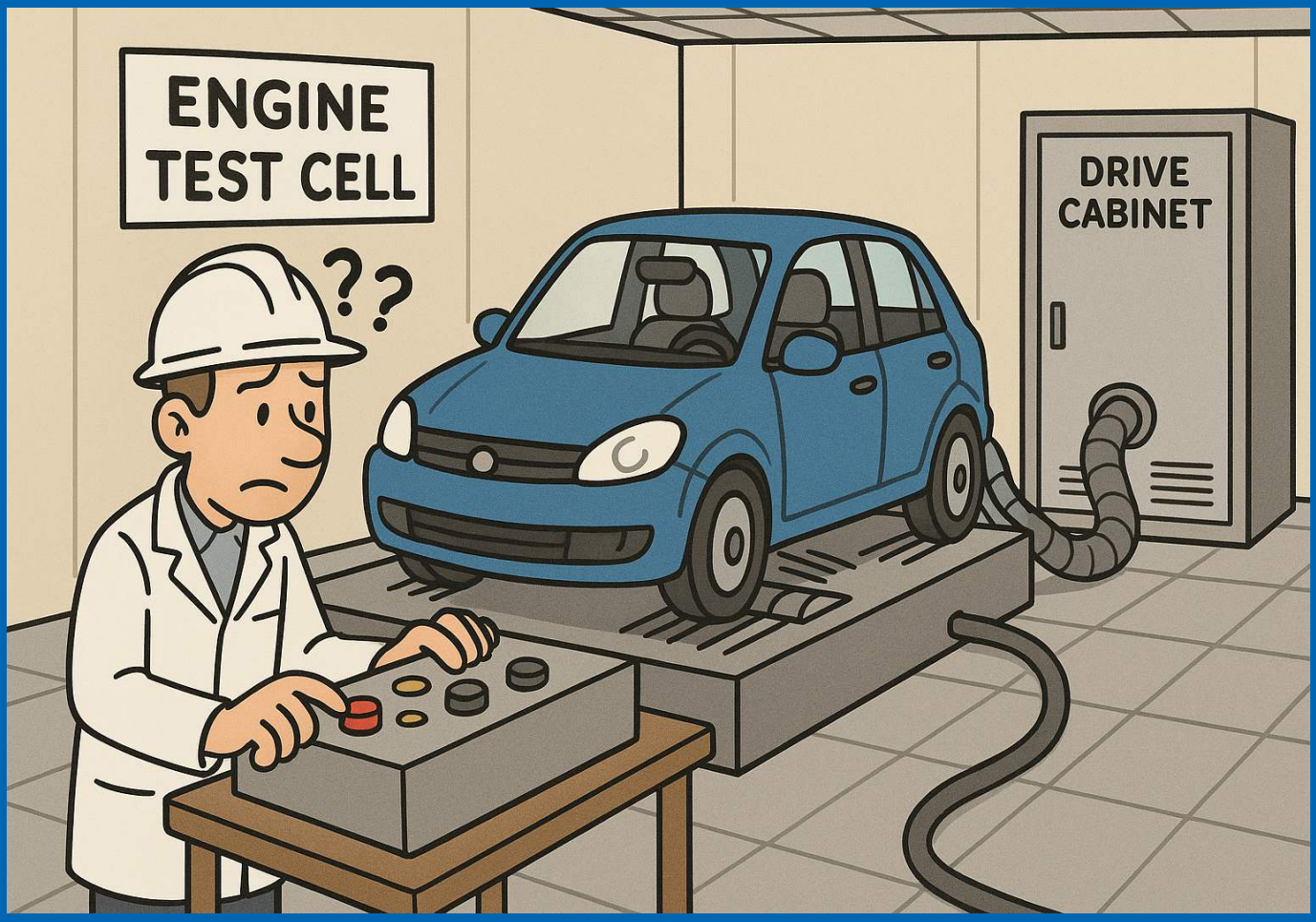
A&D Dynamometer Control Solutions

Explore different types of dynos and controllers for automating and simulating vehicle testing.



