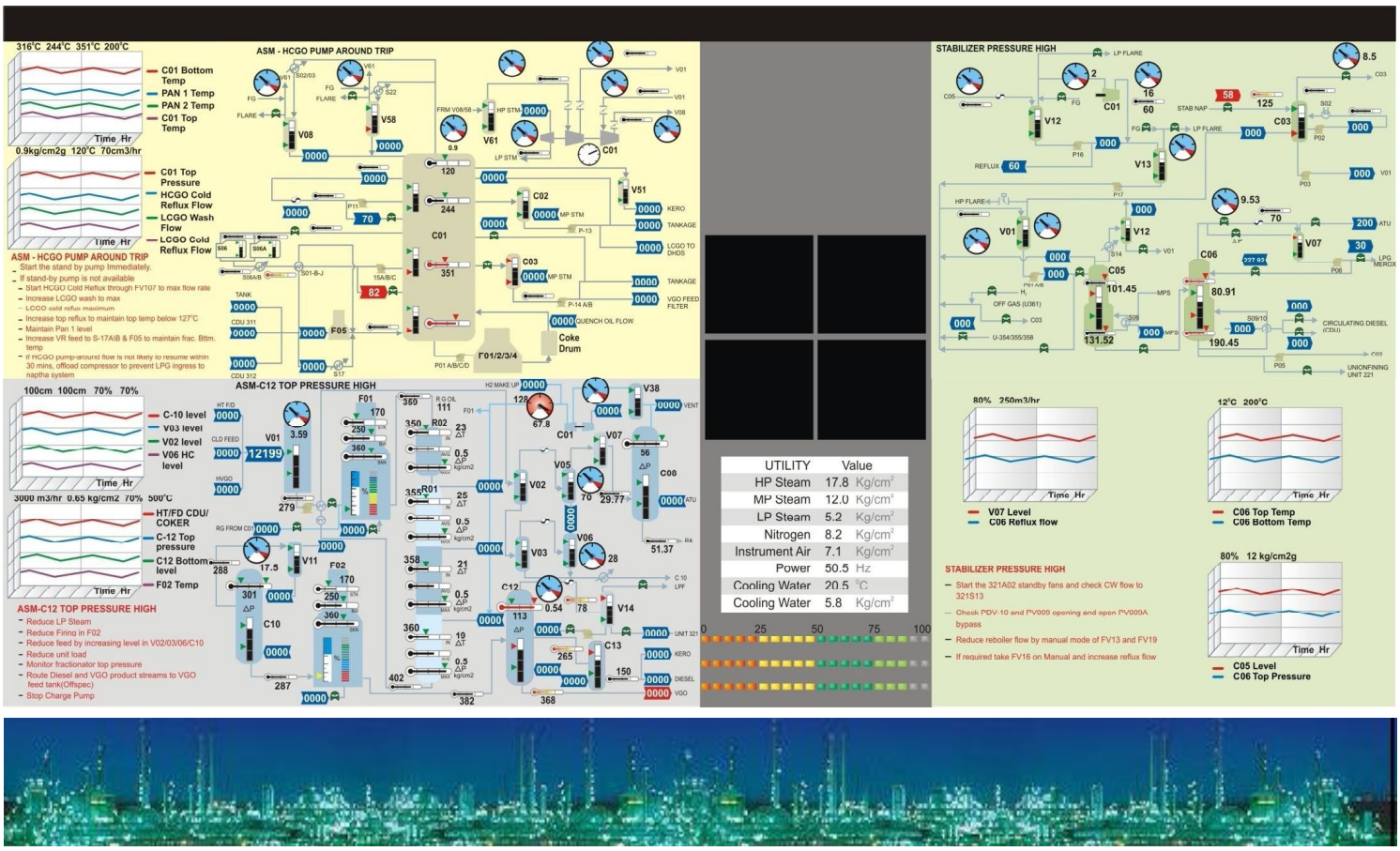
Steady state display :

- SOP’s for Startup and shutdown
- Permanent databases for Crude Assay, Product Specifications etc
- Major equipment startup steps
- Money earned per day
- Disaster Management Procedures
- Crude Blends – daily processing
- HSE highlights
- No. of permits
- KPI’s and KOI’s – shiftwise, daywise, monthwise, yearwise
- KPI’s and KOI’s – actual vs target

Typical Abnormal Situation layout :



