Performance-based EMS: From Output to Outcomes

29th Environmental & Energy Symposium & Exhibition

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Presentation Outline

- EMS and Readiness – the link
- EMS Design – enhancing management capacity throughout the organization
- Using performance measurement to drive outcomes
- Example application – waste water
- Expansion plans – building out the EMS

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EMS and Readiness

The goal of environmental operations:

Management Results ↑

- Compliance record
- Degree of access to ranges
- Environmental impacts
- Resource use efficiency
- Community relations

Environmental Costs ↓

- Lost training opportunities
- Responding to avoidable environmental problems
- Over-paying to meet environmental objectives
- Paying non-compliance fines

EMS supports readiness by identifying and acting upon opportunities to improve results and reduce costs

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EMS Framework Overview:

- Policy Statement (mission & vision)
- Team selection & training
- "Gap Analysis"

- Identify processes, aspects (e.g. air emissions, land use), impacts (e.g. air pollution, habitat destruction)
- Legal requirements
- Goals & Objectives
- Planning, programming and budgeting process

- Structure & responsibilities
- Training, awareness, competence
- Communication
- Documentation
- Document control
- Operational controls
- Emergency prep & response

- Internal audit
- Monitoring & measuring
- Root cause analysis & corrective action
- Records

- Senior management performance evaluation of policy, goals & objectives

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Knowing what to target: information provides answers to all levels

Should ES re-evaluate its goals & objectives?

What measurable goals are achievable?

What should departmental goals & objectives be?

What is the cost of gaining access to ranges?

Which aspects & practices pose the greatest risk?

Are we meeting our goals & objectives?

What points along the process chain pose the highest costs?

Which issues present the greatest compliance challenge?

