Intelligent Energy and Water Data Management for a Smart, Resilient & Sustainable Campus

Automation Systems and Energy Conservation -

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Schneider Electric

Goal of the Workshop

> Show you what you can do with a control system to help measure energy without spending dollars

> Better understand automation support for energy management

> Preservation of not just $$ but also equipment

> Look behind the curtain at the automation structure

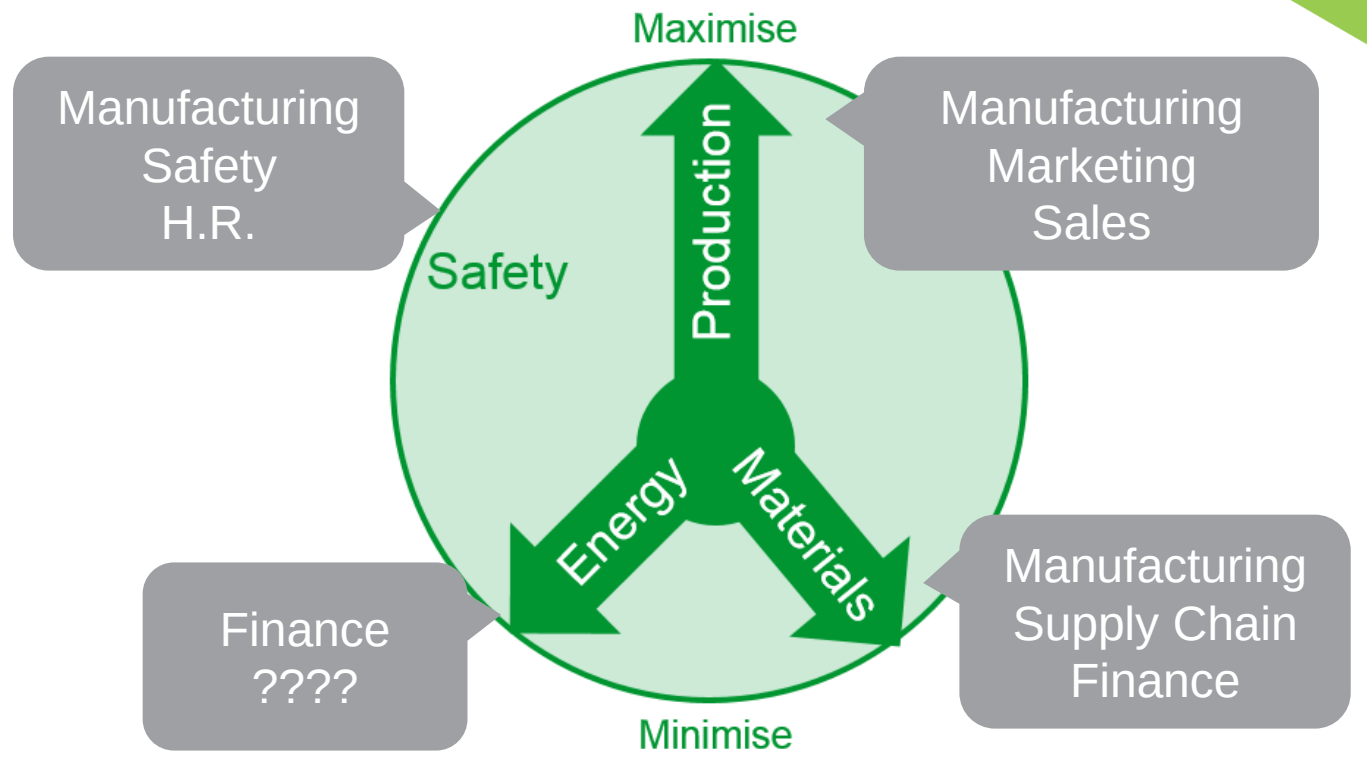
> See how energy can be presented at the automation level and at the corporate level

Business Value - Profitability

> The ability to produce valuable products for the lowest possible cost as energy costs rise