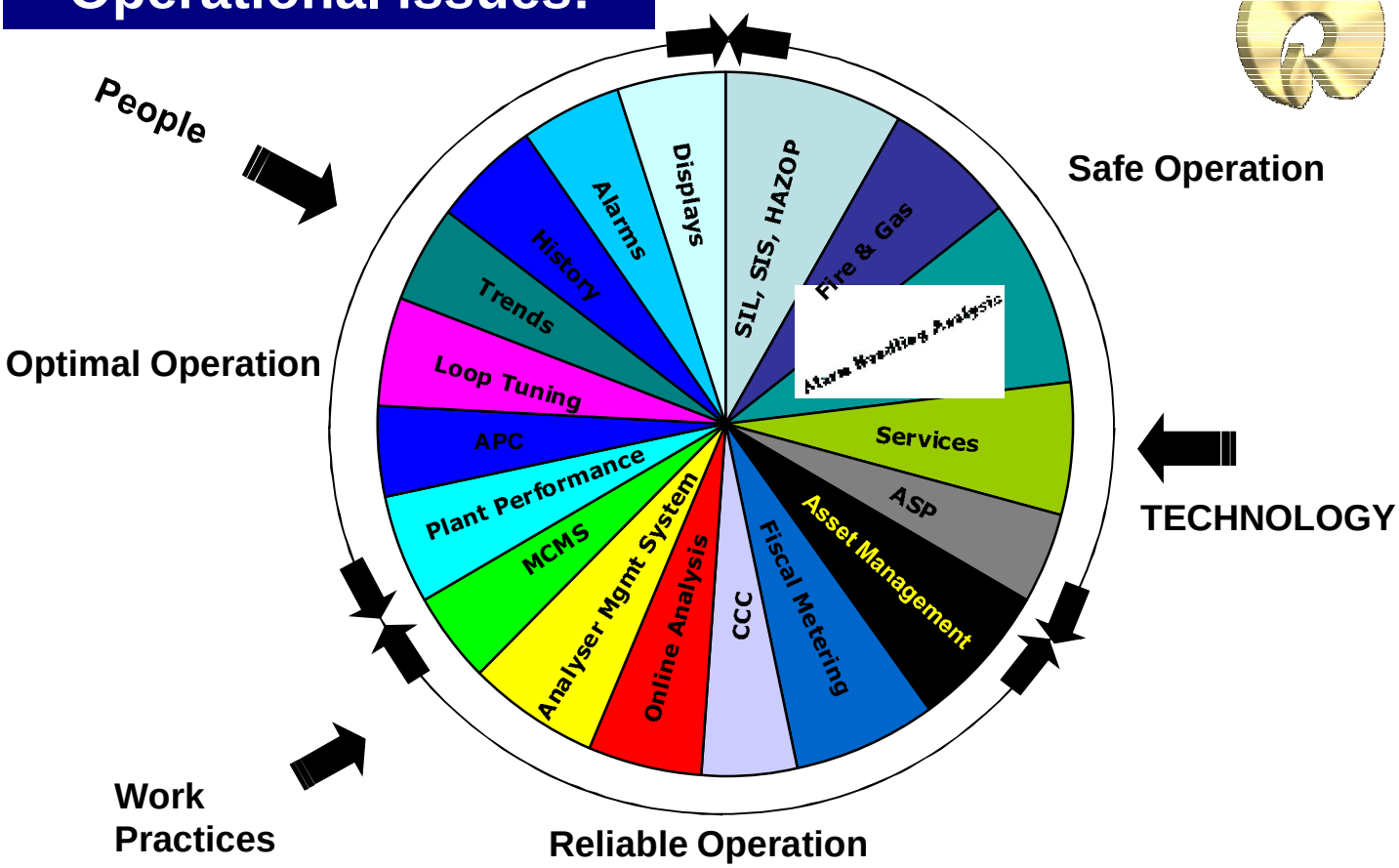
Plant Upsets/Abnormal situation:

- Predefined graphics for major upset conditions to displayed on receipt of appropriate alarm
- SOP's to aid the operator to also appear on Large Screen
- System information not easily retrievable can be promptly displayed
- Zooming–in of key parameters giving common view of relevant information
- Avoiding disruption of operator station activities

