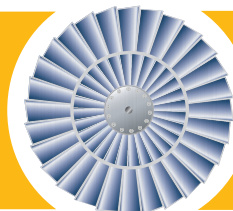


Professional Protection of Your
Rotating Machinery Assets
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CASE

M&I

Actuation Options for Steam and Hydro Turbines

Pilot Actuation (existing drive cylinder retained)					
	Pneumatic	Electric	Low Pressure Hydraulic	Self Contained Hydraulic	High Pressure Hydraulic
Stability	Good	Better	Good	Good	Best
Transient Response	Good, when supplemented with trip solenoid	Better	Better	Good, when supplemented with trip solenoid	Best
Failsafe Design	Simplex, designed to fail closed	Simplex, requires return spring if 'fail in place' is not acceptable	Simplex or redundant, designed to fail closed	Simplex, requires return spring if 'fail in place' is not acceptable	Simplex or redundant, designed to fail closed
Redundancy Options	None	None	Possible at higher cost	Possible at higher cost	Possible at higher cost
Common Applications	Power, HPI, Mechanical Drive	Power, HPI, Mechanical Drive	Power, HPI, Mechanical Drive	Power, HPI, Mechanical Drive	Power, HPI, Mechanical Drive
Maintenance Considerations	Instrument air supply, min. 75lbs.	Lube for ball screw, 1 - 2 years run time	Runs on lube oil system, frequent filtration changes, inspection every turbine outage	Fluid change 2 years run time, check mechanical mounting every 3 months	Closed oil system, routine maintenance checks every turbine outage
Longevity	Good	Better	Good	Fair	Best
Environmental	Requires at least fair quality Instrument air, of at least 75lbs.	May require cooling in higher temp applications	Requires clean lube oil system of host steam turbine	May require cooling in higher temp applications, marginal performance in high vibration applications	Self contained system, design for application environment
System Cost	1 - Lowest	2	3	4	5 - Highest
Installation Cost	1 - Lowest	2	3	4	5 - Highest
Additional Comments	In Power applications, only seen on smaller generators	Becoming a standard in the industry	Old standard in industry, not often applied in last 10 years	Popular in some applications, not always best suited for rotating machinery control	Highest performance (and cost) system available
Direct Actuation (new drive device)					
	Pneumatic	Electric	Low Pressure Hydraulic	Self Contained Hydraulic	High Pressure Hydraulic
Stability	Good	Better	Good	Good	Best
Transient Response	Good, when supplemented with trip solenoid	Better	Better	Good, when supplemented with trip solenoid	Best
Failsafe Design	Simplex, designed to fail closed	Simplex, requires return spring if 'fail in place' is not acceptable	Simplex or redundant, designed to fail closed	Simplex, requires return spring if 'fail in place' is not acceptable	Simplex or redundant, designed to fail closed
Redundancy Options	None	None	Possible at higher cost	Possible at higher cost	Possible at higher cost
Common Applications	HPI, Mechanical Drive	Power, HPI, Mechanical Drive	Power, HPI, Mechanical Drive	HPI, Mechanical Drive	Power, Mechanical Drive
Maintenance Considerations	Instrument air supply, min. 75lbs.	Lube for ball screw, 1 - 2 years run time	Runs on lube oil system, frequent filtration changes, inspection every turbine outage	Fluid change 2 years run time, check mechanical mounting every 3 months	Closed oil system, routine maintenance checks every turbine outage
Longevity	Good	Better	Good	Fair	Best
Environmental	Requires at least fair quality Instrument air, of at least 75lbs. May be restricted in high temp applications	May require cooling in higher temp applications	Requires clean lube oil system of host steam turbine	Will require cooling in higher temp applications, marginal performance in high vibration applications	Self contained system, design for application environment
System Cost	1 - Lowest	2	3	4	5 - Highest
Installation Cost	1 - Lowest	2	3	4	5 - Highest
Additional Comments	Only used in small mechanical drive applications	Only used in small mechanical drive and generator applications	Old standard in industry, not often applied in last 10 years	Popular in some applications, not always best suited for rotating machinery control	Highest performance (and cost) system available, on some applications this is the only viable option

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WHO WE ARE

CASE M&I is a rotating machinery controls and service company in the power generation and hydrocarbon processing industries. We are committed to long standing customer relationships and implementation of quality solutions.

With over 200 years of industry experience, our Case M&I staff is honored with repeat business from several committed clients due to the high level of attention to detail, prompt service and follow through to the customer. Every client is important to us and our field service background keeps us focused on this niche market. Commitment to support is key and Case M&I is available 24 hours a day 7 days a week.

WHAT WE PROVIDE

CASE M&I is a prime mover controls and support services company with offices in Loveland, CO and Seattle, WA offering the following products and services:

- ◆ Utility Steam Turbine Controls
- ◆ Industrial Steam Turbine Controls
- ◆ Hydro Turbine Controls
- ◆ Combustion Turbine Controls
- ◆ Compressor Controls
- ◆ Engine Controls
- ◆ Turbine Safety Systems
- ◆ Turnkey Installation & Commissioning
- ◆ Field Services
- ◆ Spare Parts
- ◆ Training
- ◆ Water and Fluid Treatment



Thank you for considering CASE M&I for your plant and rotating equipment service needs. Let us show you what we can do to enhance your operation.

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