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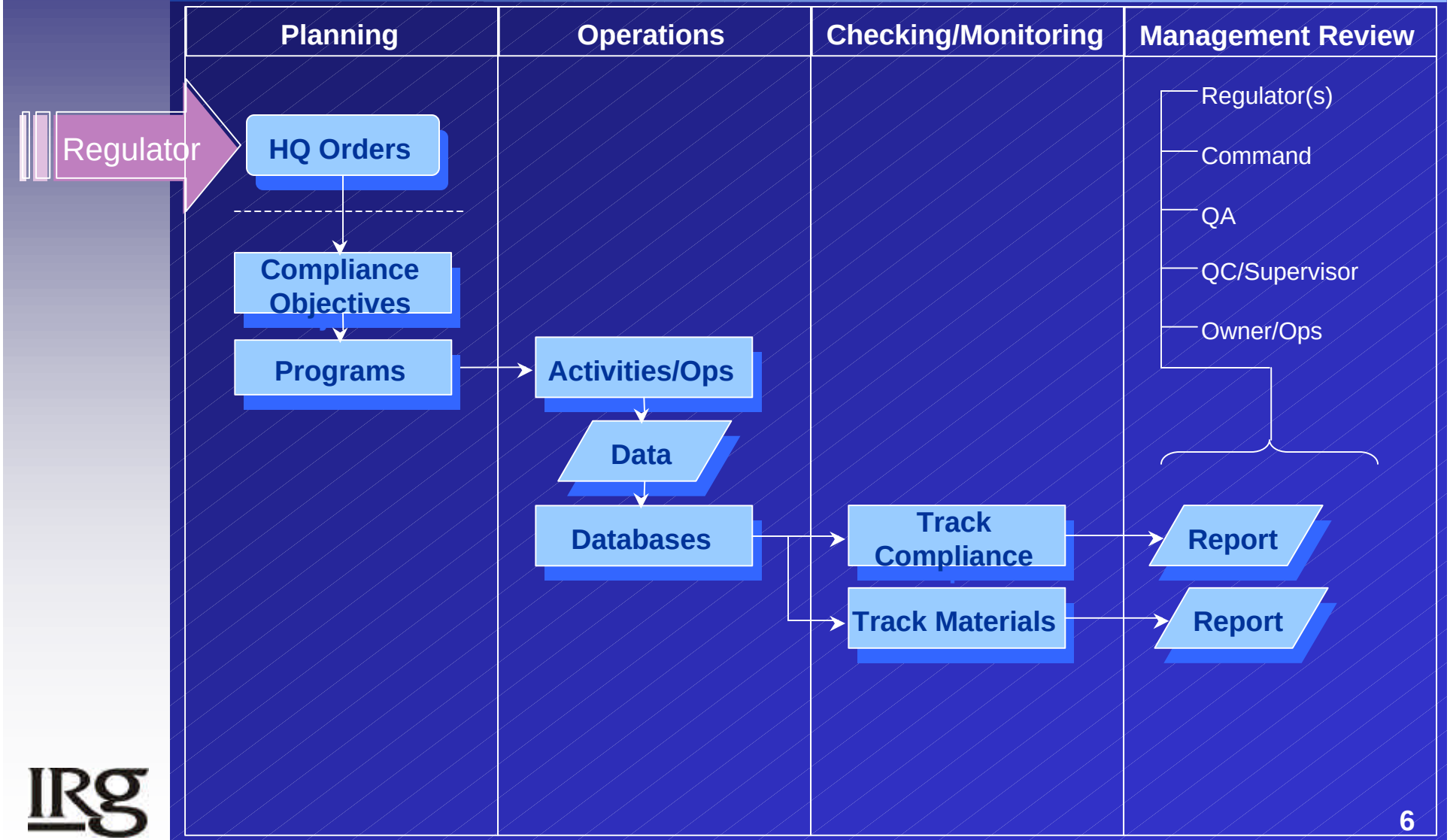
