



INTELLIGENT INTEGRATED CONTROL SYSTEMS “The Role of Fieldbus Technologies”

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- ▼ Bechtel providing engineering, procurement, construction and management services to the Royal Commission in Jubail since 1975
- ▼ Global EPCM services
- ▼ 41,000 persons & \$ 21 Billion/year (2003)
- ▼ Civil, Defence & Space, Mining & Metals, Oil & Gas, Petroleum & Chemicals, Pipelines, Power, Telecomms, Water, Rail.

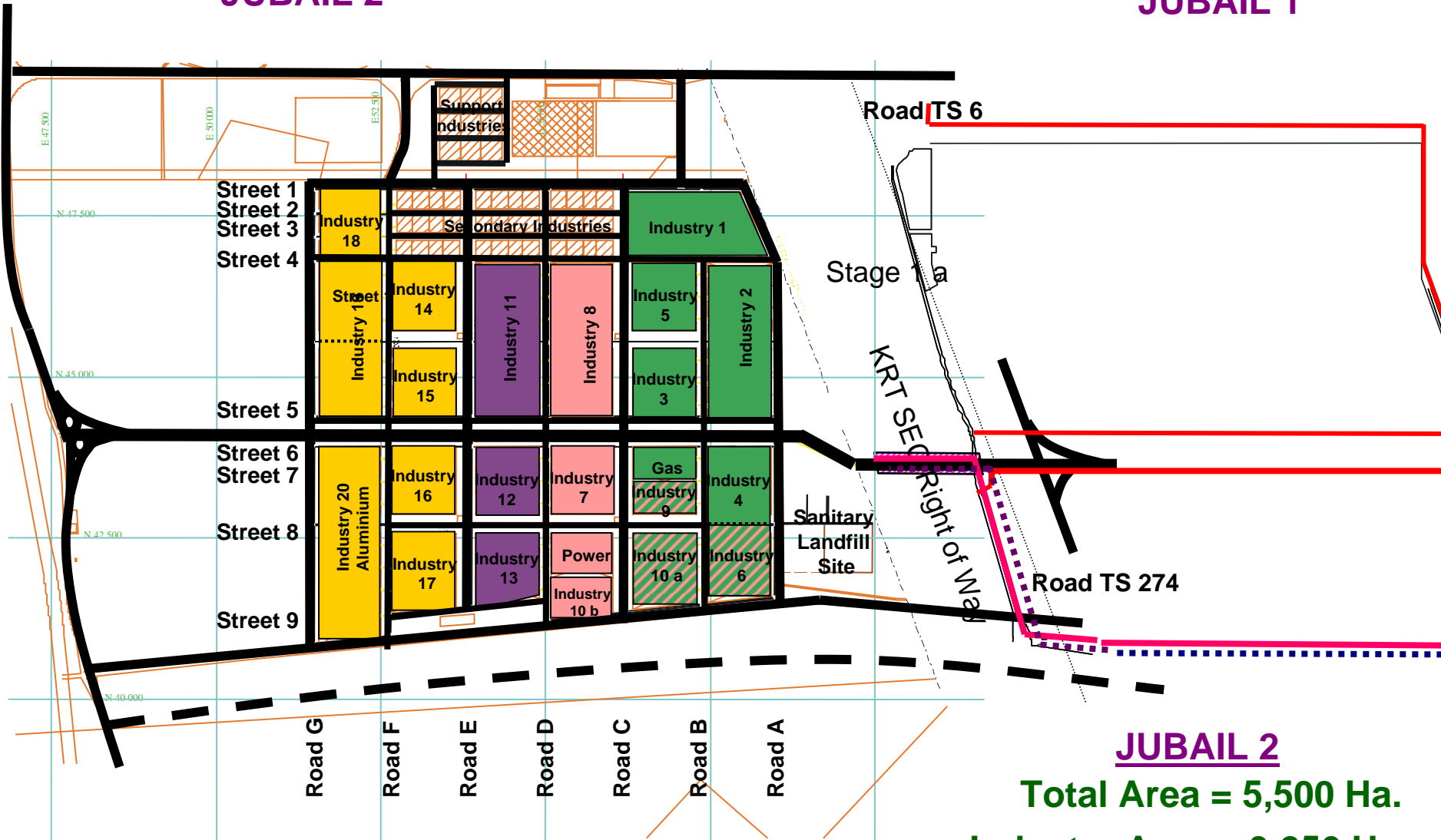


- ▼ Royal Commission established in 1975
- ▼ Develop Jubail & Yanbu as industrial cities
- ▼ Promote utilization of KSA natural resources
- ▼ Encourage and enhance talents of Saudi citizens
- ▼ Administer industrial cities
- ▼ Liaise with other agencies Saudi Aramco, Seaports authority



JUBAIL 2

JUBAIL 1



JUBAIL 2
Total Area = 5,500 Ha.
Industry Area = 3,250 Ha.



- The Goal:** To guarantee Minimum-Cost-of-Ownership and 100% Availability.
- The Vision:** To provide enabling technologies for current and future goals.
- The Strategy:** To deploy state-of-the-art control systems, intelligent devices and asset management/condition monitoring systems.
- The Tactics:** To distribute intelligence throughout the control and monitoring environment - integrated via fieldbus technologies.



▼ Intelligence Philosophy

- /// To provide a quantum jump in a control systems faculty of knowing by increasing information or data to facilitate reasoning.
- /// Increase in this faculty leads to a change in the concept of control systems to one of intelligent control systems.



▼ Design

- /// Multi-variable devices
- /// Intelligent devices
- /// Integration of data
- /// Integration of systems

