

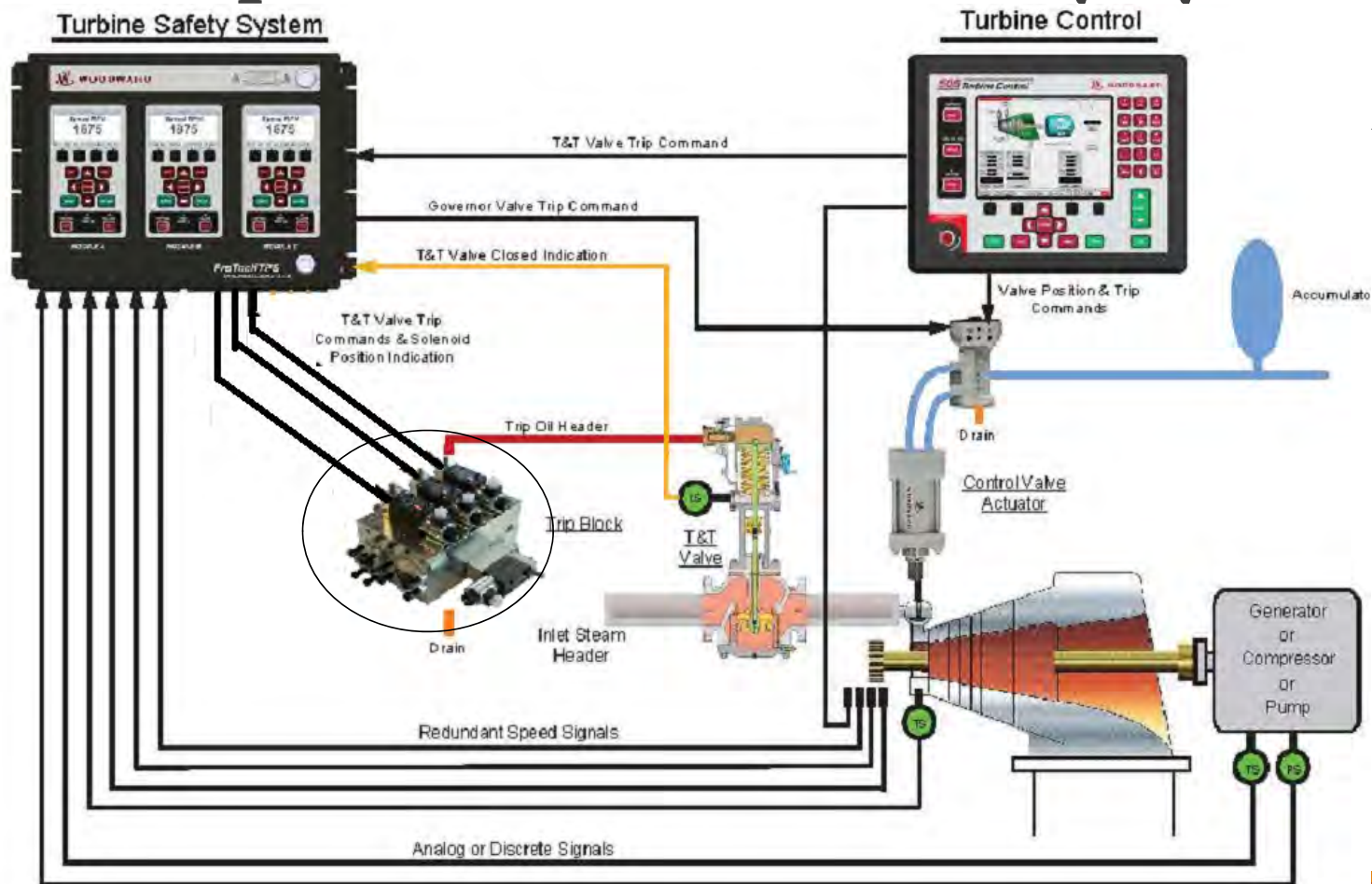


# Turbine Trip Block

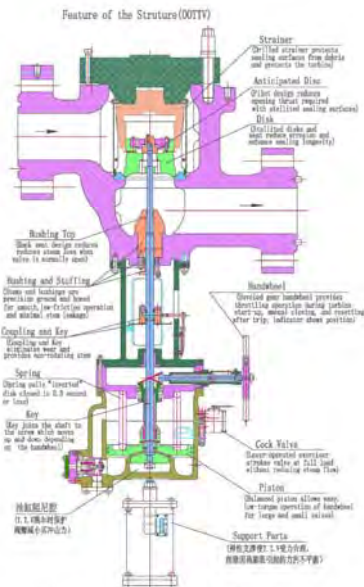
## State-of-the Art Protection System

APPLICATION SUMMARY  
AND  
INTRODUCTION TO FSD/IMI DESIGN

# Turbine Speed Control and Safety System



# Turbine Tripping Principal



Note: This document comprises a general overview of the products described herein. It is issued for informational purposes. Some modifications or variations may be required for the individual conditions. Please refer to the technical specifications for the details. **OMID ENERGY** reserves the right to modify the products without prior notice.