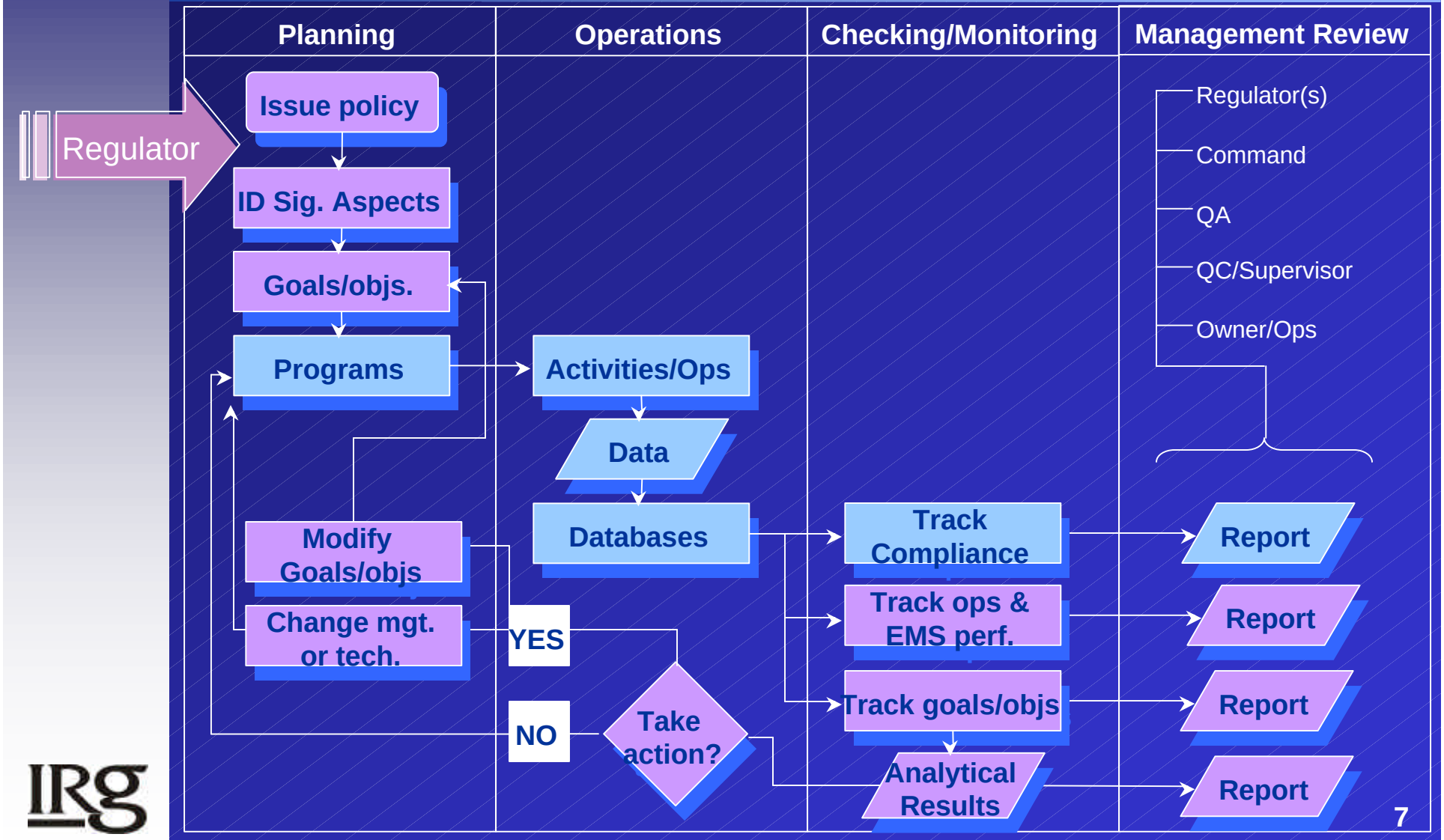
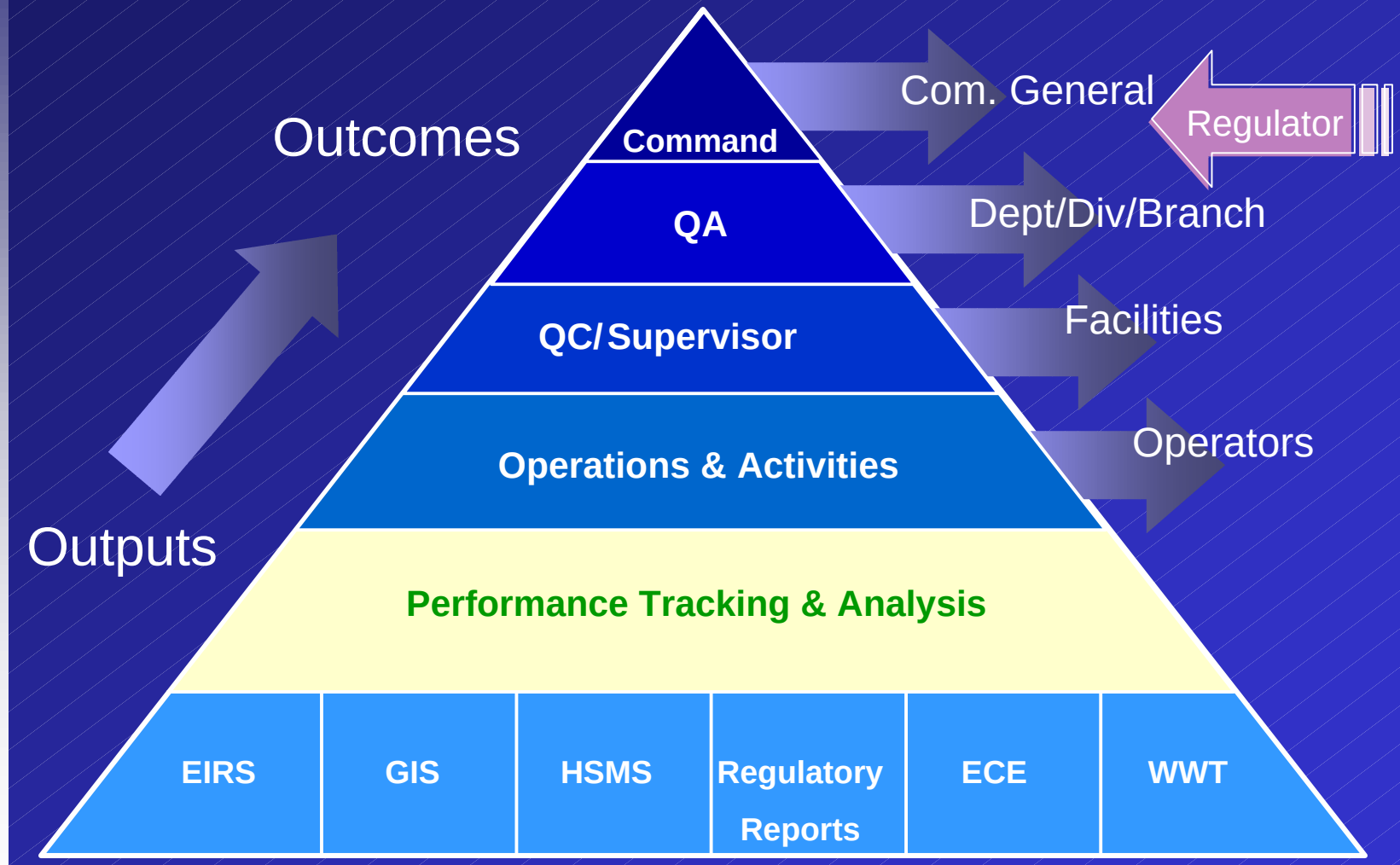
Data Flow Model: As Is