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1. Introduction

In a fast-evolving automotive landscape, internal combustion engines (ICE) are seeing a surprising resurgence. As hybrid and ICE testing regain prominence, engineering teams are once again faced with the need to control, upgrade, or build new testing facilities. Whether it's restarting long-idle test rooms or constructing hybrid-capable setups from scratch, the need for flexible and modern testing solutions has never been greater.

2. The Comeback of ICE Engines

While electric vehicles (EVs) continue to capture headlines, ICE engines are far from obsolete. Many OEMs are rebalancing their strategies to include cleaner and more efficient ICE vehicles. This shift requires swift action from test facilities:

- Reactivating mothballed test cells
- Building new ICE- or hybrid-compatible labs
- Choosing between upgrading old systems or starting fresh

This creates both a challenge and an opportunity—one that A&D Technology is uniquely prepared to meet.

3. Challenges in Modern Test Facilities

Test engineers are facing two primary paths forward:

- **Reviving Old Test Equipment:** Many existing labs are equipped with outdated or unsupported controllers.
- **Investing in New Infrastructure:** Green facilities must be equipped to support modern hybrid testing that includes ICE, electric motors, and batteries.

4. Understanding the Legacy Landscape

The testing industry is cluttered with legacy and proprietary systems. Familiar names include:

- STARZ, SPARC, XACT, MIRA, ARCUS
- Homegrown systems and older LabVIEW setups
- AccuDYNE, PowerTEST
- MiDACS, ADACS, DynLoc
- V-series
- VXin systems

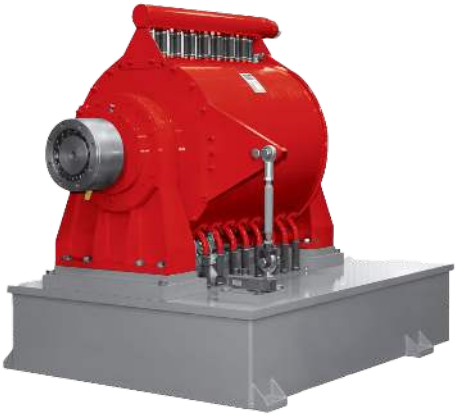
Common Problem:
Many of these systems are now obsolete or poorly supported, making them a liability for modern test demands. A&D's controller solutions can replace or interface with these outdated systems.

5. Overview of Dynamometer Types

Each test application requires different types of dynos. Here's a simplified breakdown:

Water Brake Dynos

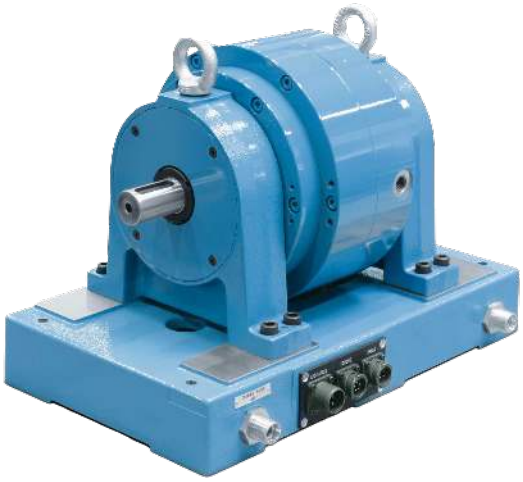
Creates resistance by regulating water flow and pressure inside the unit, using water to generate torque against the device under test.



- **Pros:** Low cost, high torque
- **Cons:** Fluctuates with water pressure, no motoring, low control stability

Eddy Current (EC) Dynos

Uses electromagnetic induction to generate resistance, with current flowing through coils to produce a magnetic field that opposes rotation.