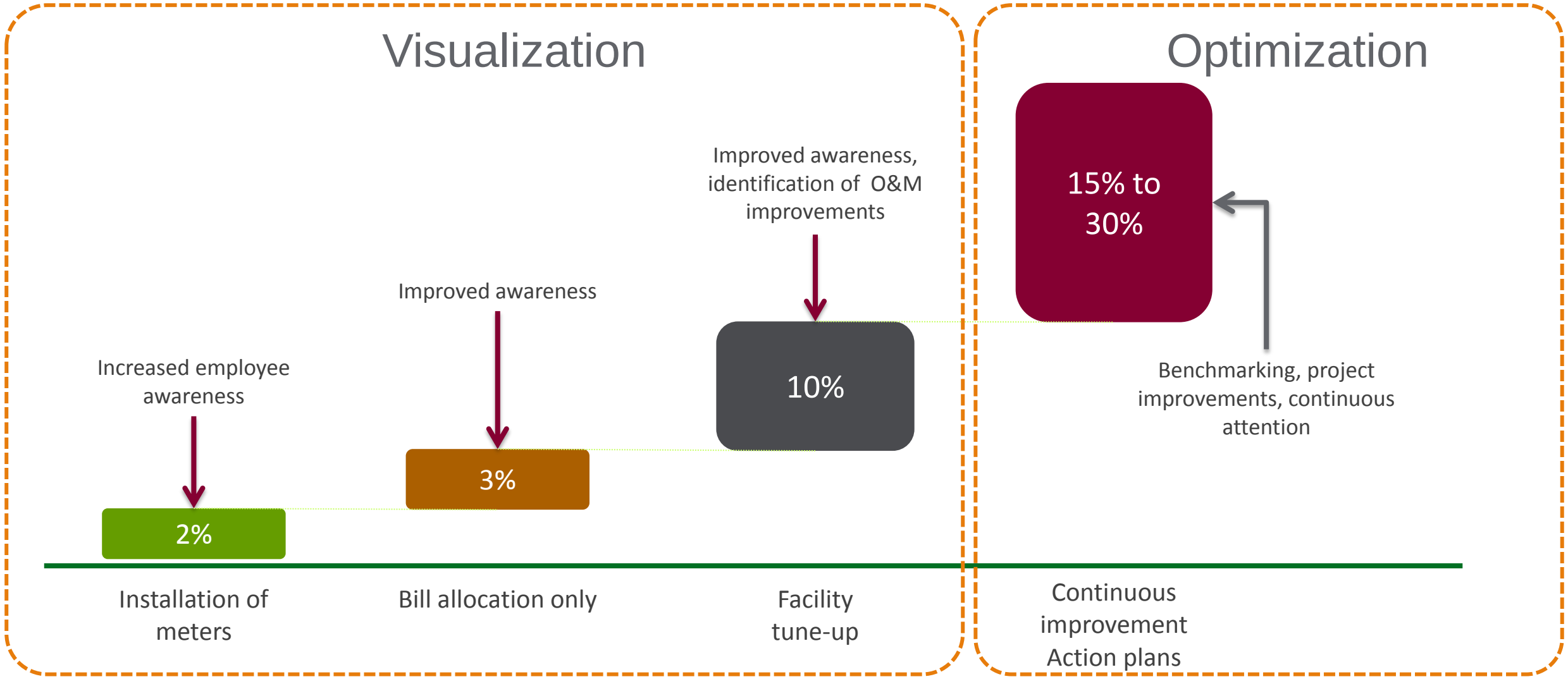
44%

Energy costs on average as percent of profit



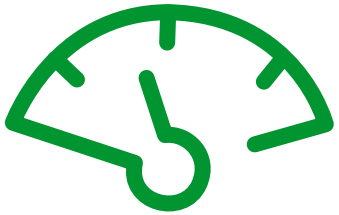
ARC Estimates 50% of Industrial companies are not measuring energy

Expected savings from Energy Performance



Source: Schneider best practices, US Department of Energy Metering Guide, Feb 2006

Causes of Energy Overconsumption



Energy Cost

Procurement	Sourcing Market Forecast
Supply	Power Quality Utilities Efficiency
Equipment	Asset Selection Energy Recovery
Process	Automation Advance Process Control
Operational	Automation Site Procedures
Maintenance	Fault Detection Scheduling