▼ Practical Benefits

- /// In situ mass & energy balances
- /// Plant thermal/pressure profiles

▼ Goal

- /// MCoO



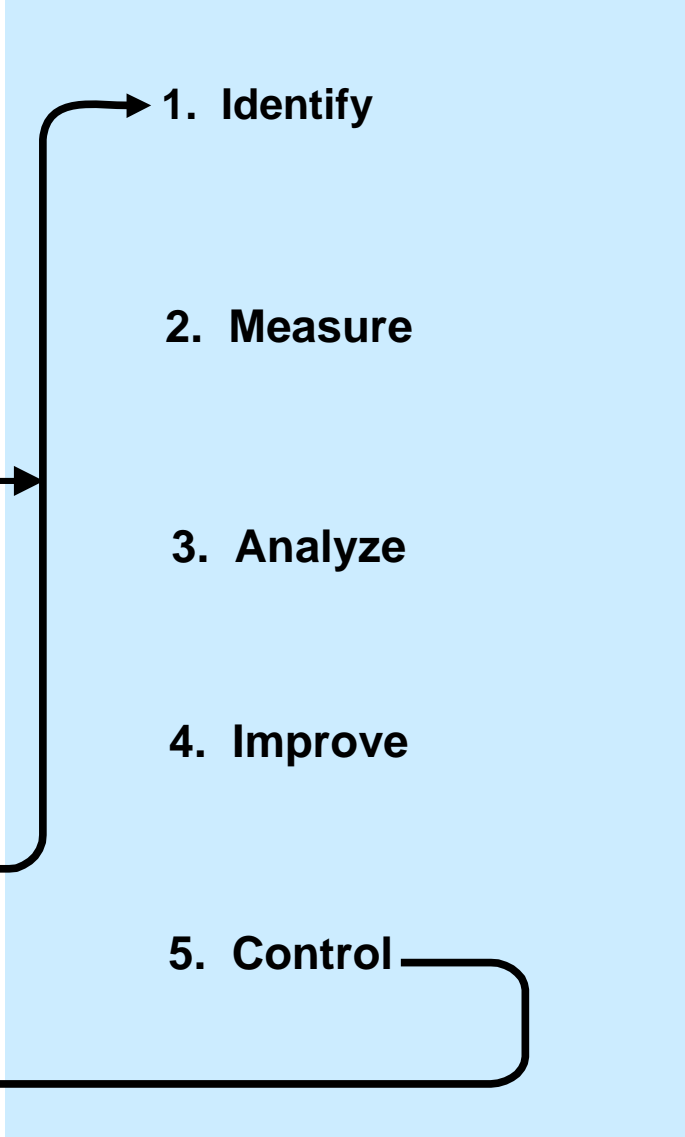
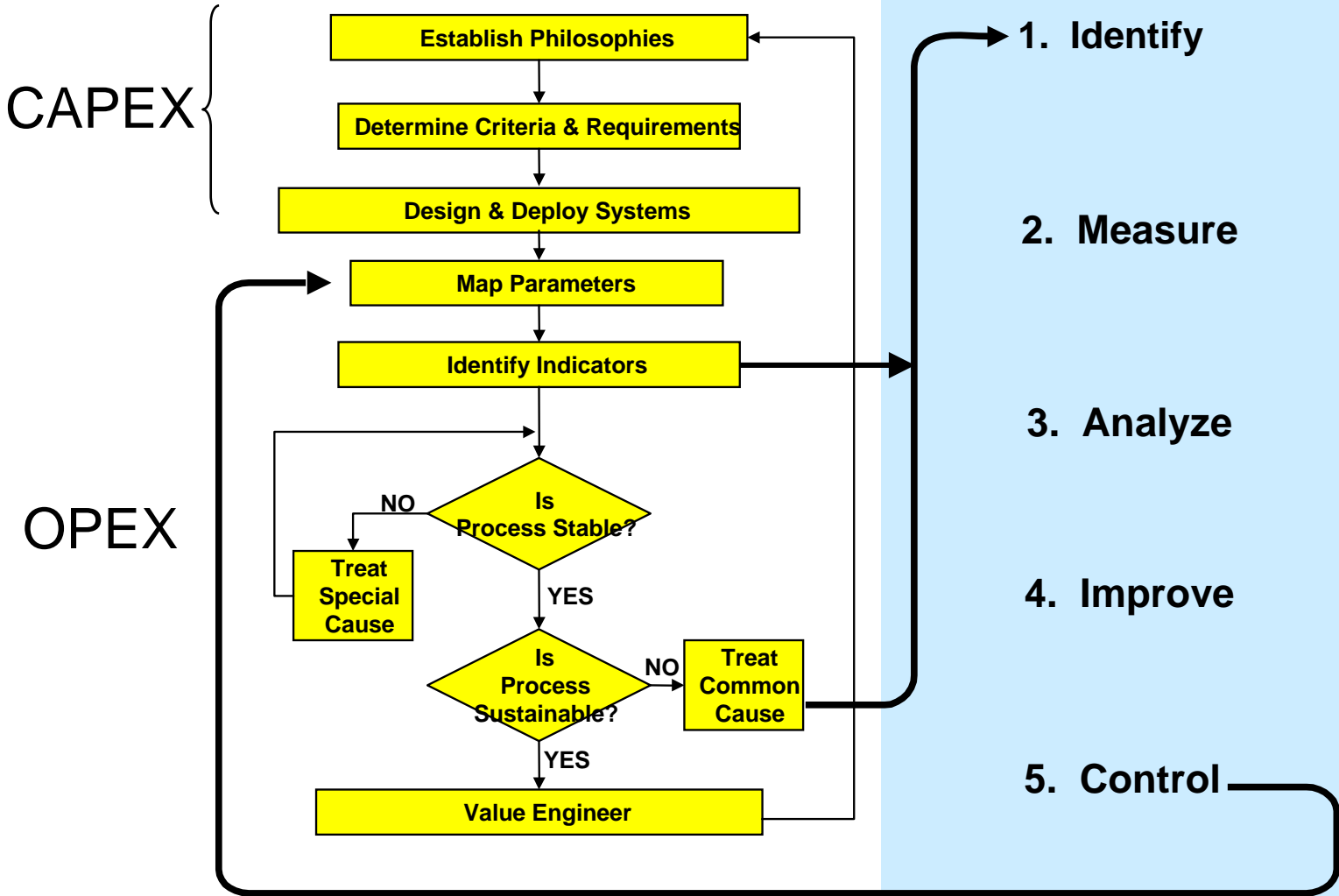
- ▼ **Debottlenecking Example:**
 - /// Control valves purchased one size-up after 1.2-1.4 factor applied
 - /// Piping standard sizes 4", 6" etc.
 - /// Vessels with added design factor

