PROTOCOL FOR
DETERMINING ECONOMIC ACHIEVABILITY
FOR NPDES PERMITS

12 August 1982

CONCLUSIONS

- Two stage test may resolve conflict re:

  -- inadequacy of firm-level analysis even though it is easy to perform

  versus

  -- accuracy of plant-level analysis

- Reliance just on firm level analysis may encourage litigation

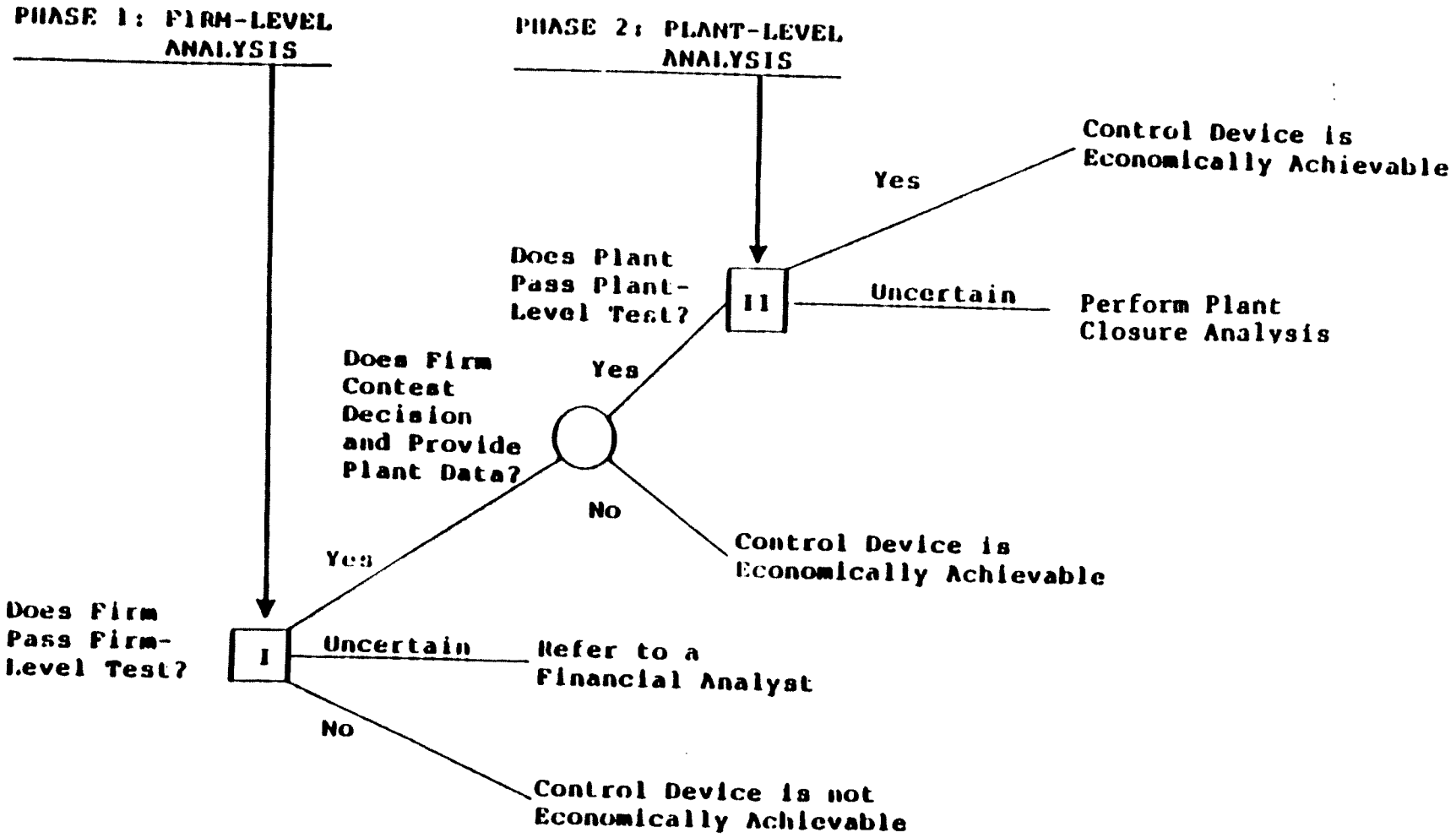
- Major limitations are:

  -- Difficulty in detecting biased plant level data.

  -- Rigorous analysis would be complicated.

- The two stage protocol is a screening method which should be adequate in most cases. A rigorous plant closure analysis will still be needed in a few situations.

SEQUENCE OF ANALYSES FOR DETERMINING ECONOMIC ACHIEVABILITY



APPROACH

A two stage test is recommended:

Stage I Firm Level Analysis

Stage II Plant Level Analysis

The Stage I test will show that in most applications the pollution controls will be economically achievable.

If a firm contests the decision, then it must provide EPA with plant specific data to perform the Stage II test.

