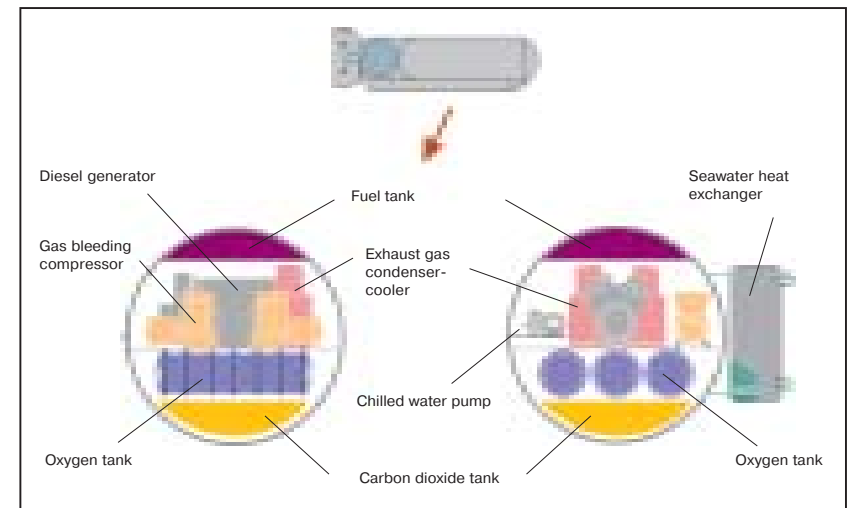
The APP power module development has required to perform the following aimed at:

- ▶ generation of heat-transfer medium flow patterns;

- ▶ development of layout diagrams for APP basic equipment inside the pressure casing of the power module;
- ▶ calculation & theoretical justification of circulating medium composition, thermal and hydraulic parameters.

The performed research has enabled to:

- ✓ formulate the circuit thermal & hydraulic diagram of APP with CLE on diesel fuel and oxygen, which is stored in the liquid state, with liquefaction of carbon dioxide of combustibles according to a special scheme with its subsequent accumulation in the heat-insulating reservoirs;
- ✓ develop an algorithm to calculate the flow rate of used and supplied to the engine gas mixture components, as well as consumption of discharged combustibles;
- ✓ develop the layout diagram for APP with CLE basic components, with accumulation



Power module with closed-loop internal combustion engine. Layout diagram