365K CAD
Program Savings
Demand/Response Strategy

100k USD
Per Annum Savings
Avoided power factor penalties

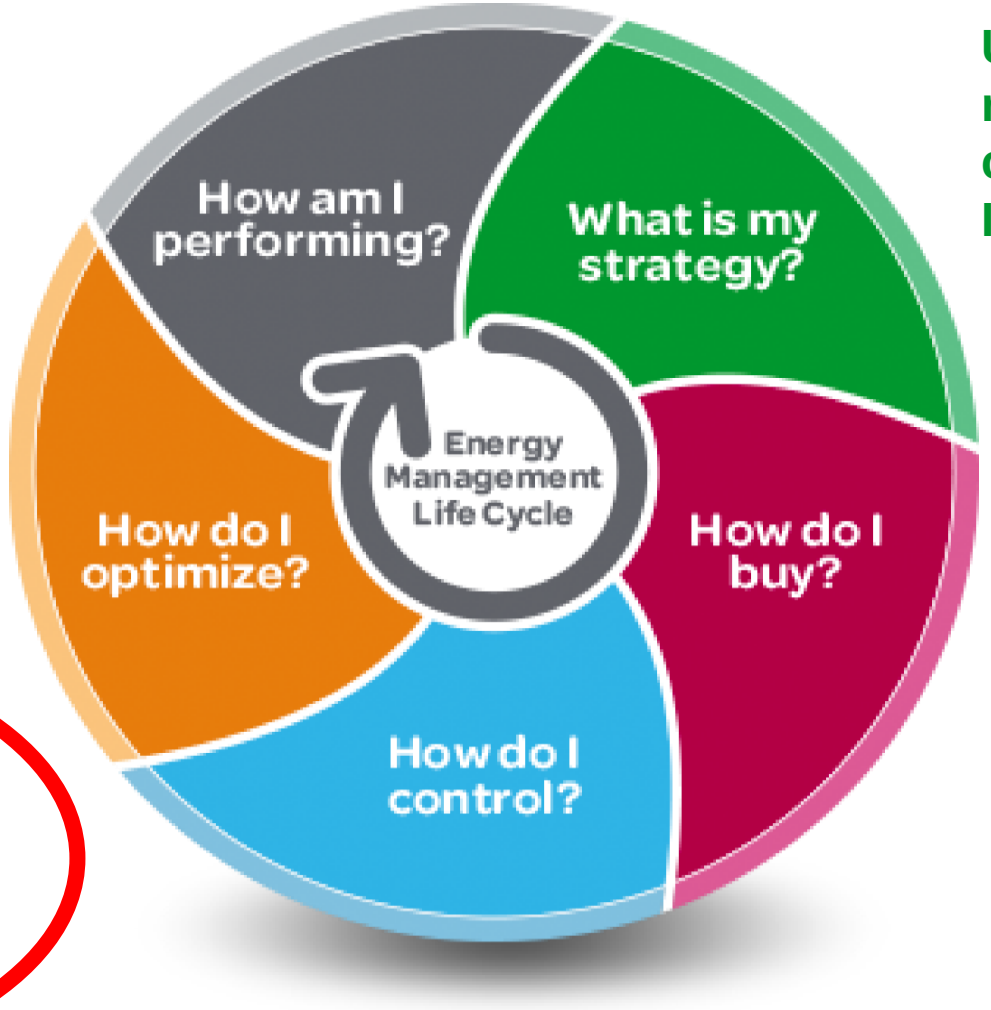
52% = 5GWh
Annual Savings
Equipment & Monitoring

▲34% Production **▼47%** Energy Use
Lean Energy Management

A Holistic Approach

and its continuous application

Provide clear visibility on your energy consumption and cost to bring awareness across the business



Understand Sustainability regulation and how that can be achieved for your Industry

Understand Energy Supply markets and ensure you have the correct source and best price for energy now and in the future

Analyze energy consumption to find opportunities to reduce energy waste

Understand how energy is distributed and consumed within your site in order to manufacture goods

Energy Blocks to Consider

> Energy blocks are used to collect/create energy values for output of energy consumed
> Some blocks are interconnected

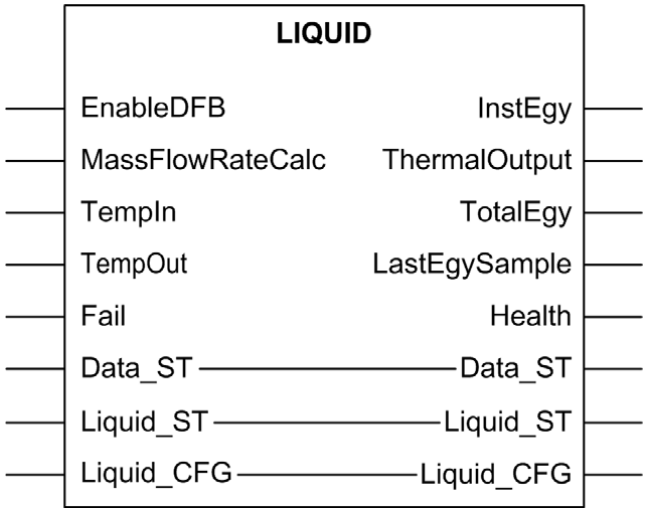
> Boiler Energy – steam energy
> Air Compressor Energy – compress air vol/electric consumed & compress air press/electric consumed
> Liquid Energy - energy consumed/produced by liquid
> Electric Energy – instantaneous energy rate & energy consumed for an electrical device
> Process Energy – energy/production unit (inputs from gas, electrical, solid energy object)
> CO2 – Global Warming Potential (GWP) per fuel type
> Solid Fuel Energy – energy content of the solid fuel
> Aggregrated Energy – collected energy from above blocks