- **Pros:** More stable control via current, simple cooling
- **Cons:** Cannot motor UUT, limited torque range

DC Dynos

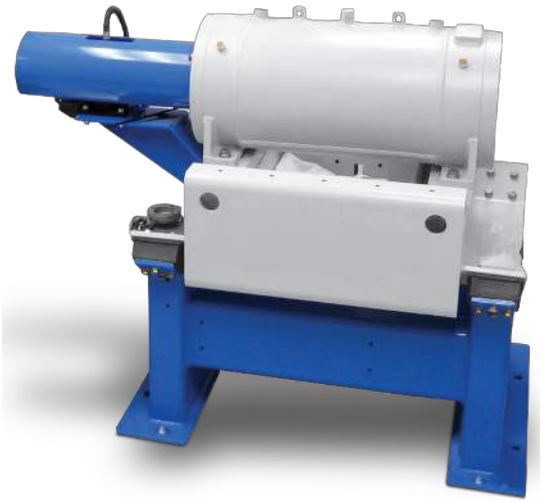
Generates and controls torque through magnetic fields created by direct current in the motor's coils, allowing it to both absorb and supply power to the test object.

- **Pros:** Can motor UUT, better speed/torque control
- **Cons:** No torque at 0 rpm, slower acceleration, limited power

AC Dynos

Controls torque using alternating current to vary magnetic fields in a motor, offering smooth, responsive power and the ability to generate torque from zero RPM.

- **Pros:** Torque available at 0 rpm, fast acceleration, lower inertia
- **Cons:** Larger drive systems, higher cost



PM Dynos (Permanent Magnet)

Uses fixed magnets and electronic control to produce high torque and rapid acceleration, making it ideal for fast, high-precision simulation and motor testing.

- **Pros:** Very fast, high acceleration (>20,000 rpm/s), strong power
- **Cons:**Very expensive, very low inertia

6. Selecting the Right Controller

Your ideal controller depends on your dyno and test application. Control stability, communication protocols, and real-time data acquisition are essential.

7. A&D's Control Solutions

The Loop Controller

Ideal for **EC dynos or water brakes**, this controller offers:

- One built-in amp (15A), expandable via external amps
- Multi-dyno control (up to 4)
- Communication: Modbus, Profibus, EtherCAT, Discrete I/O
- 100Hz real-time control

ADX

A powerful portable Linux-based controller with:

- Intel Core i7 CPU
- Real-time OS
- Modular I/O options
- Supports: RS232/422/485, CAN, LIN, EtherCAT, TCP/IP, Fiber

PROCYON

High-speed HIL simulation platform for labs:

- Simulates road load, traction motors, vehicle systems, BMS, engines, and transmissions
- Compatible with Simulink-based tools: CarSim, TruckSim, AmeSim, GT-Suite, and more

8. Simulation and Hardware-in-the-Loop (HIL)

Advanced test environments increasingly rely on HIL simulation. A&D has HILS systems for simulating engines, motors, batteries, ADAS scenarios, thermal systems, and ECUs.

- Real-world testing of virtual prototypes
- Integration with industry-standard simulation software
- Efficient validation for hybrid powertrains and complex ECUs

9. The Power of iTest

A&D Technology's flagship control & automation platform, iTest, is built to handle all dyno types:

- **Water Brake:** Uses analog output to control water valves
- **EC Dyno:** Direct commands via amplifiers
- **DC/AC Dyno:** Supports closed-loop or drive-integrated control
- **PM Dyno:** Optimized when paired with ADX or PROCYON

iTEST ensures flexibility, precision, and full control across all your testing scenarios.

10. Conclusion

As ICE and hybrid powertrain testing gains momentum, test labs must quickly evolve. Whether restarting legacy cells or launching new facilities, the right control platform can make or break your success.

With a portfolio of adaptable controller solutions—iTEST, PROCYON, ADX, and the Loop Controllers—and established relationships with premiere dyno suppliers, **A&D Technology is your trusted partner for every phase of modern powertrain testing from engineering studies to full integration.**

Ready to optimize your test lab?
Contact A&D Technology today to schedule a consultation or demo.
www.aanddtech.com

Dynamometer Control Solutions for ICE and Hybrid Systems:...

Dynamometer Control Solutions for ICE and Hybrid Systems: Mastering Modern Engine Testing" explores the resurgence of internal combustion engines and the critical need for innovative testing solutions in an evolving automotive landscape. This comprehensive guide addresses the challenges of reactivating outdated test facilities and selecting the right dynamometer and control system, providing insights into advanced simulation and hardware-in-the-loop techniques. With adaptable solutions from A&D Technology, this book equips engineers to effectively navigate the complexities of modern powertrain testing.