Chapter 10

Hydraulics and Payloads
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Stories From Real Life: Lethbridge's Diving Barrel

Chapter Outline

1. Introduction
2. Hydraulic Mechanisms
   2.1. How Hydraulic Systems Work
   2.2. Force Amplification
   2.3. Hydraulic Versus Electrical Power Delivery
   2.4. How to Build Your Own Hydraulic System
   2.5. The Pneumatic System Option
3. Manipulators
   3.1. Components of a Manipulator System
   3.2. Home-Built Manipulators—A Case Study
4. Underwater Tasks and Tools
   4.1. Tow Sleds
   4.2. Tools
5. Considerations When Designing Payloads
   5.1. Mass, Buoyancy, and Stability
   5.2. Lifting
   5.3. Reaction Forces
   5.4. System Interference
6. Examples of Payload Options for Simple ROVs
   6.1. Gripper Variations
7. Chapter Summary

Chapter Learning Outcomes

- Describe what a payload is and why it’s important for an underwater robotic vehicle. Why are multiple and/or interchangeable payloads particularly useful?
- Explain the basic components of a standard hydraulic system and how these systems can be used to transfer force, motion, and power from a prime mover to an actuator.
- Contrast a single-function manipulator with a more complex multi-function version.
- Describe options for building a single- or double-function manipulator for a simple ROV like SeaMATE.
- Describe different types of payload tools carried by various commercial underwater robotic vehicles.