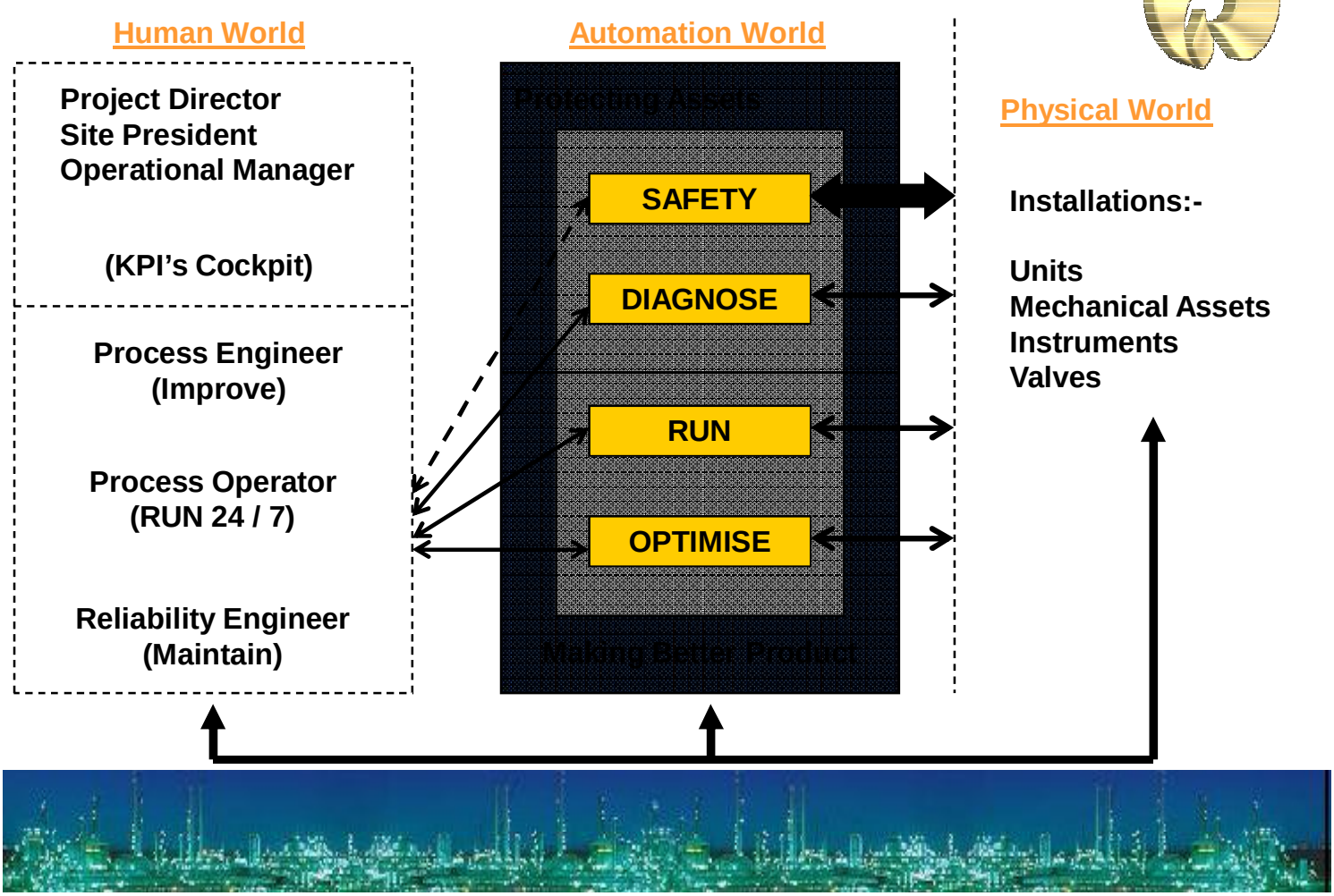
Motivation to Operation group:

- Complex level Display under one roof
- Benchmarked KPI information.
- Benchmarked Key Operations Indices.
- Current status wrt Target
- Best Achievement till date
- Safety tickers and videos
- Gross Refining Margin
- Quick escalation to all stakeholders

Operational issues:

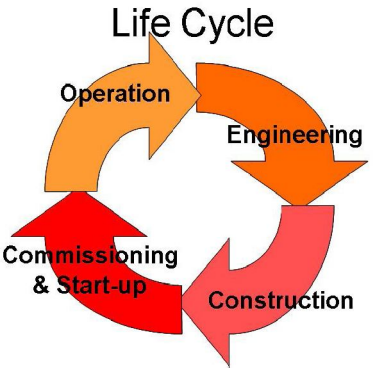


Operational Excellence is our Focus:



Foundation Fieldbus System：

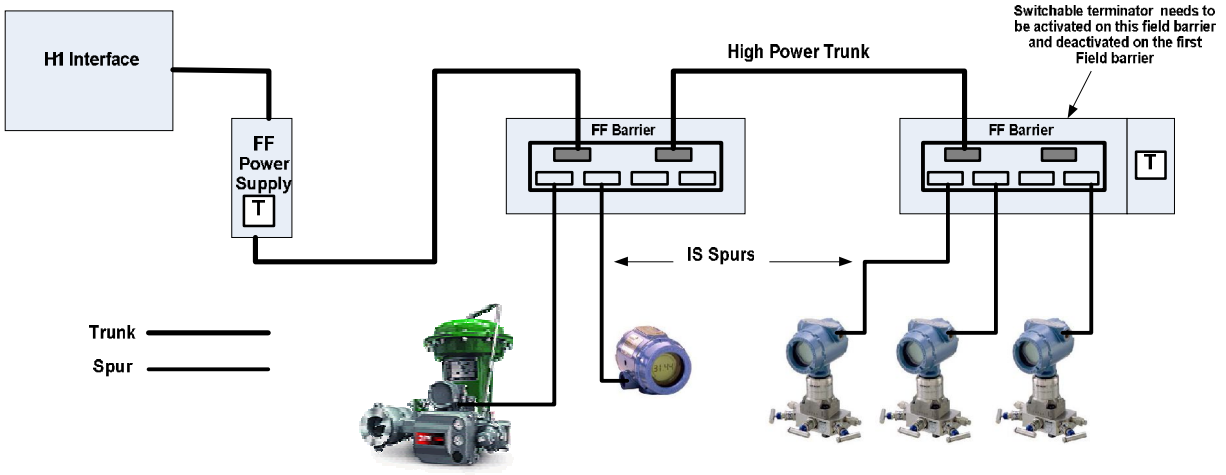
Our considerations :



- **The future of Process Automation.**
  - **Life cycle stage**
- **Proven Technology.**
  - **First FF systems delivered more than 5 years ago.**
- **Openness.**
  - **Non Proprietary.**
  - **Continuity to evolve.**
  - **Adopt new technology.**
  - **Interoperability**

Foundation Fieldbus wiring Concept:

Most common Segment Design.
Chicken Foot Topology

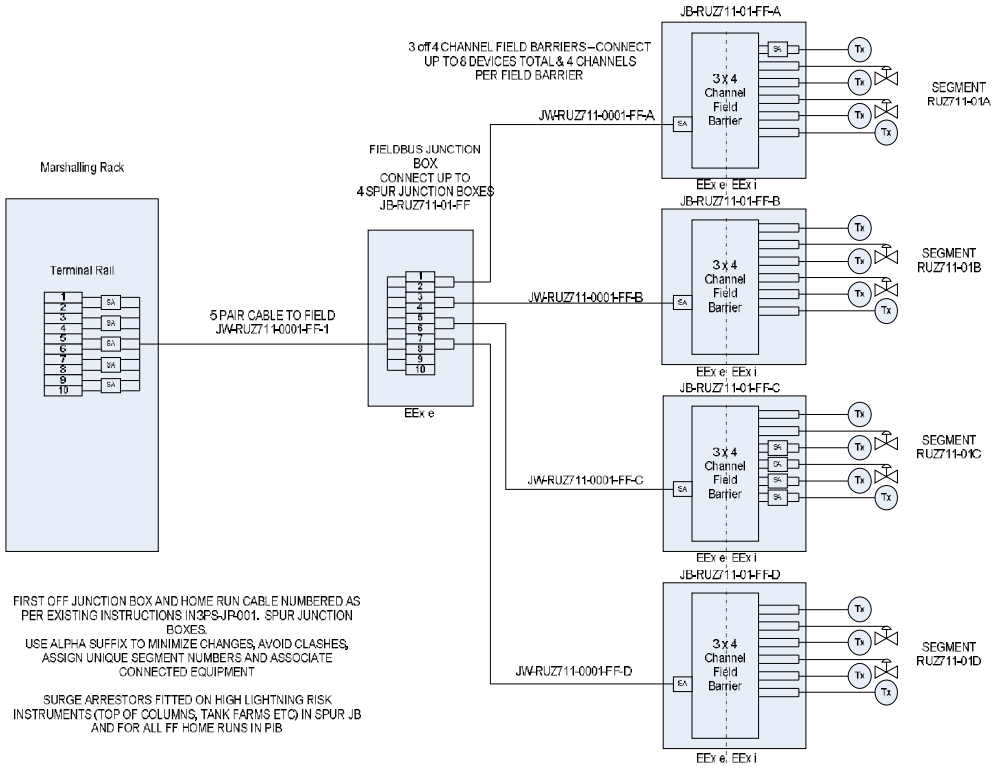


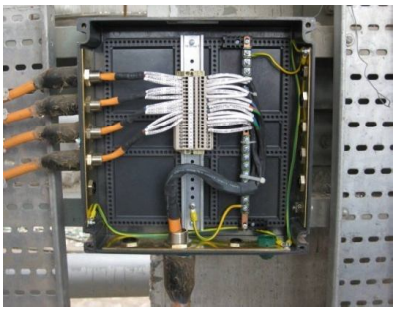
Hybrid Segment

The FF barrier has the trunk side galvanically isolated from the spurs

Segment with more than one coupler.
Note the couplers can be mounted in junction boxes.

