

PRISM Topaz Mixed-Gas Closed Circuit System: Design and Development For Recreational, Scientific, and Commercial Users

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Abstract

To effectively maximize underwater durations, many in the scientific, recreational and technical market are turning their attention to the field of closed circuit diving systems. Extended durations, reduced decompression obligations, and reduction/elimination of bubble exhaust contamination are just a few of the benefits offered by this mode of diving. The rebreathing concept pre-dates open circuit SCUBA, however, the material and physiological science at that time was not as advanced and this allowed simpler open circuit concepts and systems to predominate the diving market, despite their relative inefficiencies.

We will provide a brief overview of the different types of equipment and how such apparatus functions. We'll discuss how technology has advanced to meet the rigorous demands of the underwater environment, including developments in scrubber design, sensors and electronics resulting in more efficient and reliable systems. Developments in physiology and a better understanding of how this equipment effects the diver has, through rigorous independent testing, lead to improved equipment designs, with emphasis placed on work of breathing effort, hydrostatic loading, oxygen control and ergonomics.

A review of training and logistical considerations is required for successful field applications of closed circuit systems, including an examination of project objectives. This critical element relies upon the educated diver matching appropriate units and finding an acceptable trade-off between system size, weight, and complexity versus training requirements and in-field support and maintenance.