- Each Steam Turbine Has a Trip /Trip & Throttle Valve
- Normally TTV/TVs opens by Hydraulic Oil pressure acting against a spring
- When the oil pressure in actuator drops, spring load closes the valve quickly
- All turbine trip signals need to drain the control oil from TTV/TV actuator
- As per API 612, draining of the oil will be done by minimum two Solenoid valves.
- Solenoid Valves need to be fast open valves and normally need to be de-energize for shutting down the turbine

# API 612 Requirement

---

12.3.3.1: The turbine shall be provided with a **minimum of two**, separate electro-hydraulic solenoid operated valves located in the shutdown system.

## Remarks:

TWO Separate valves in 1oo2 arrangement assure **Safety**, but not **Availability**

The best protection system in accordance with to IEC 61508 is ineffective without any appropriate trip component

# Safety and Availability

---

**1002 Provides Safety**



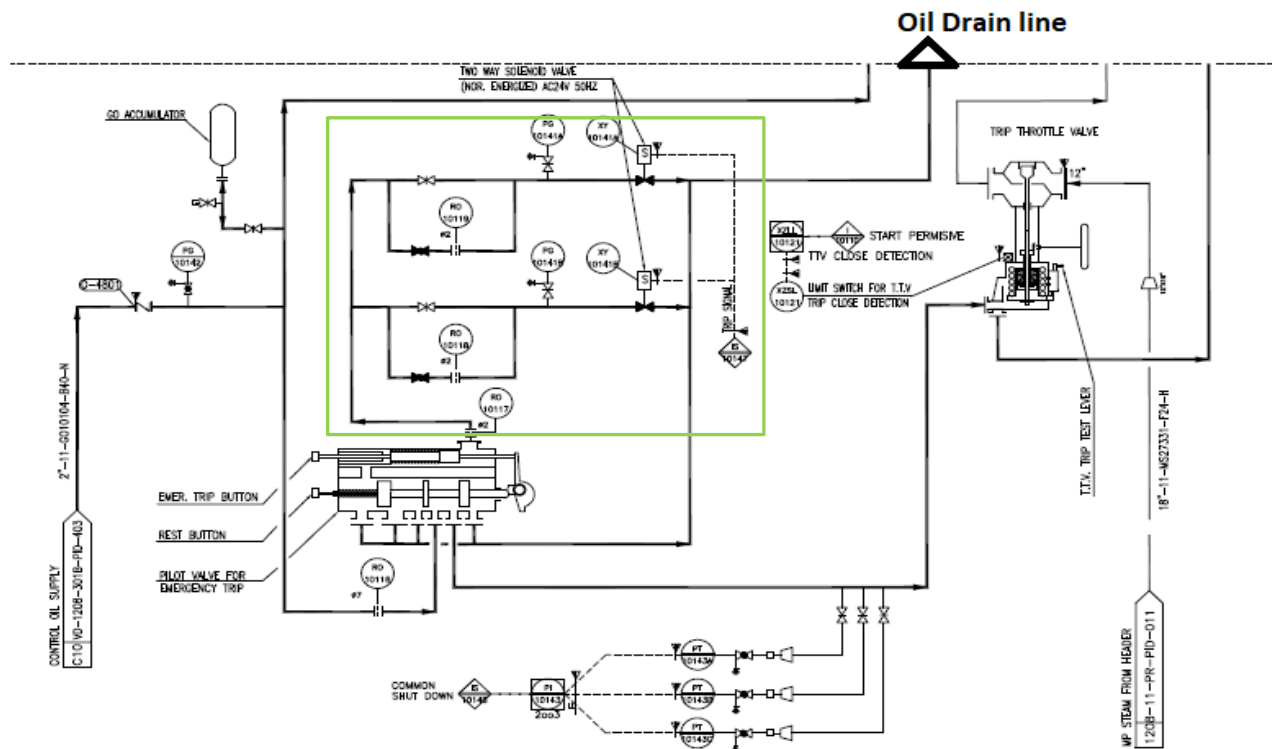
**2002 Provides Availability**



**2003 Provides Safety and Availability**

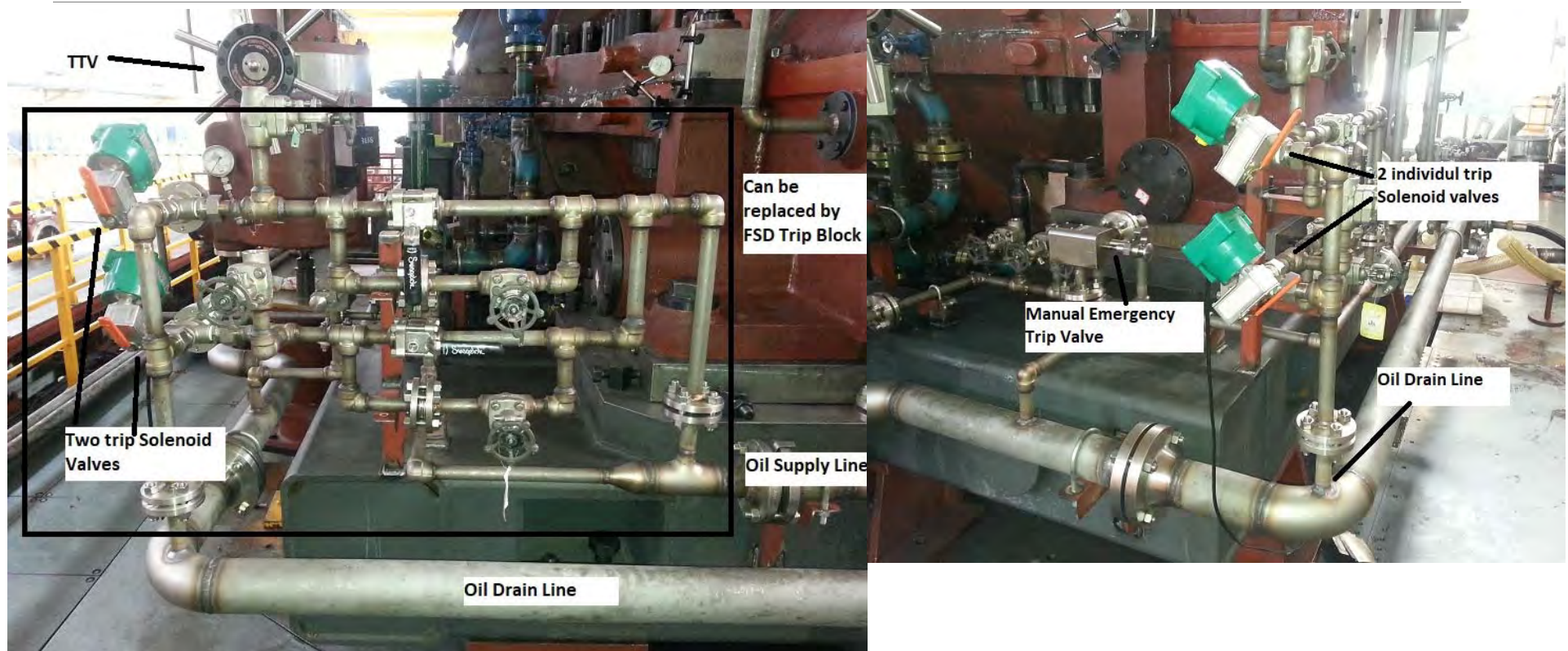


# Sample Traditional Trip System PID





# Sample Traditional Trip System



# Disadvantageous of Traditional Trip System

---

- API requirements met with 2 solenoid valves. (1oo2 Voting)

## How about Availability?!



Any false signal or de-energizing the solenoid valves for power cutoff reasons can cause turbine trip.

- Having lots of connections and piping elements can cause oil leakage in high temperature hazardous area which can in worst case represent a significant explosion hazard.
- Larger installation footprint and complexity of operation and test.
- Solenoid valves can be SIL certified but not all the system!