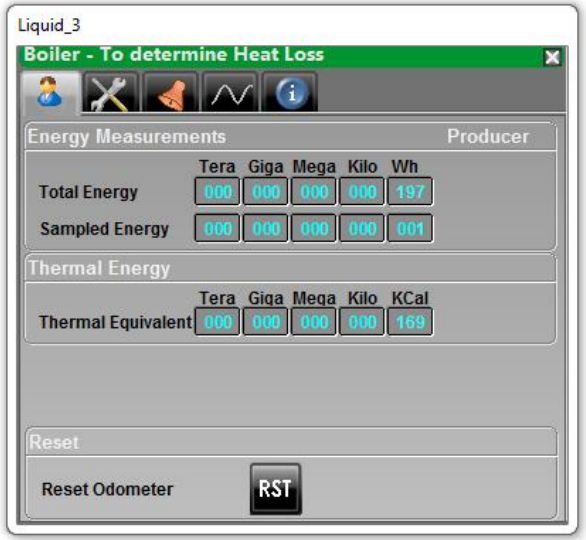
Control Blocks - Embedded

> Things to validate regarding energy
  > Calculations should be simple – pre-configured
  > Consistent and tested and validated
  > Displays should be mandatory

> The block and the calculations are TVDA - tested, validated, documented, and architected