Foundation Fieldbus wiring Concept:





Intelligent Field Devices:

Valves

Travel Deviation
Cycle Counter
Valve Signature
Step Response
Dynamic Error Band
Drive Signal
Output Signal

Coriolis Flow

Real-Time Flow Rate
Density
Temperature
Tube Frequency
Drive Gain
Live Zero

Analytical

pH Electrode Aging
Glass Electrode Failure
Electrode Failure
Electrode Coating
Electrode Poisoning
.

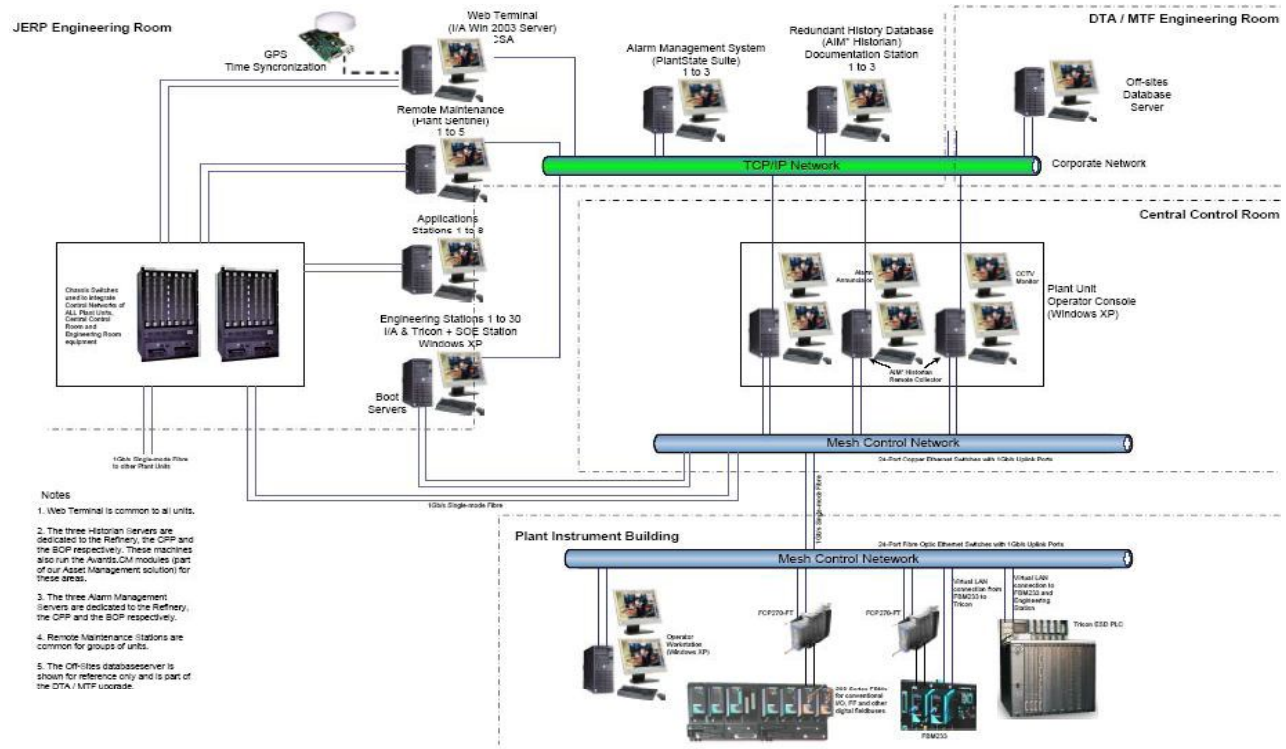
Transmitters

Electronics Failure
Sensor Failure
Process Condition
Configuration Warning
Plugged Impulse Lines
Sensor Drift