Data Flow Model: To Be



Building the bridge between data and performance information



What the bridge will do:

- Automatically receives data from existing databases in order to maximize data utility ("data productivity")
- Routinely analyzes performance based on indicators at four levels Operations/QC/QA/Command).
- Provides graphical and narrative content for reports, guidelines and orders.
- Allow managers to focus on value-added EMS activities vice mundane, transactional activities

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Two main performance indicator categories:

Operations/QC (output)	QA/Command (outcomes)
• Total haz. material footprint • Total air emissions • Total water releases • Total # of accidental releases • Total time spent on compliance • Total toxic releases • Environmental impacts	• # of targets met/not met • # of major/minor findings • # of training hours without encumbrances • Frequency of audits • # of external complaints • # of NOVs/non-compliance events • Cost of compliance assurance • Cost of meeting objectives

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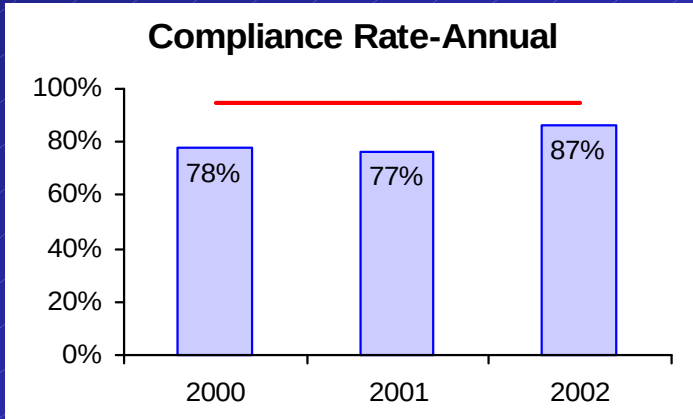
Aspect: Water Usage

Overall Objective: Minimize incidence of violation for waste water treatment

Target: Achieve 100% or higher compliance rate for all treatment plants combined

Performance Indicators Framework:

Management Hierarchy	Key Questions	Indicator Hierarchy	Specific Indicators
• Command	• What is the overall compliance level (all treatment plants combined)?	• Overall Water Quality	• % violation rate (annual and monthly)



Narrative: In the period 2000-02 the compliance rate has improved by 10% to 87% but remains short of the target of 100% or less.

Root Cause: The improvement in compliance was achieved through improvement in performance of Plants 1 and 2.

