

Industry-led Efforts to Promote Voluntary Pollution Control: Effect of the Chemical Manufacturing Industry's Responsible Care Program on Environmental Compliance

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1. Introduction

American Chemistry Council (ACC)

- “Driving innovation, creating jobs, and enhancing safety”



Responsible Care



Responsible Care[®]
OUR COMMITMENT TO SUSTAINABILITY

Responsible Care Guiding Principles

Responsible Care[®]

initiative.

We pledge to operate our business according to the following

Guiding Principles

Chemistry is essential to the products and services that help make our lives safer, healthier and better. Through the Responsible Care initiative and the Responsible Care Global Charter our industry has made a worldwide commitment to improve our environmental, health, safety and security performance. Accordingly, we believe and subscribe to the following principles:

- o To lead our companies in ethical ways that increasingly benefit society, the economy and the environment.
- o To design and develop products that can be manufactured, transported, used and disposed of or recycled safely.
- o To work with customers, carriers, suppliers, distributors and contractors to foster the safe and secure use, transport and disposal of chemicals and provide hazard and risk information that can be accessed and applied in their operations and products.
- o To design and operate our facilities in a safe, secure and environmentally sound manner.
- o To instill a culture throughout all levels of our organizations to continually identify, reduce and manage process safety risks.
- o To promote pollution prevention, minimization of waste and conservation of energy and other critical resources at every stage of the life cycle of our products.
- o To cooperate with governments at all levels and organizations in the development of effective and efficient safety, health, environmental and security laws, regulations and standards.
- o To support education and research on the health, safety, environmental effects and security of our products and processes.
- o To communicate product, service and process risks to our stakeholders and listen to and consider their perspectives.
- o To make continual progress towards our goal of no accidents, injuries or harm to human health and the environment from our products and operations and openly report our health, safety, environmental and security performance.
- o To seek continual improvement in our integrated Responsible Care Management System[®] to address environmental, health, safety and security performance.
- o To promote Responsible Care[®] by encouraging and assisting others to adhere to these Guiding Principles.

Responsible Care Metrics

- ACC members required to report:

- » **Energy Metrics**

- » **Environmental Metrics**, including toxic air pollutants released

- » **Safety Metrics**

- » **Accountability Metrics**

2. Contribution

- Previous studies on TRI emissions
 - » Most TRI pollutants not regulated
 - » TRI lacks info on effluent limits
- Our study examines compliance
 - » Compliance status
 - » Extent of compliance
 - Overcompliance
 - “Beyond Compliance”
 - Form of voluntary pollution control

3. Hypotheses to Test

- H1: Pollution prevention, waste minimization codes of conduct improve compliance
- H2: Focus on “process” of pollution control, rather than “outcomes”, fails to influence compliance
- H3: Responsible Care protocols distract environmental management professionals from effective pollution control, leading to less compliance

4. Regulatory Context

- Clean Water Act
 - » National Pollutant Discharge Elimination System (NPDES)
 - Industrial sources
 - » Chemical manufacturing



Jeff Morton
Business Partner



Barbara Heidolph
Marketing Development Manager



Chris Casimiro
Senior Account Manager

Forward Thinking

That Delivers The
Edge You Need

When it comes to meeting our customers' challenges, we stop at nothing. Improving the performance of your products is the reason we're here. At Astaris we deliver innovative ideas to create new products, identify efficiencies and improve quality. Working in partnership with you to develop ideas that others can't even imagine—that's why we work for Astaris. On the job at your facility and at ours, finding solutions is our job and our priority. What can Astaris do for you?