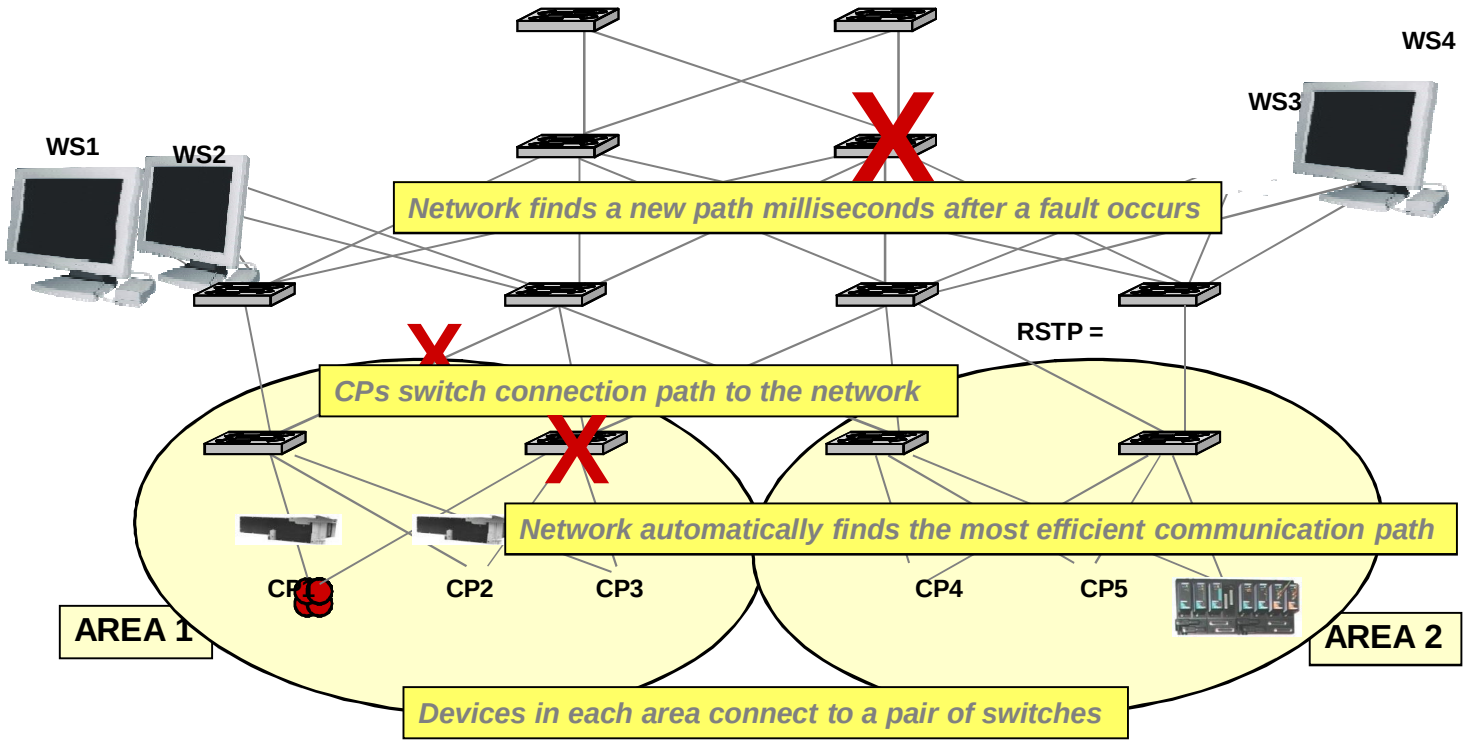
Expectations of the FF Technology:

- Inter operatable products & Systems
- Elimination of proprietary Protocols
- Technology enables innovation by manufacturers
- Device Diagnostics
- Lower installation costs
- More information from the valves
- Multiple inputs from one device
- New instrumentation easier to add later
- Reduced wiring.
- Reduced terminations.
- Reduced commissioning time.
- Ability to implement control in the field.
- Reduced Control room space.
- Instrument Diagnosis.

Distributed Control Systems:



Mesh Network:

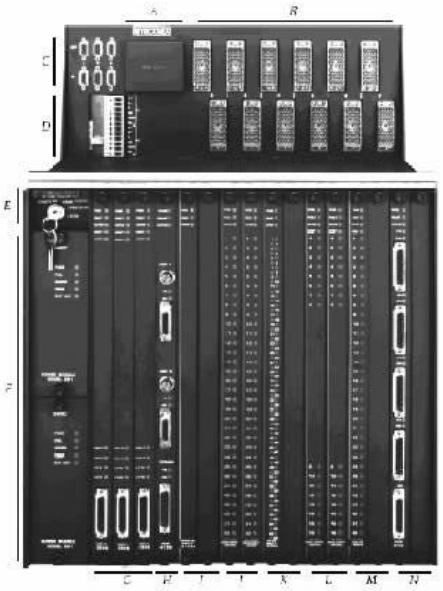


Emergency Shutdown System:

Development in Logic

Switches → Relay → PLC → ESD

CPU assembly



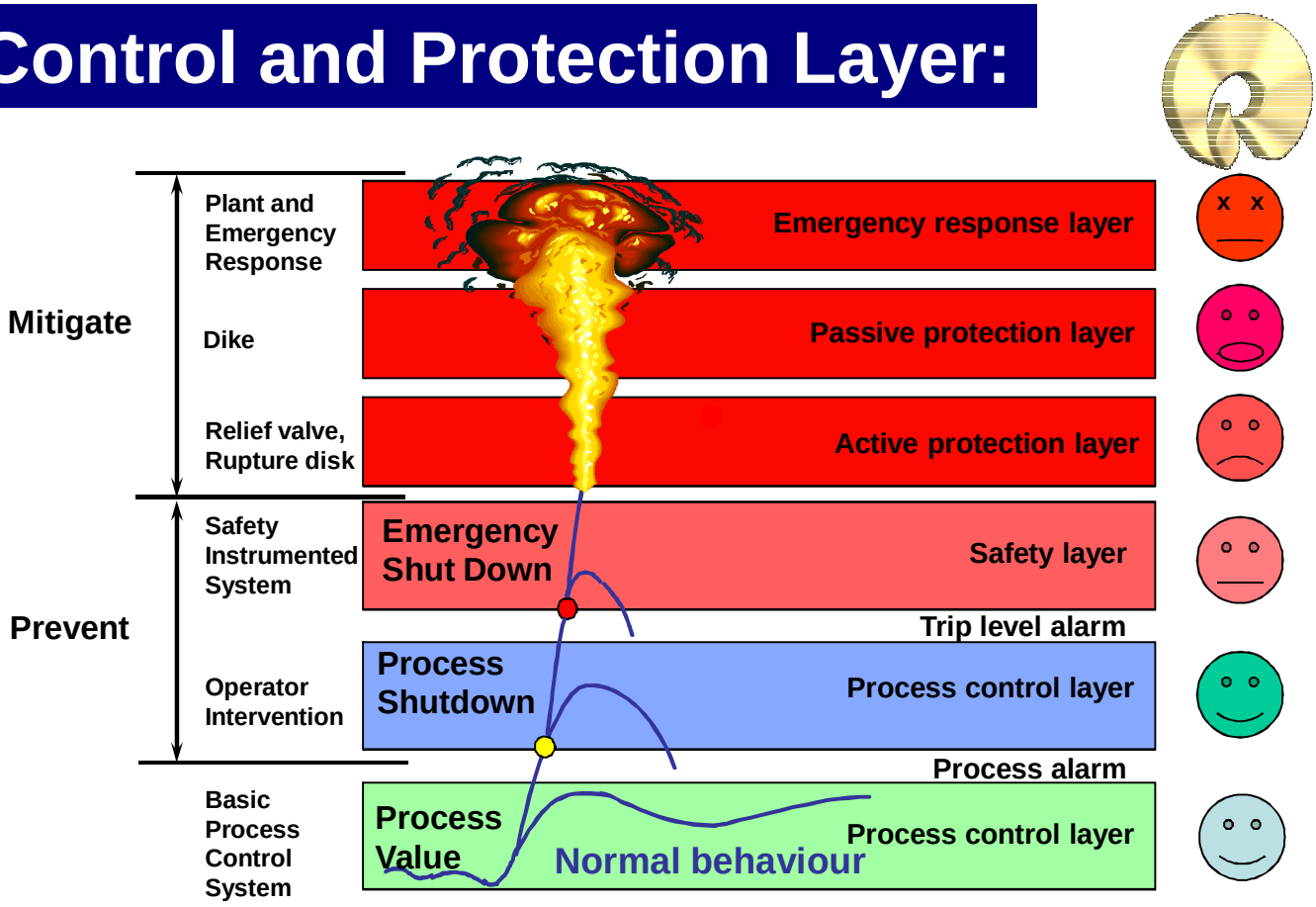
ESD Protection:

It is a Safety Instrumented System (SIS) also known as Emergency Shut Down (ESD) system which takes care of the abnormal process conditions and protects :

- **Plant and Equipment**
- **Environment**
- **Human Life &**
- **Reduces the risks associated with Hazardous Operations**

A safety system may be defined as a system of logic which is designed to await and recognize the onset of a specific process demand with the objective of preventing a dangerous process hazard.