# Solutions

---

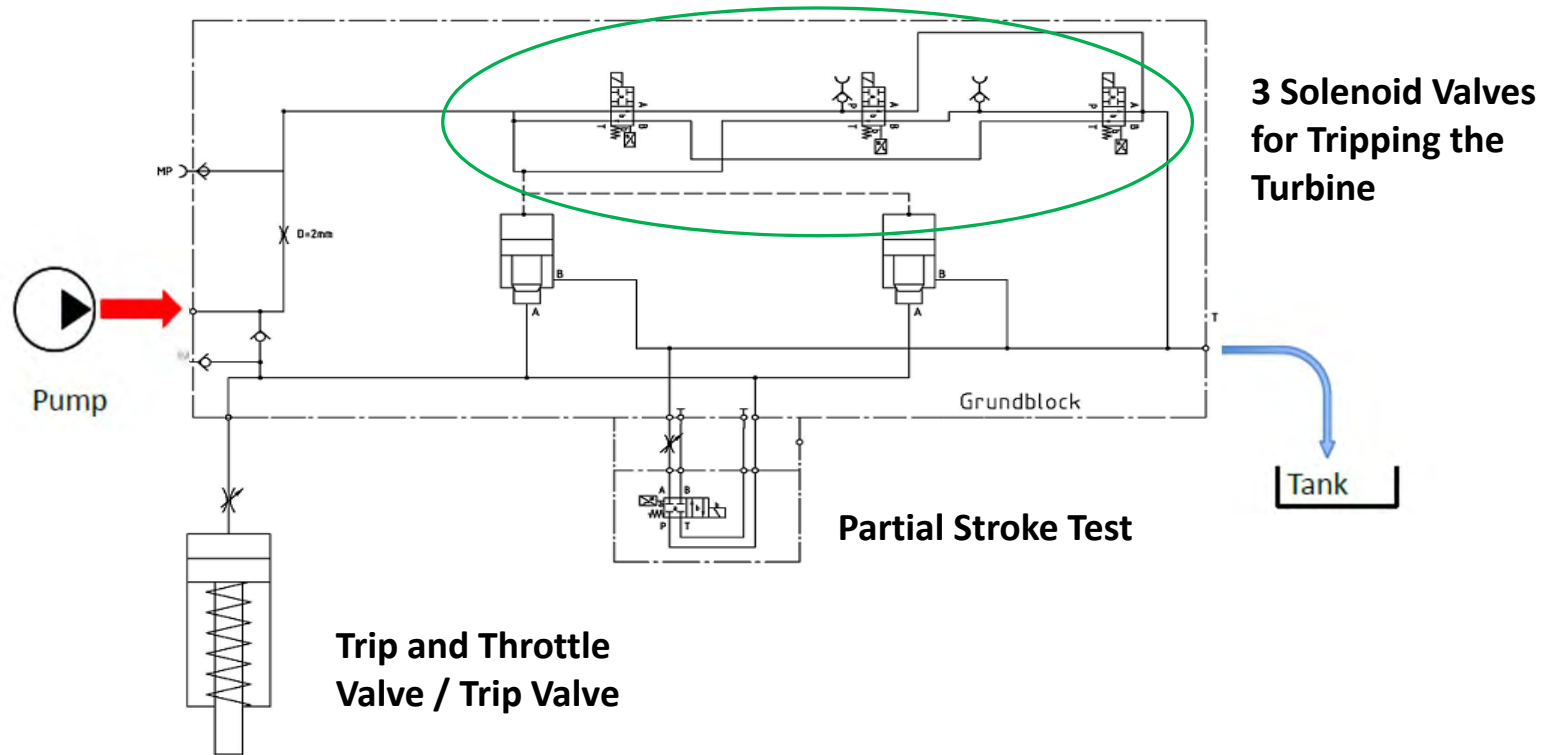
**API requires 2 valve As MINIMUM and most OEMs follow the minimum requirements only!**

But there must be better way to increase availability and reliability!