THE LEADER IN CREATIVE PHOSPHATE SOLUTIONS

Astaris facility in Lawrence, KS



Treatment process: Stage 1



Treatment Process: Stage 2



Treatment Process: Stage 3



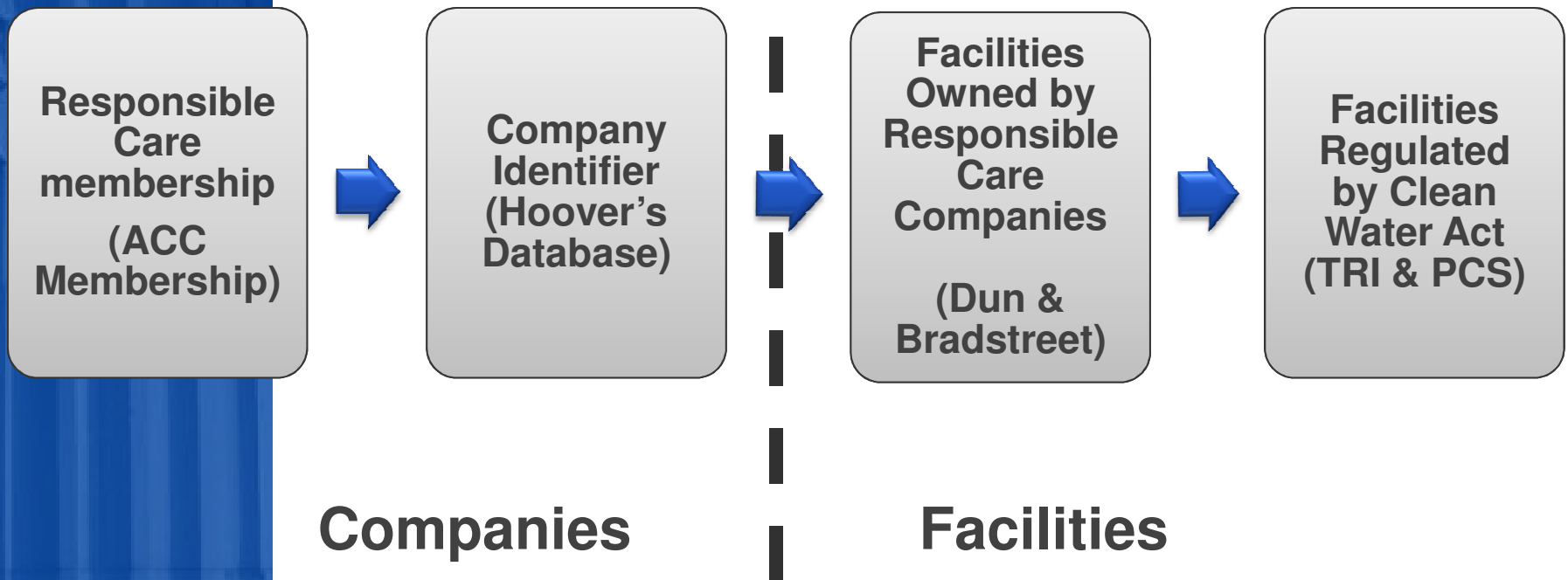
Discharge into Kansas River