> The math should be correct





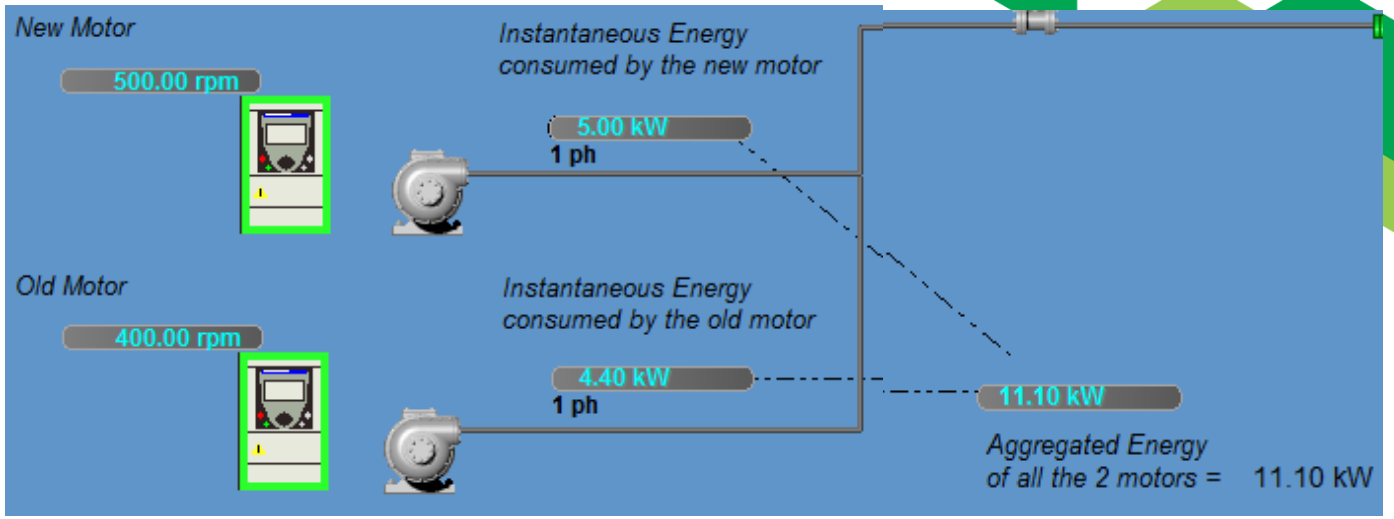
Measuring Energy Real Time

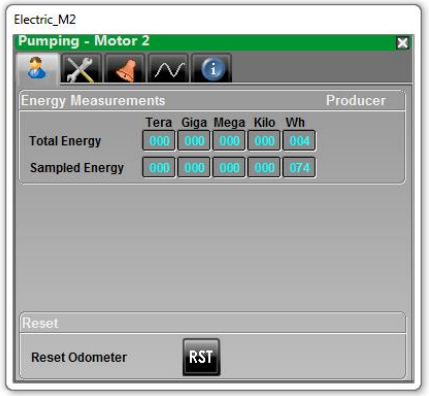
> Process can be in control & out of control at same time

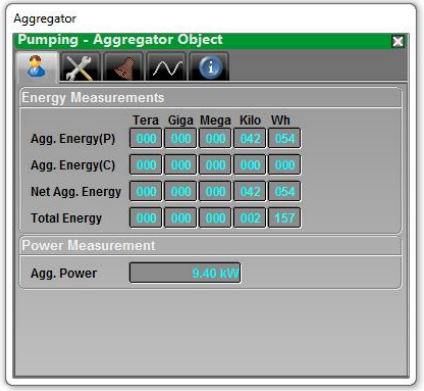
> Treat energy as another IO point

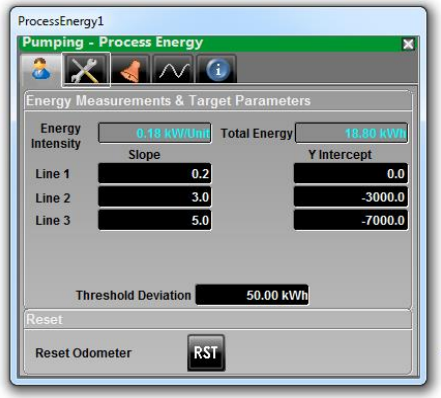
> Provides info on health of the process & assets

> Energy should be measured as:
  > Produced
  > Consumed
  > Unitized
  > Aggregated with reset





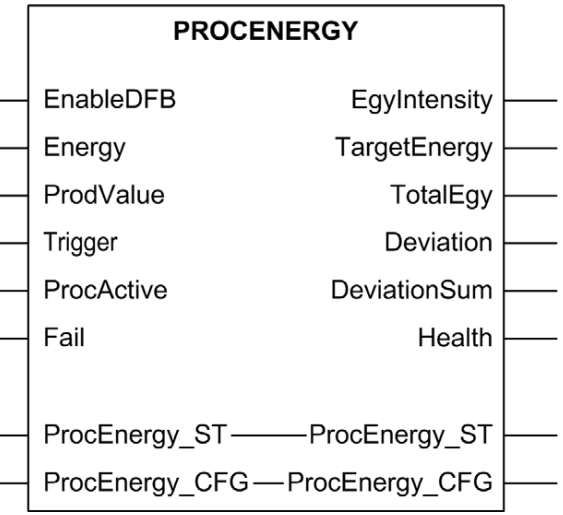




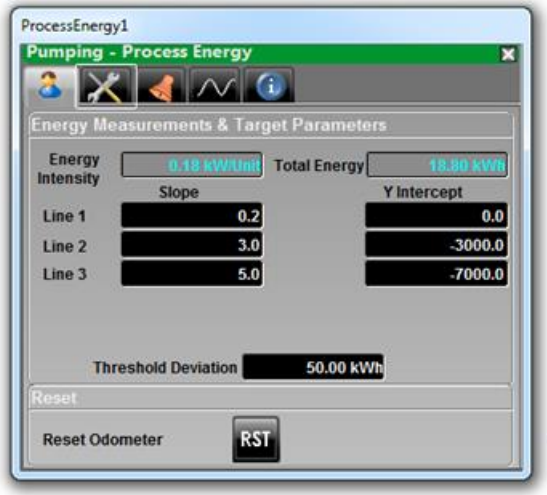
Energy Intensity = The energy consumed to produce a unit of product

How the Blocks Can Work

Parameter	Type	Description
EnableDFB	BOOL	Enables the DFB.
Energy	REAL	The energy parameter coming from an accumulator which is recording the overall instantaneous energy being utilized for the production parameter.
ProdValue	REAL	The instantaneous production value. This can come from a weight transmitter of a reactor or any transmitter which is monitoring a production value.
Trigger	BOOL	The trigger input is to be a pulsed input to be given after the shift is over. This will reset the total energy and will give the energy deviation for that particular shift from the modeled energy.
ProcActive	BOOL	Takes the health of the Process that is being monitored. If the process is healthy the block requires an input of 1 and will calculate the energy values.
Fail	BOOL	Any detected failure that is linked to the block. This input will come from a CONDSUM Block