NECESSARY FINANCIAL STATEMENT DATA

- Complete using Moody's report

Balance Sheet

Assets	Current Assets	
	Inventories	
Liabilities	Current Liabilities	
	Current Portion of Long-Term Debt	
	Total Long-Term Liabilities	
	Net Stockholders Equity	

Income Statement

Interest Expense	
Depreciation	
Other Fixed Payments (Rent)	
Net Profit Before Taxes (Earnings Before Tax)	
Net Income After Tax	
Extraordinary Item	

OTHER NECESSARY INFORMATION

Pollution Control Costs and Assumptions

1.	Capital Cost	$12,000,000
2.	Annual Operating Expenses	$250,000
3.	Estimated Life of Equipment	8 years
4.	Expected Operating Cost Growth Rate	0 percent
5.	Annual Credits for Product Recovery	0 percent

Company Market Information

1.	Inmont Company Beta (β)		1.10
2.	Risk-free Rate of Interest (r_f)		.12
2.	Interest Charged on New Company Debt		.17
3.	Marginal Income Tax Rate		.46
4.	Stock Price	High	10.9
		Low	5.0
5.	Number of Shares Outstanding		7,890,000

FIRM LEVEL ANALYSIS

- Approach relies on publicly available data

- Two components to analysis:

  1. Financial statement analysis
  2. Market value analysis

- Guidelines are provided to evaluate conflicting signals of financial health.

FINANCIAL STATEMENT ANALYSIS

- The analysis involves using data from balance sheets and income statements to calculate various financial indicators.

- Three types of ratios are calculated
  - -- liquidity ratios
  - -- solvency ratios
  - -- leverage ratios

- Critical values for comparison
  - -- financial rules of thumb
  - -- intra-industry comparison
  - -- time series comparison

- Data required
  - -- Four digit SIC code of firm
  - -- Financial statements for last three years usually found in Moody's Industrial Manual
  - -- Industry average financial reviews found in Robert Morris Associates, Annual Statement Studies.

LIQUIDITY RATIOS

- Liquidity ratios reflect a firm's ability to meet its short-term financial obligations.

- Two ratios are used:

  -- Current ratio

  -- Quick ratio

- Current Ratio = Current Assets / Current Liabilities

- Quick Ratio = $\frac{\text{(Current Assets - Inventory)}}{\text{Current Liabilities}}$

SOLVENCY RATIOS

- Solvency Ratios measure a firm's ability to meet long-term financial obligations and indicate the likelihood of bankruptcy.

- Two ratios are used:

  -- Fixed charge coverage ratio

  -- Beaver's ratio

- Fixed Charge Coverage Ratio

$$\frac{\text{Cash earnings before fixed charges}}{\text{All fixed charges}}$$

- Beaver's Ratio

$$\frac{\text{Internally generated cash flow}}{\text{(Current liabilities + Long term debt)}}$$

BEAVER'S RATIO

- A study has identified ratio as the single best predictor of bankruptcy.

- Assume partial debt financing in proportion to firm's debt ratio.

- Nonrecurring expenses or revenues should be excluded.

LEVERAGE RATIO

- Leverage measures the proportion of a company's value that is financed by debt relative to the proportion that is financed by stockholders.

- The Debt-Equity Ratio is the most commonly used indicator of leverage.

- D/E = Long-term Liabilities / Total Stockholder's Equity

- It is not a particularly useful number for assessing financial health, but it may be helpful in interpreting solvency ratios.

- Industry average ratios and historic ratios are important comparative indicators. A general target does not exist.

- The ratio is not adjusted for the cost of pollution control because if it is financed by debt the firm usually will retire other higher cost debt.

MARKET VALUE ANALYSIS

- Stock market prices are used as a proxy for the future performance of a firm.

- Stock market value equals the net present value of a firm's expected future cash flows.

- Two approaches are used:

  -- Measure the effect of pollution control costs on stock price

  -- Examine trends in market value

- To do the analysis, the net present value cost of the pollution control device must be estimated.

CONCLUSIONS FOR EXAMPLE FIRM

- Liquidity ratios indicate the control device can be purchased with current assets.
- Solvency ratios are low but they are not significantly affected by pollution control costs. Rely on Liquidity results.
- Debt-equity ratio and bond ratings indicate low risk of default.
- Market indicators are positive.
- Overall conclusion: Firm can afford the pollution control equipment.

DRAWING CONCLUSIONS FROM FIRM LEVEL ANALYSIS

- If all tests are positive, the pollution control option is economically achievable.

- If all analyses indicate poor financial condition, the pollution control option would not be economically achievable.

- In some cases all indicators will not agree on the financial condition of the firm. A framework for evaluating conflicting signals is necessary.