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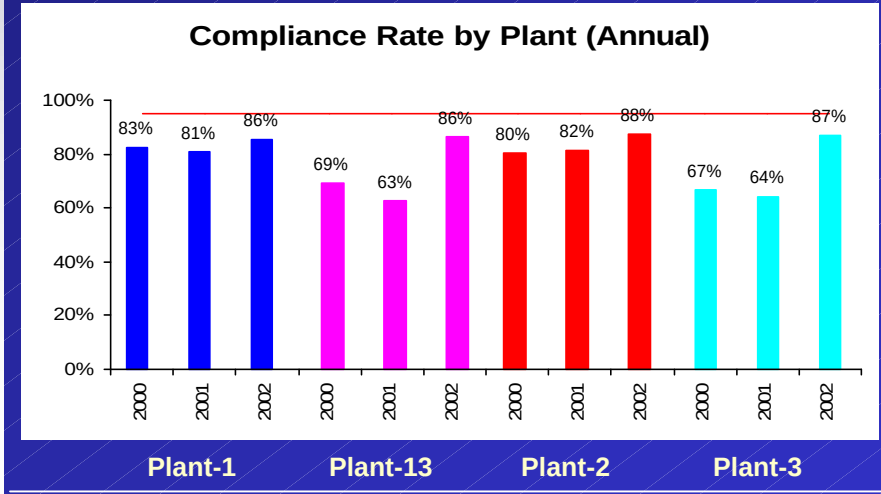
Aspect: Water Usage

Overall Objective: Minimize incidence of violation for waste water treatment

Target: Achieve 100% or higher compliance rate for all treatment plants combined

Performance Indicators Framework:

Management Hierarchy	Key Questions	Indicator Hierarchy	Specific Indicators
• QA/QC and Supervisor	• Plant Level Compliance	• What is the overall compliance level for individual plants ?	• % violation rate (annual and monthly)



Narrative: All plants show improvement trend but remain short of the 100% compliance target. The average improvement per year for the period 2000-03 is around 6-7%.

Root Cause: Plants 1 and 2 improved because of the following reasons:

- Increase in training events for operators

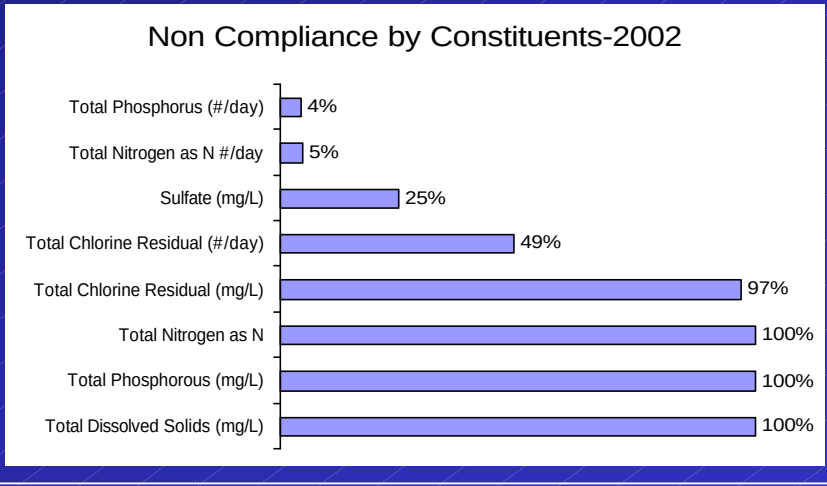
Aspect: Water Usage

Overall Objective: Minimize incidence of violation for waste water treatment

Target: Achieve 100% or higher compliance rate for all treatment plants combined

Performance Indicators Framework:

Management Hierarchy	Key Questions	Indicator Hierarchy	Specific Indicators
• QA/QC and Supervisor	• Compliance by Constituents	• What is the overall compliance level for individual constituents ?	• % violation rate (annual and monthly)



Narrative: Constituents that are of most concern are Total Dissolved Solids, Total Phosphorous, Total Nitrogen and Total Chlorine. These constituents are virtually always in violation.