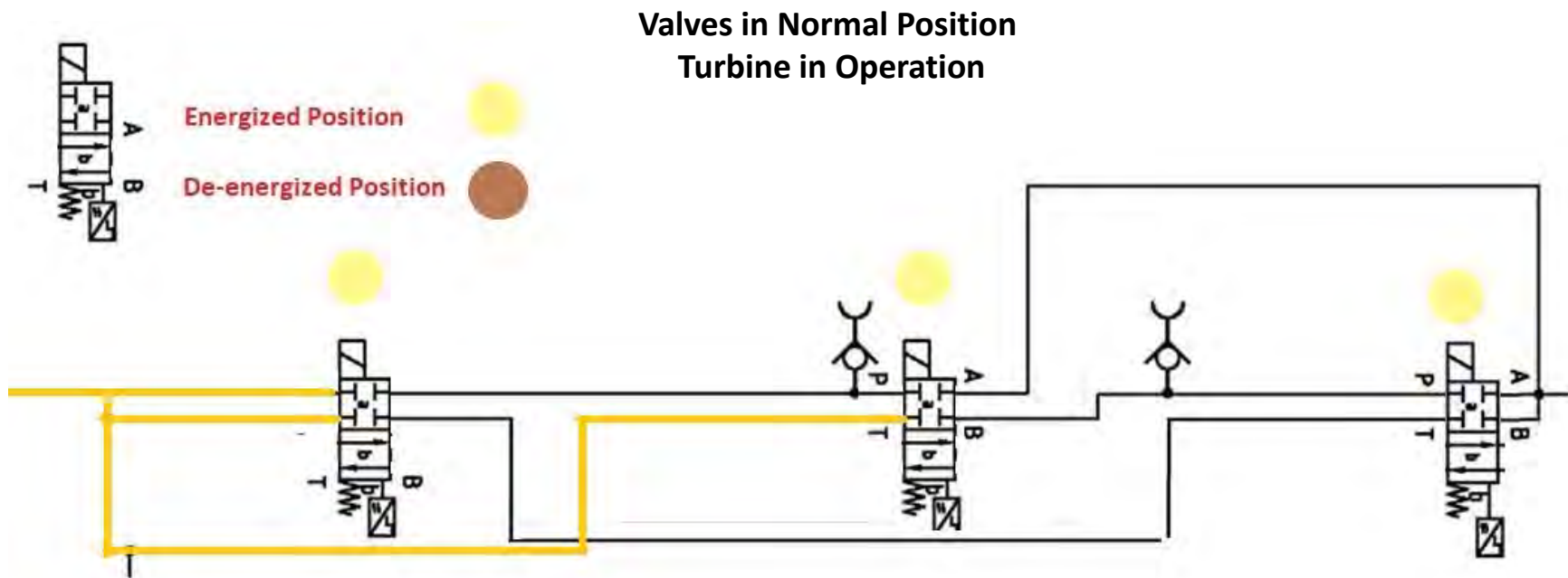


**Using 2oo3 voting in a trip block  
which  
guarantees both safety and availability.**

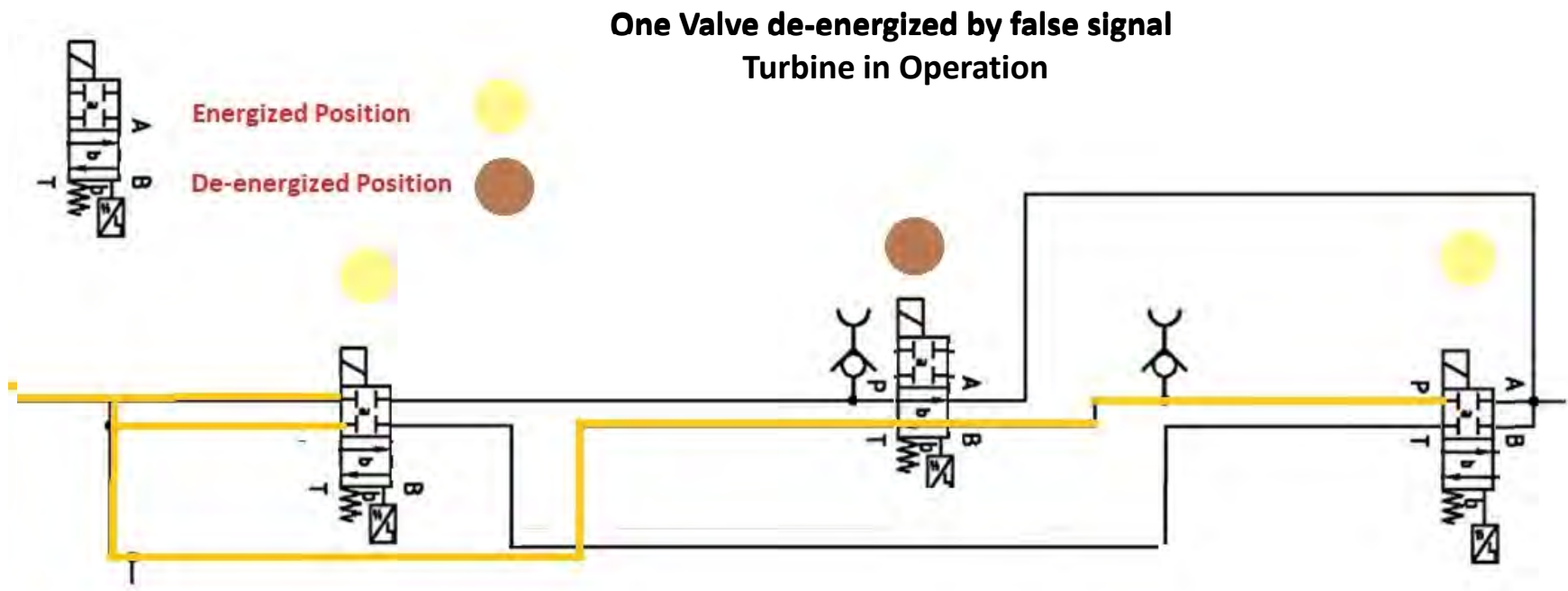
# Safe and Available 2003 Arrangement



# How It Works – Normal Condition

