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Using case studies of underwater infrastructure surveys of dams and hydropower tunnels, this paper will address the importance of accurate and comprehensive condition assessment by Remotely Operated Vehicle (ROV), with particular attention to recent advances in underwater sensor and imaging technology. One of the greatest difficulties in addressing the issue of risk for dams and appurtenances is obtaining a comprehensive condition assessment of its underwater structures. Typically lacking is the ability to survey large areas (and, in the case of tunnels, traverse long distances), accurately measure what is being observed, and then correlate such metrology via GIS, GPS, or local benchmarks. Technological advances in underwater robotics, sensors, and computer processing have brought recent, radical changes that have begun to address these shortcomings.

The goal of this paper is to raise awareness of the importance of proactive vs reactive underwater inspection programs and to review current underwater imaging technology and future trends. The paper will begin with a case study of recent underwater infrastructure failure (or at risk of failure), the various responses considered and attempted, and the end results. High resolution video, 2D and 3D sonar, laser dimensioning, and photogrammetry will be reviewed along with rendered examples of each data type used in real-world underwater survey scenarios. A discussion about which sensor is considered most applicable in the various situations and conditions will follow. Finally, the paper will address the next wave of underwater technology development: advances in remote robotic repair.