- ▼ **IT FOLLOWS** that additional capacity is available all around the plant. It is a matter of identifying which is the equipment most accurately designed which in turn acts as a limiting bottleneck in increasing plant production.

- ▼ MCoO decreased by increasing production in addition to maintenance savings etc.



MCoO Road Map





- ▼ Parameterization:
 - /// Map cause and effect relationships
 - /// Identify potential improvements
 - /// Select the best solutions
 - /// Analyze benefit of selected solutions
 - /// Implement solutions
 - /// Develop and implement a control plan
 - /// Verify impact of solution (cost and availability benefit)



“In any set or collection of objects, ideas, people and events, a FEW within the sets or collections are MORE SIGNIFICANT than the remaining majority”

(Pareto 80/20 Principle – 1906 Italian economist Vilfredo Pareto
An avid gardener he observed 80% peas came from 20% pods
80% of a country's wealth is owned by 20% of its people - USA 83% 1998)

“A Problem well stated is a problem half solved”
(Charles Kettering, U.S. Engineer, Inventor)

- Step 1:** Define the scope of the indicator
- Step 2:** Flowchart the activities needed to produce the desired outcome
- Step 3:** Identify each indicator as value-added or non-value-added
- Step 4:** Identify the cycle time for each indicator
- Step 5:** State the metric for the indicator



- ▼ Main criteria and requirements:
 - /// Improve availability
 - /// Improve operability
 - /// Improve maintainability
 - /// Improve plant predictability & variability
 - /// Improve profitability (lowering OPEX & CAPEX).



▼ Availability:

Failure Event	Failure Mode	Frequency	Impact	Total Loss (hrs./yr.)	Cost of Loss (S.R.)
Recirculation Pump Fails	Bearing Fails	12 per year	12 lost hrs.	144 lost hrs. of prod.	SR 63,000 / year
Seal Failure	Blown Seals	4 per year	24 lost hrs.	96 lost hrs. of prod.	SR 24,000 / year
Filter DP High	Filters Clogged	26 per year	2 lost hrs.	52 lost hrs. of prod.	SR 6,000 / year
Pressure Gauge Leaks	Leaks Due To Corrosion	.33 per year	24 lost hrs.	8 lost hrs. of prod.	SR 1,000 / year

- ▼ CAPEX reduction compared to non-fieldbus systems is estimated as 10-25%.
- ▼ OPEX reduction compared to non-fieldbus systems is estimated as 7-10%.



▼ Cost of non-IICS & Fieldbus:

- /// Low availability
- /// High variability
- /// High maintenance
- /// High operating costs
- /// Production outages
- /// Lower profitability and market share

(continued)



Cost of Non-IICS: continuum

Easily identified, but only the
TIP of the ICEBERG



Can you name any additional costs? – Bet you can!



▼ **WHY FIELDBUS?**

- ▼ Fieldbus technologies combined with asset condition monitoring systems and intelligent devices are a pre-requisite for MCoO and 100% Plant Availability.
- ▼ Fieldbus technologies combined with state-of-the-art systems, asset management systems and intelligent devices are a pre-requisite for identifying new key indicators for improvements in plant performance.

▼ **NEXT**

- ▼ The next stage of IICS is free-programming and correlation tools as an adjunct of AMS [or other] to allow easier identification of interdependent plant parameters, for further improvements in the Business Metrics of: Plant Productivity, Quality, MCoO and Availability.



THE END