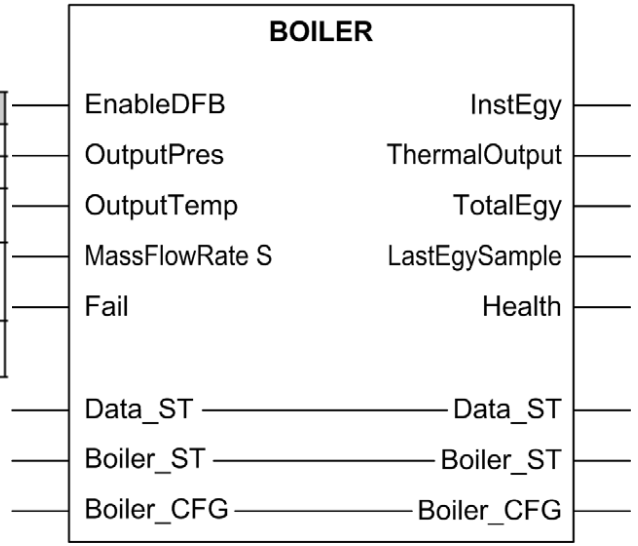
Parameter	Type	Description
EnergyIntensity	REAL	The energy consumed to produce a unit of product.
TargetEnergy	REAL	This is the energy that is modeled by user.
TotalEnergy	REAL	Total energy consumed for that shift. Gets reset as soon as the shift is changed through the trigger input.
Deviation	ARRAY [0...4] OF INT	This is an array, which contains the last 5 deviations from the last 5 shifts.
DeviationSum	REAL	Sum of last 5 deviations.
Health	BOOL	Indicates the health of the block. • Health = 0: Energy of the block is not aggregated. • Health = 1: Energy of the block is aggregated.



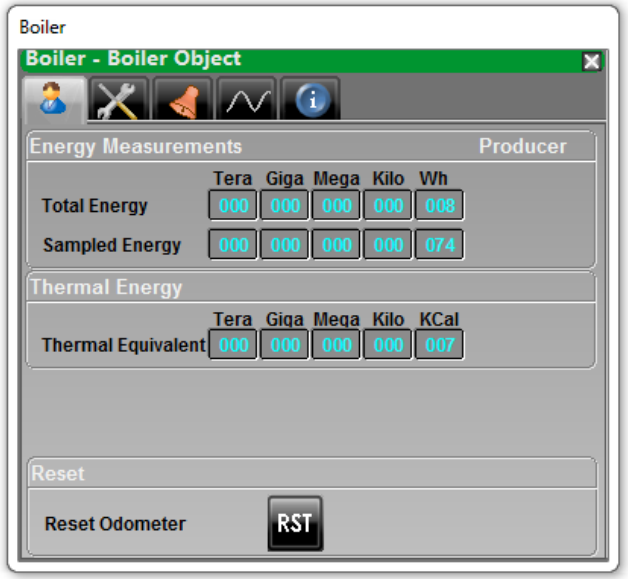
Energy Intensity = The energy consumed to produce a unit of product

How Blocks Can Work

Parameter	Type	Description
EnableDFB	BOOL	Enables the DFB.
OutputPres	REAL	The pressure of the superheated steam output.
OutputTemp	REAL	The temperature of the superheated steam output.
MassFlowRateS	REAL	The mass flow rate of the output superheated steam is required to calculate the output energy of this steam generated.
Fail	BOOL	Any detected failure that is linked to this block. This input will come from a CONDSUM block.



Parameter	Type	Description
InstEgy	REAL	Instantaneous energy rate in kW. In order to be in line with the ODVA standards, the instantaneous energy value should not exceed 32767 kW.
ThermalOutput	ARRAY [0...4] OF INT	Instantaneous energy in local units.
TotalEgy	ARRAY [0...4] OF INT	Total energy consumed in Wh.
LastEgySample	ARRAY [0...4] OF INT	Energy consumed in the last sample time in Wh.
Health	BOOL	Indicates the health of the block: • Health = 0: Energy of the block not aggregated. • Health = 1: Energy of the block is aggregated.



Make the most of your energy℠