In today’s hydro industry, where the availability of qualified candidates, competitive factors, and an aging workforce of skilled hydros experts have all combined to create a mismatch of demand for employee development and training, American Governor Company (AGC) is at the vanguard of addressing this challenge. AGC, with its focus on real-world solutions, is dedicated to improving the efficiency and reliability of the hydropower industry. AGC’s presence in the industry is a testament to the dedication of its skilled hydro experts, who have combined to create a maelstrom of change in the industry’s ability to meet these needs. As the world leader in providing control system service and support in the hydropower industry, AGC has also become a leading provider of advanced, transportable simulators utilized to address the inherent challenges of training powerplant personnel in a high-quality and effective manner.

**Digital Governor Simulators**

There is a variety of digital governor simulators available, ranging from completely virtual to completely mechanical, with all equipment required to complete the digital conversion. Each customer decides what training focus will be, and the simulator is customized to that application. For example, training personnel on modes of operation and how to tune and calibrate a digital governor may only require a virtual simulation rather than a full blown unit.

- Demonstrate complete conversion process from mechanical to digital using fully functional governor
- Trainees learn best practices for installing new devices and maintaining system integrity
- Familiarize plant personnel with new machinery
- Trainees can experience calibration/turning utilizing the PLC during commissioning without outage
- Learn the ins and outs of equipment in a safe and hands-on environment without costly penalties of improper or accidental use
- Different unit dynamics are programmed for each unit, encouraging observation of different processes while allowing for real-time response and interaction
- Experience full immersion into the simulation of functioning governor controls and plant/turbine
- Simulate fully-functional governor and hydraulic system
- Gate, speed, etc., sensors added for critical feedback to simulator
- PLC included with plant/turbine simulator enclosure
- Trainees can fully calibrate and operate the unit, including synchronizing, load rejections, etc.

**Mechanical Governor Simulators**

Mechanical governor simulators come in various shapes and sizes depending on the type of governor the trainees are learning. Many of the principles of mechanical governing can be transferred between the different types; however, it is best to learn on the unit that will be maintained in the power plant. Complete governor simulators can be customized based on the application and training facility.

**Benefits**

- Training on a governor simulator enables utility personnel to learn and pass on critical knowledge while demonstrating on real equipment in a low-risk environment
- Specific situations and grid events can be replicated and investigated without the need for an outage
- Drastically reduce or eliminate travel expenses incurred for training
- Simulator may be a source for spare parts in the event of an emergency

**Cutaways**

Some situations require trainees to delve into the workings of complex pieces of machinery and equipment. For these situations, 3-dimensional cross-section views of equipment have been found to greatly increase understanding. These views come to life when the spools are cycled or shafts turned during demonstrations with classes or between sections in one-on-one lesson recaps.

- Cutting away sections of machinery and equipment in a low-risk environment
- Cutaways can be used to shuttle spools and manually actuate valves
- Smaller cutaways and simulators are available to teach the operation of specific equipment

**Mechanical Cabinet After Digital Conversion**

Virtual governor and unit simulated using a Laptop and PLC

- Alabama Power Company Digital Governor Simulator
- Pelton Governor Simulator
- Plant/Turbine Simulator
- Permanent Magnet Generator
- Woodward 11X
- Herkules Gear Pump
- Dual Stage Proportional Distributing Valve
- Mechanical Governor Simulator for Manitoba
- Herringbone Gear Pump
- Turbo Governor Simulator
- Auxiliary Valve
- Gateshaft Relay Valve

**Acknowledgements**

American Governor Company has provided governor parts, service, and/or training to over 1,500 hydro plants worldwide. The experience, integrity, responsiveness, and technical support for legacy governors as well as complete, custom-engineered simulators have been advanced as new workforce development programs incorporating simulation have been implemented at powerplants across the globe. AGC offers many training tools that are customized for each application. AGC’s customers have used entire governor systems, from the pressure vessel to the cabinet actuator, in a safe environment where mistakes become lessons rather than losses. In so doing, these training simulators help to create a skilled workforce who can properly operate and maintain equipment, avoid misoperation, and improve the overall efficiency of the powerplant.

**Introduction**

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