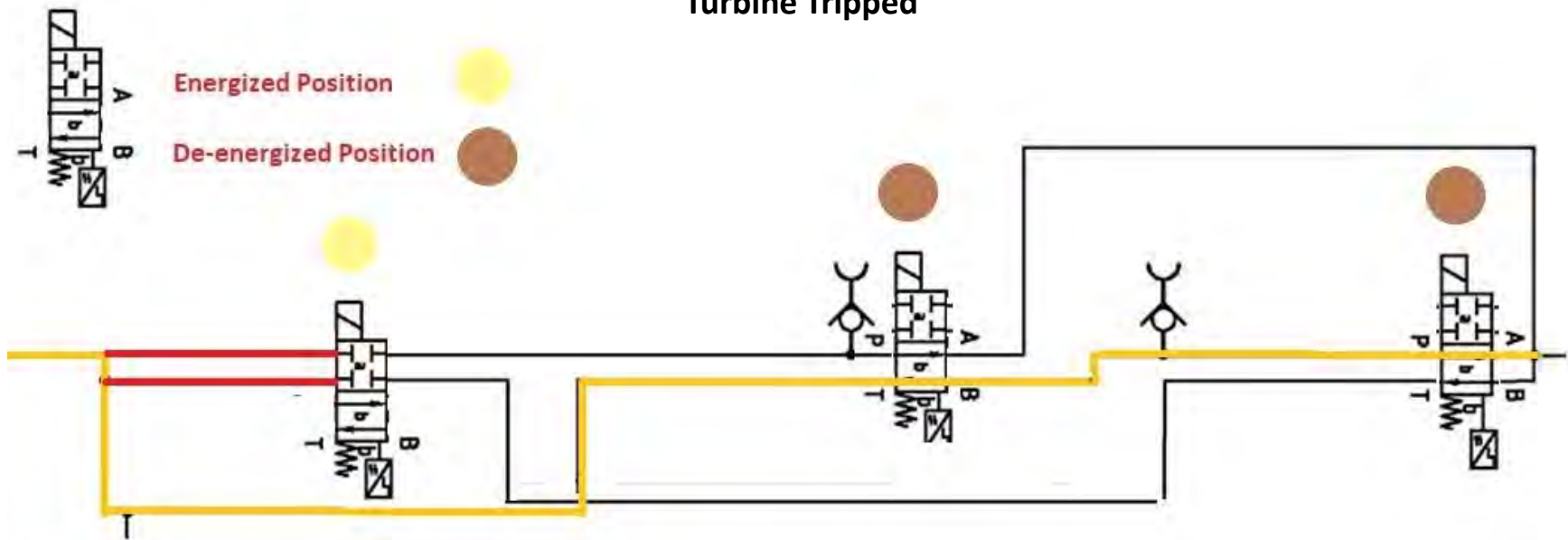


# How It Works - False Signal (1003)



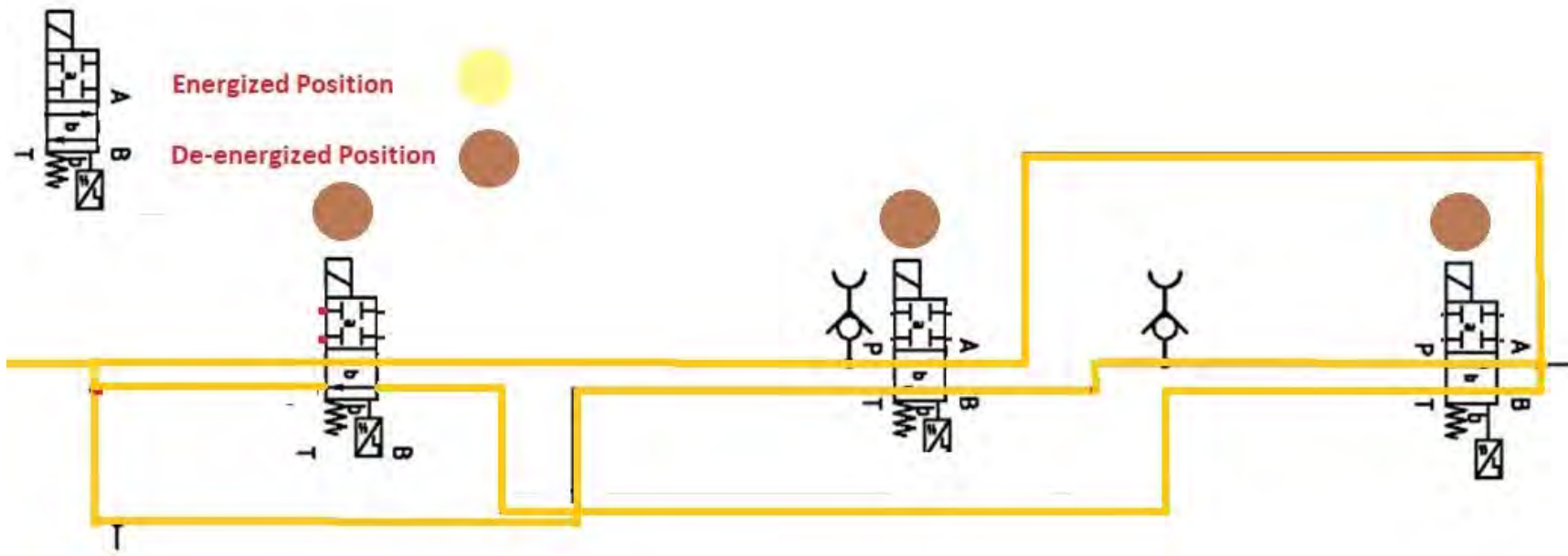
# How It Works – 2003 Tripping

2 Valves De-energized  
Turbine Tripped



# How It Works – Normal Shut Down (3003)

All Valves De-energized  