Root Cause: These constituents are not in compliance due to:

- Antiquated treatment plant technology

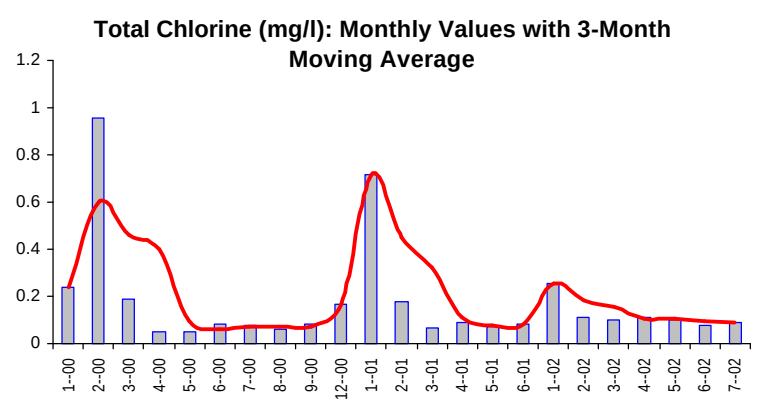
Indicators Analysis: Wastewater Treatment Example

Overall Objective: Minimize incidence of violation

Target: Achieve 100% or higher compliance rate for all treatment plants combined

Performance Indicators Framework

Management Hierarchy	Indicator Hierarchy	Key Questions	Specific Indicators
• Operations and Activities	• Total Chlorine Violation Pattern	• What's the long-term trend and violation characteristics of total chlorine ?	• Monthly Averages



Narrative: Total chlorine shows a cyclical pattern where the effluent values surge in the months of January and February every year. The values decline in other months to around 0.15 mg/l. The cycles are also showing declining peak values.

Root Cause: The reasons for cycles and the decline in peak values are:

- Recurring personnel turnover

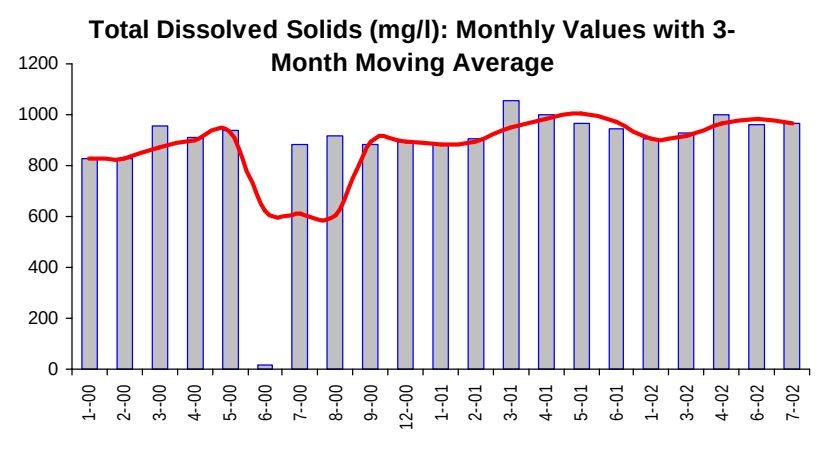
Aspect: Water Usage

Overall Objective: Minimize incidence of violation for waste water treatment

Target: Achieve 100% or higher compliance rate for all treatment plants combined

Performance Indicators Framework:

Management Hierarchy	Key Questions	Indicator Hierarchy	Specific Indicators
• Operations and Activities	• Trend of Total Dissolved Solids	• What's the long-term trend and violation characteristics of total chlorine ?	• Monthly Averages



Narrative: Total dissolved solids shows a slow but worsening trend. This constituent has remained in continual violation for three years. The slow but the declining trend needs to be understood. Could it be associated with treatment plant conditions? A sudden dip in the value could be due to data entry error.

Root Cause: Antiquated treatment plant technology

Steps for instituting performance analysis process:

- Conduct database review:
  - What data is captured?
  - What format?
  - What is is used for?
- Develop performance indicators
- Customize performance measurement system
- Generate baseline report
- Incorporate findings into decision process

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