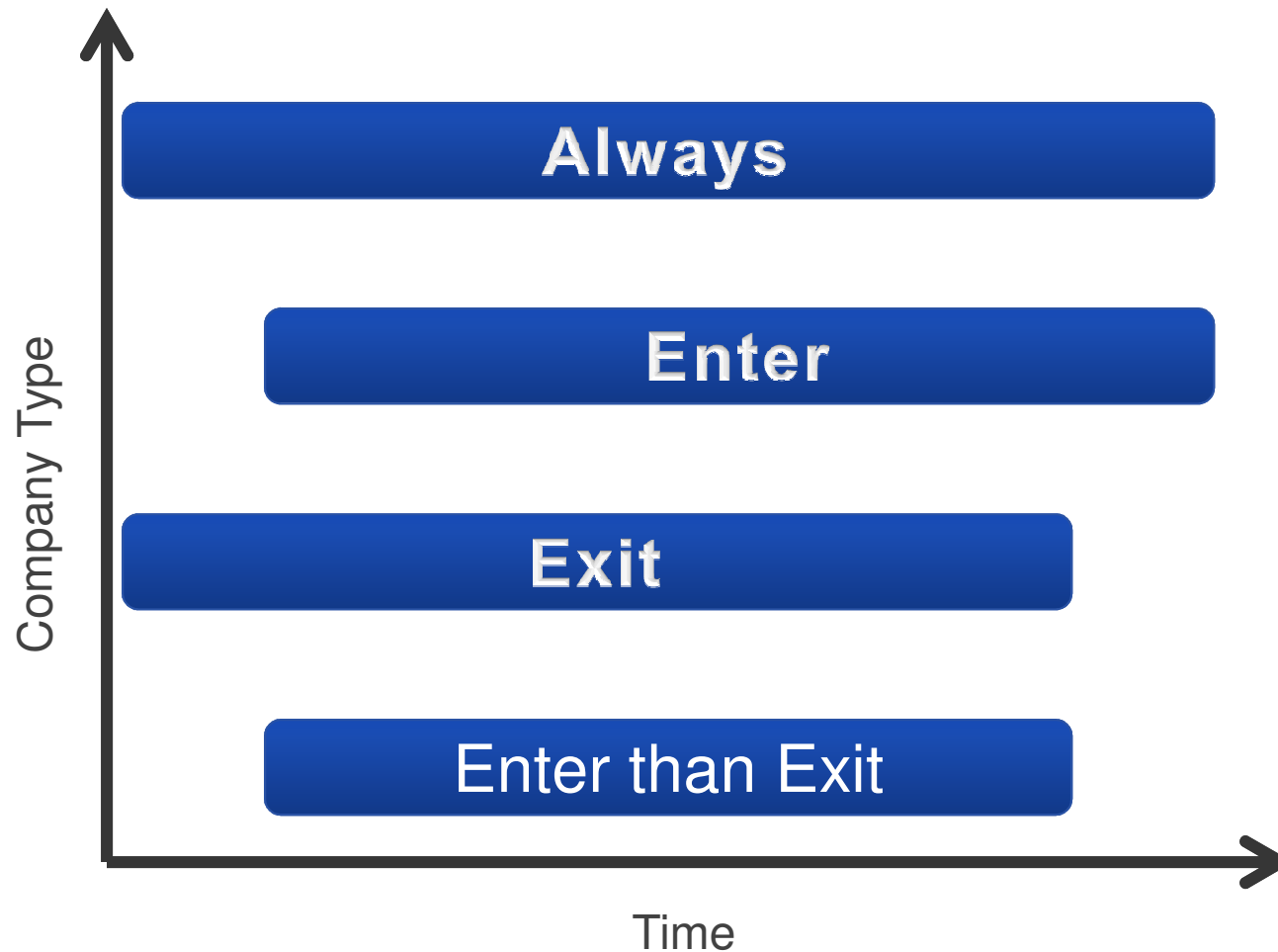
4. Regulatory Context

- Permit with Effluent Limits
- Discharges: measured monthly
- Inspections (i.e., monitoring)
- Sanctions (e.g., fines)
- Sample Period: 1995 to 2001

