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# Features of Composites Application in Shipbuilding

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**Abstract :** Specific features of ship structures, made from composites, i.e. simultaneous shaping of material and structure, large sizes, complicated outlines and tapered thickness have defined leading role of technology, integrating test results from material science, designing and structural analysis. Main procedures of composite shipbuilding are contact molding, vacuum molding and winding. Now, the most demanded composite shipbuilding technology is the manufacture of structures from fiberglass and multilayer hybrid composites by means of vacuum molding. This technology enables the manufacture of products with improved strength properties (in comparison with contact molding), reduction of production duration, weight and secures better environmental conditions in production area. Mechanized winding is applied for the manufacture of parts, shaped as rotary bodies – i.e. parts of ship, oil and other pipelines, deep-submergence vehicles hulls, bottles, reservoirs and other structures. This procedure involves processing of reinforcing fiberglass, carbon and polyaramide fibers. Polyaramide fibers have tensile strength of 5000 MPa, elastic modulus value of 130 MPa and rigidity of the same can be compared with rigidity of fiberglass, however, the weight of polyaramide fiber is 30% less than weight of fiberglass. The same enables to the manufacture different structures, including that, using both – fiberglass and organic composites. Organic composites are widely used for the manufacture of parts with size and weight limitations. High price of polyaramide fiber restricts the use of organic composites. Perspective area of winding technology development is the manufacture of carbon fiber shafts and couplings for ships. JSC 'Shipbuilding & Shiprepair Technology Center' (JSC SSTC) developed technology of dielectric uncouplers for cryogenic lines, cooled by gaseous or liquid cryogenic agents (helium, nitrogen, etc.) for temperature range 4.2-300 K and pressure up to 30 MPa – the same is used for separating components of electro physical equipment with different electrical potentials. Dielectric uncouplers were developed, the manufactured and tested in accordance with International Thermonuclear Experimental Reactor (ITER) Technical specification. Spiral uncouplers withstand operating voltage of 30 kV, direct-flow uncoupler – 4 kV. Application of spiral channel instead of rectilinear enables increasing of breakdown potential and reduction of uncouplers sizes. 95 uncouplers were successfully the manufactured and tested. At the present time, Russian the manufacturers of ship composite structures have started absorption of technology of manufacturing the same using automated prepreg laminating; this technology enables the manufacture of structures with improved operational specifications.

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