EVALUATION OF CONFLICTING SIGNALS IN FINANCIAL CONDITION

- **Trade offs**

	Conflict	Solution
Positive Indicator: Negative Indicator:	Liquidity Ratio Large Solvency Ratio Small Debt-Equity Large	Rely on Liquidity Ratios unless firm has recently borrowed large sums of money. Then rely on Solvency ratios.
Positive Indicator: Negative Indicator:	Debt-Equity Ratio Low Market-to-Book Low	Rely on Liquidity and Solvency Ratios
Positive Indicator: Negative Indicator:	Debt-Equity Low High Bond Ratings Solvency Ratio Low	Rely on Bond Ratings
Positive Indicator: Negative Indicator:	Market Value Not Declining Liquidity Ratios Large Solvency Ratios Declining	Rely on Liquidity Ratios and Market Value

PLANT LEVEL ANALYSIS

- Necessary when a firm contests the firm level decision.

- Any analysis based on costs and revenues specific to a plant faces the following problems:

  -- Plant level financial data are usually confidential,

  -- The necessary data are not always collected by firms at the plant level,

  -- Non-standardized accounting procedures do not facilitate easy verification of reported cost and revenue items, and

  -- Companies will have the incentive to misrepresent their plant's condition.

- Thus, the tests presented here are useful as screening mechanisms not as definitive rules for determining economic achievability.

- When screen is inconclusive, a plant closure analysis will be necessary.

PLANT TEST

- Three tests are used:
  - -- The earnings test
  - -- The gross margin test
  - -- The revenue test
- Require data from plant income statement
- Require estimation of annual pollution control costs

ANNUAL POLLUTION CONTROL COST

- Capital Cost of buying and installing the equipment must be annualized to allocate cost over time.

- Operating Cost, annual expenses to maintain and operate the equipment, are already in annual terms.

- A Capital Recovery Factor (CRF), when multiplied by the capital cost of the equipment, defines a series of level cash flows that have a discounted NPV equal to the NPV of the investment and all tax shields over the useful life of the asset.

- An average CRF for the chemical industry of .17 can be used to annualize capital costs.

PLANT INCOME STATEMENT

Income Statement Components

REVENUES

- Pounds of chemical produced at the plant x price per pound

COST OF GOODS SOLD

- Cost of materials
- Direct labor cost
- Production overhead cost

GROSS MARGIN

- Revenues - Cost of Goods Sold

CORPORATE OVERHEAD

- Selling, general and administrative expenses
- Interest Expense
- R&D Expense
- Depreciation on common property

EARNINGS BEFORE TAXES

- Revenues - Cost of Goods Sold - Corporate Overhead

THE EARNINGS TEST

- If earnings before taxes are greater than zero after the annual cost of pollution control has been subtracted, the equipment is economically achievable.

- Definition allows plant to cover all fixed and variable costs in the long run and remain in operation.

- Major drawbacks:

  -- Corporate overhead expenses are not usually allocated to individual plants explicitly.

  -- Biases in corporate overhead allocations would be difficult to detect.

THE GROSS MARGIN TEST

- Designed to provide measure of economic achievability equivalent to the earnings test.

- If the annual cost of pollution control is less than a defined fraction of gross margin, the equipment is economically achievable.

- The threshold is defined as the ratio of EBT to gross margin for the particular industry segment.*

*Calculated from Robert Morris Associates by four digit SIC code.

LIMITATIONS OF GROSS MARGIN TEST

- Test is only a proxy for the earnings test because actual EBT are not known.

- Firms may not calculate gross margin at the plant level.

- Test assumes that pollution control costs cannot be passed on to customers through higher prices.

- Average CRF assumes that risk and return characteristics of the plant are like that of the industry.

- Biases in reported data would be difficult to detect:

  -- Transfer prices

  -- Inventory cost allocation

THE REVENUE TEST

- Designed to provide a measure of economic achievability equivalent to the earnings test.
- Used when costs are not available and as a check on the gross margin test.
- If the annual cost of pollution control is less than a defined fraction of revenue, the equipment is economically achievable.
- The threshold is defined as the ratio of EBT to revenues for the particular industry segment.

DECISION RULE FOR THE REVENUE TEST

Annual Cost of Pollution Control / Revenues	$<$	Threshold	Equipment is economically achievable
Annual Cost of Pollution Control / Revenues	$\geq$	Threshold	Inconclusive: plant closure analysis necessary

SIC	Threshold (low value of EBT/Revenue range)
2831 2833 2834	.05
2873 2874	.02
2861 2865 2869	.02
2851	.03
2844	.06
2821	.03
2841	.04

LIMITATIONS OF THE REVENUE TEST

- Very crude test which relies on limited data.
- Depends entirely on industry average data for costs and EBT estimates.
- Assumes average CRF is reflective of firm characteristics.
- Transfer prices could bias revenues.

CONCLUSIONS FOR SAMPLE PLANT

Test	Decision Rule	Conclusions
1. The Earnings Test EBT - Cost of Control = 16.36	>0	Economically Achievable
2. The Gross Margin Test $\frac{\text{Cost of Control}}{\text{Gross Margin}} = .02$	<.07	Economically Achievable
3. The Revenue Test $\frac{\text{Cost of Control}}{\text{Revenue}} = .006$	<.02	Economically Achievable

- Control equipment is easily affordable.