5. Data

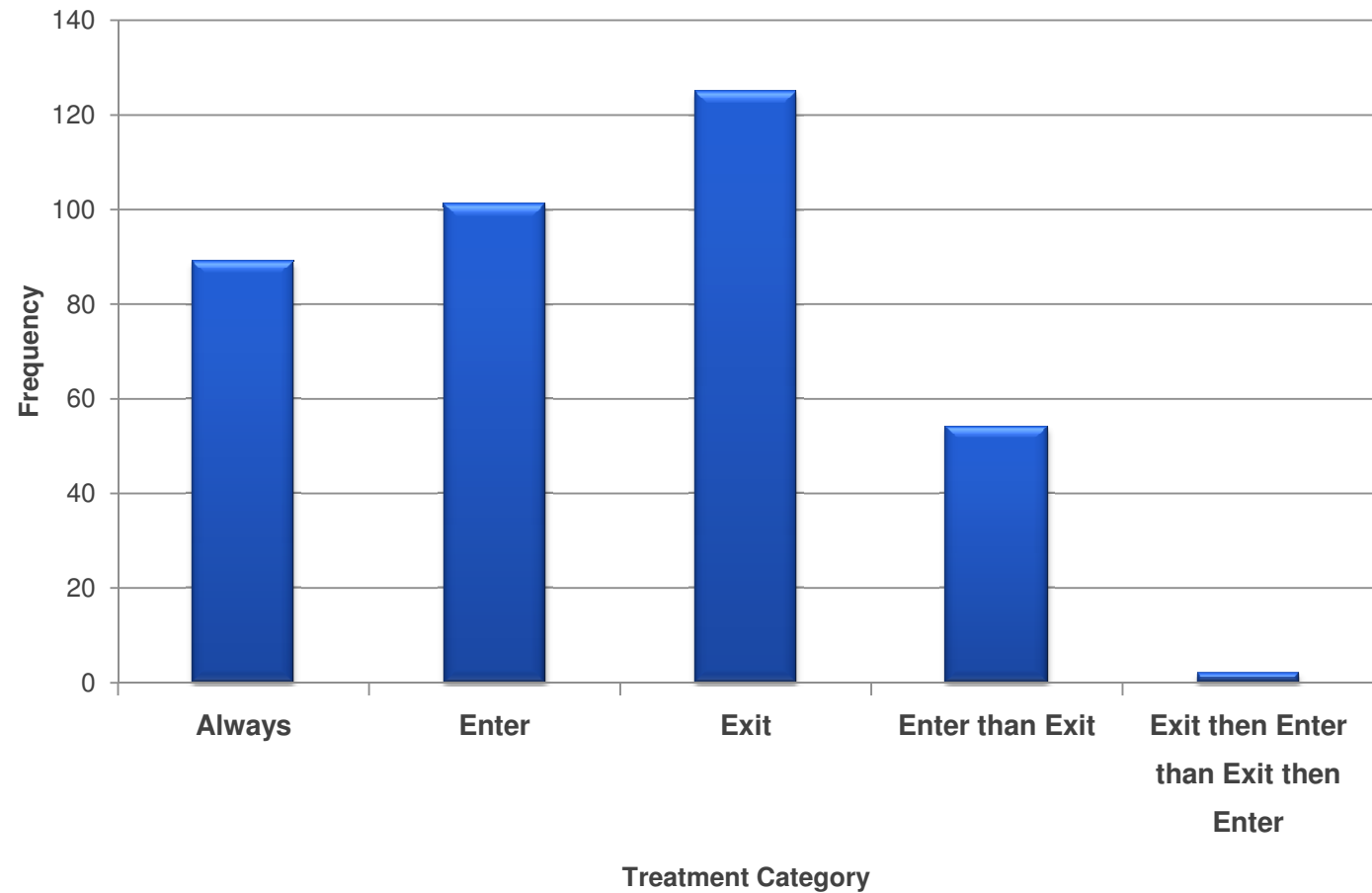


Treatment Categories based on Timing



5. Data

Frequency of Treatment Categories



5. Data

- Sample
 - » 89 facilities, 78 months per facility
 - » N = 7098

Treatment %	# of Facilities	% of Sample
8	1	1
15	3	3
23	16	18
31	2	2
38	4	4
62	1	1
69	6	7
77	1	1
85	3	3
100	52	58

6. Statistical Analysis

- Empirical Objective:
 - » Assess influence
 - of company-level Responsible Care participation
 - on facility-level compliance with wastewater limits
- Estimate functional relationship b/n
 - » Compliance
 - » RC participation + other factors
- Employ regression analysis
 - » Identify “best fitting” line ($y = b + mx$)

6. Statistical Analysis

- Dependent Variables
 - » Discharge ratio = discharges / limit
 - Total Suspended Solids
 - Biological Oxygen Demand
 - » Compliance status
 - Compliance vs Non-compliance
 - All regulated pollutants
 - Binary: employ probit estimator

6. Statistical Analysis

Pollutant Discharge Ratio	N	Mean	Std Deviation
Total Suspended Solids	5481	0.307	0.370
Biological Oxygen Demand	4491	0.305	0.751

	RC Non-participation	RC Participation	Total
Compliance	1548	4107	5655 (79.7 %)
Noncompliance	366	1077	1443 (20.3 %)
Total	1914 (27.0 %)	5184 (73.0 %)	7098

6. Statistical Analysis

- Primary Regressor
 - » RC Participation in given year
- Control Factors
 - » Year indicators or time trend
 - » Industrial sub-sector indicators
 - » Inspections: state, federal
 - » Enforcement actions: federal
- Assess robustness
 - » various dependent variables
 - » various regressor sets

7. Statistical Results

- Total Suspended Solids
 - » RC participation → discharge ratio ↑
 - $p = 0.0001$ (99.99 % confidence)
 - coefficient ≈ 0.049
 - mean discharge ratio = 0.307
 - RC → 16 % ↑ relative to mean
 - » Robust to choice of regressors

7. Statistical Results

- Biological Oxygen Demand
 - » RC participation → discharge ratio ↑
 - $p = 0.0001$ (99.99 % confidence)
 - coefficient ≈ 0.115
 - mean discharge ratio = 0.305
 - RC → 38 % ↑ relative to mean
 - » Robust to choice of regressors
- Compliance Status (all pollutants)
 - » RC participation → violation ↑
 - $p = 0.124$ (insufficient confidence)
 - treat as 0

8. Conclusions, Caveats

- Responsible Care participation
 - » Fails: improve overall compliance status
 - » Undermines extent of compliance regarding two prominent pollutants
- Caveats
 - » Single time period: 1995 to 2001
 - » Excludes fully un-treated facilities (i.e., companies never participated)