Turbine Tripped

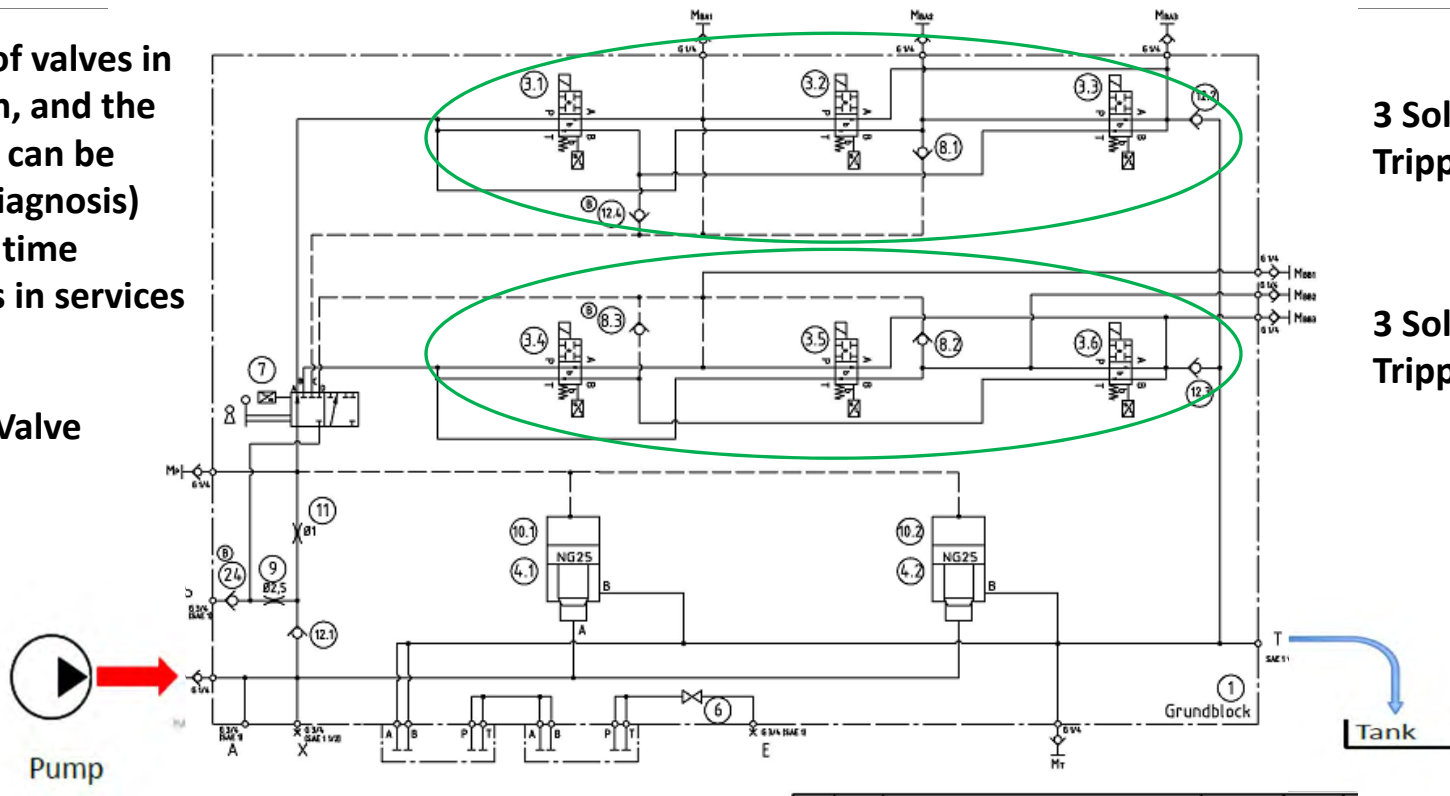




# Redundant 2003 Arrangement- Increased Reliability

One Set of valves in operation, and the other set can be tested (diagnosis) even the time turbine is in services