Control and Protection Layer:

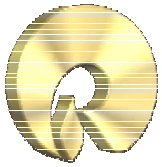


Fault Tolerant Concept:

. A Single fault in the system must not create erroneous inputs or outputs, nor shall it prevent the system from functioning as designed

1. Redundancy
2. Isolation
3. Voting
4. Diagnostics
5. Hot Repair

Safety Integrity levels:



SIL is the product of Consequence and Frequency

Broadlly accepatable Risks

Tolerable risk

Intolerable Risks

The required SIL (to make the risk broadly acceptable) can directly be entered in the cell that represents the initial risk.

Likelihood (y^{-1})				
1	1	2	3	4
10^{-1}	a	1	2	3
10^{-2}	a	a	1	2
	-	a	a	1

High Risk

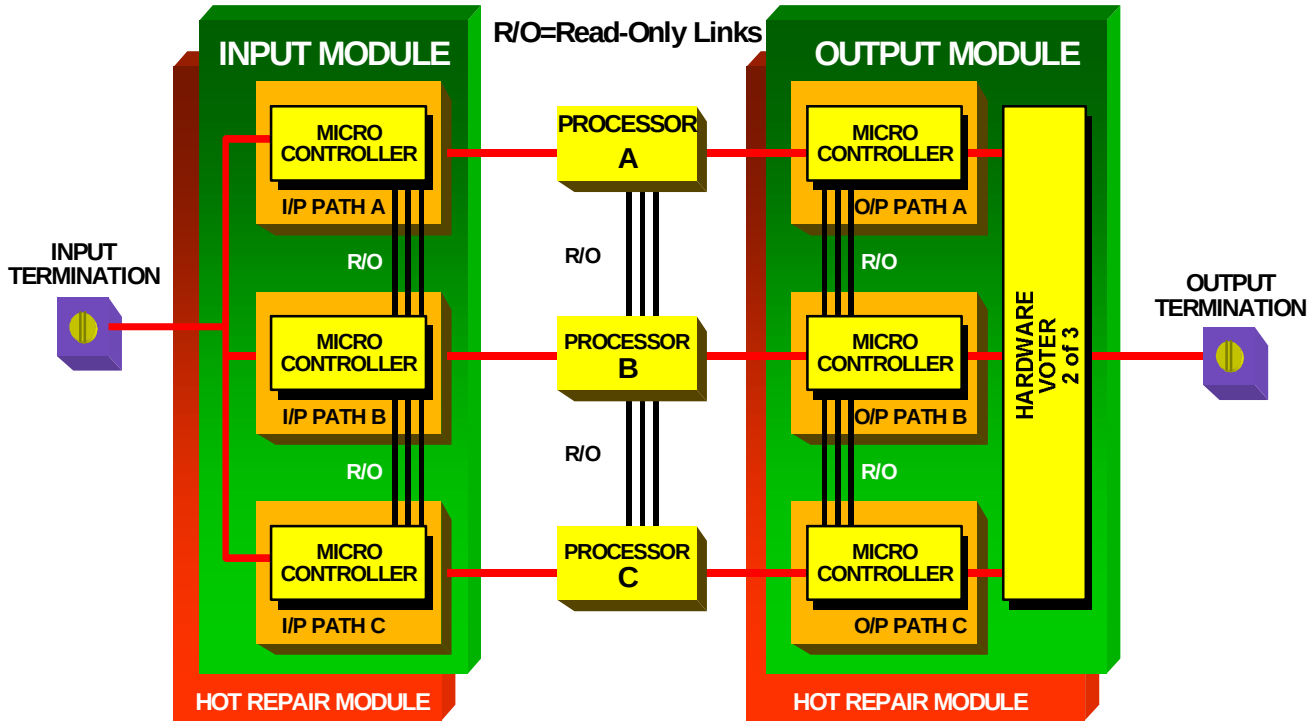
Low Risk

Consequence

Safety Integrity levels:

SAFETY INTEGRITY LEVEL	LOW DEMAND MODE OF OPERATION (Average Probability of failure to perform its design function on demand)	CONTINUES/HIGH DEMAND MODE OF OPERATION (probability of dangerous failure per hour)
4	>=10 E-5 to 10E-4	>=10 E-9 to 10E-8
3	>=10 E-4 to 10E-3	>=10 E-8 to 10E-7
2	>=10 E-3 to 10E-2	>=10 E-7 to 10E-6
1	>=10 E-2 to 10E-1	>=10 E-6 to 10E-5

TMR SYSTEM ARCHITECTURE




Thank You