Selector Valve

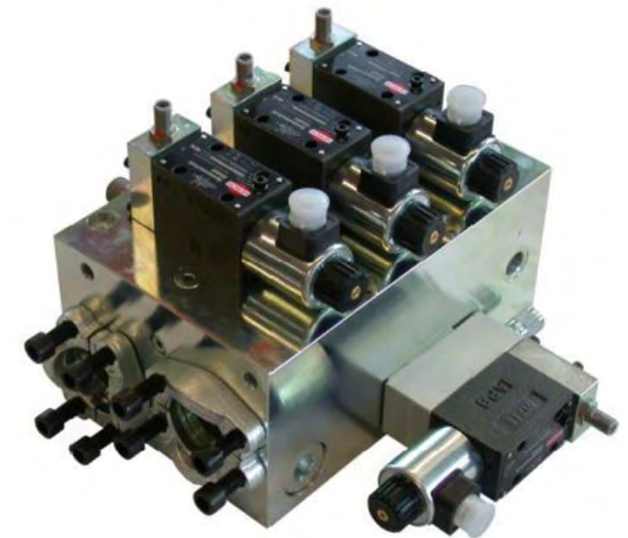
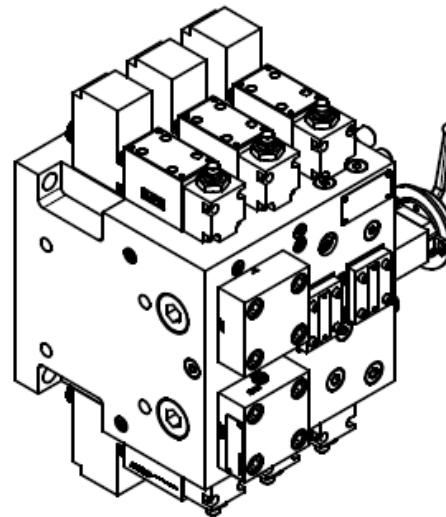
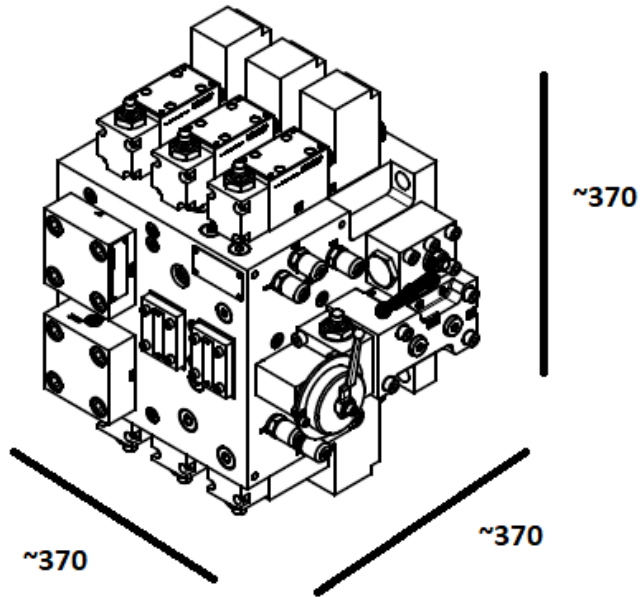


3 Solenoid Valves for Tripping the Turbine

3 Solenoid Valves for Tripping the Turbine

# General Arrangement of 2003 Trip Block

Very Compact Design





# Advantageous

---

**Reliable actuation of the trip valve in combination with prevention of erroneous actuations**

**Increased availability by implementing 2oo3 voting logic**

**Compact Design in mono-block facilitates intonation and retrofit and simplify piping layout**

**Possibility of monitoring trip valve position**

**Only 3 connections: Oil header, oil drain and Trip valve connection: Less leakage possibility**

**SIL3 Certified Components and System**

**Supports testing during turbine operation**

**Stainless Steel Component**

**Fast Trip Time**

**Remote position indication capability of solenoid valves**

**Certified for Hazardous Area**

**Minimized Maintenance Requirement**

**Additional custom smart module capability as per requirement**

**OMID**  
**ENERGY**



Contact Us:

Unit B7, No.178, Marzdaran Blvd.,

Tehran

Iran

Tel: +98 21 44273118

Email: [Info@omidenergy.com](mailto:Info@omidenergy.com)