

# ChlorAlert: A Chemical Sensor for the Transportation Industry



Sponsored by Union Tank Car Company

IIT Faculty Advisors: Joseph R. Stetter  
William Penrose

# History

- UTLX concerned about NARs

- UTLX approaches IIT (2000)

- IIT creates IPROs to find solution
- IPRO performs feasibility studies
  - Chlorine sensor technology developed
  - Concept evolves to include telecommunication system
  - First prototypes built
- Project goals broaden and ENPRO is formed



# Problem Definition

- NARs : small leaks that usually occur around the fitting assembly through
  - gaskets on safety, loading and unloading valves
  - thermal wells
- Safety Issues
  - possible exposure to workers
  - explosion hazard
- Pollution Issues
  - air and water contamination



# ENPRO Spring 2002

- Develop a chlorine leakage detection system
  - Refine product
  - Build product
- Perform Testing
  - In-lab testing
  - Field-testing
  - Revise product
- Develop Business Plan
  - Market research
  - Raise capital



# Team Members

## Student members -

Naveed Aziz

Robert Bobek

Kapil Gupta

Birute Jurjonas

Naveed Mirza

Martin Miyumo

Oluwatosin Ogunlela

Preaw Prommintr



# Team Organization

- Division according to tasks

- Electrical
- Mechanical
- Testing
- Documentation
- Website
- Business Plan

- Time management

- PERT chart





# Subgroups

## ■ Electronic

- Potentio-stat boards
- Power supply boards

## ■ Mechanical

- Sensor Housings
- Mounting brackets

## ■ Testing

- In-lab testing
  - Chlorine Sensors
  - Potentio-stat boards
- Field Testing
  - ChlorAlert systems

## ■ Documentation

- Indexing documents
- Purchasing accounts records
- Time logs
- Meeting minutes
- Correspondence

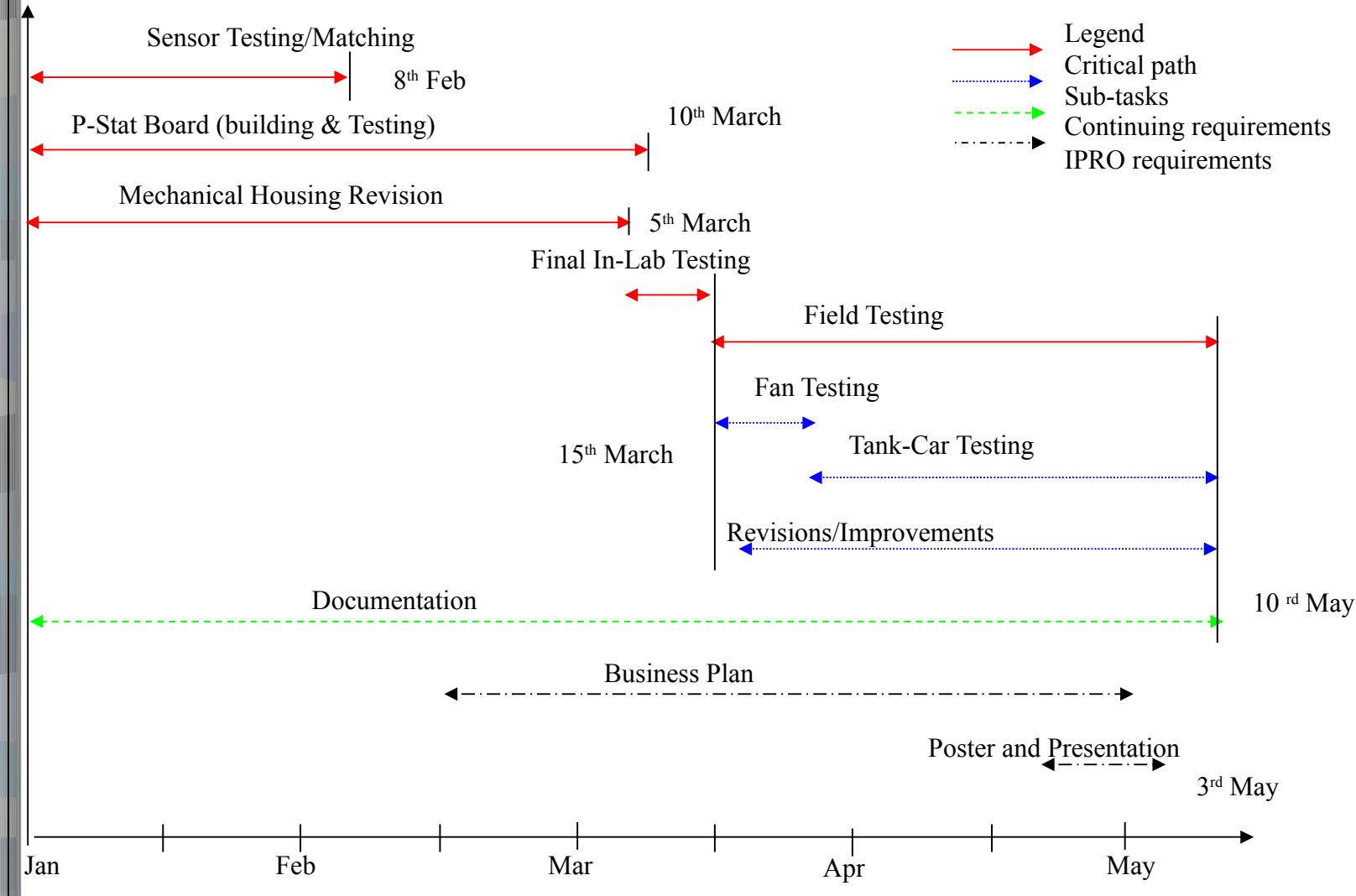
## ■ Website

- [www.iit.edu/~ipro353](http://www.iit.edu/~ipro353)
- Update/maintain

## ■ Business Plan

- Revise previous plan

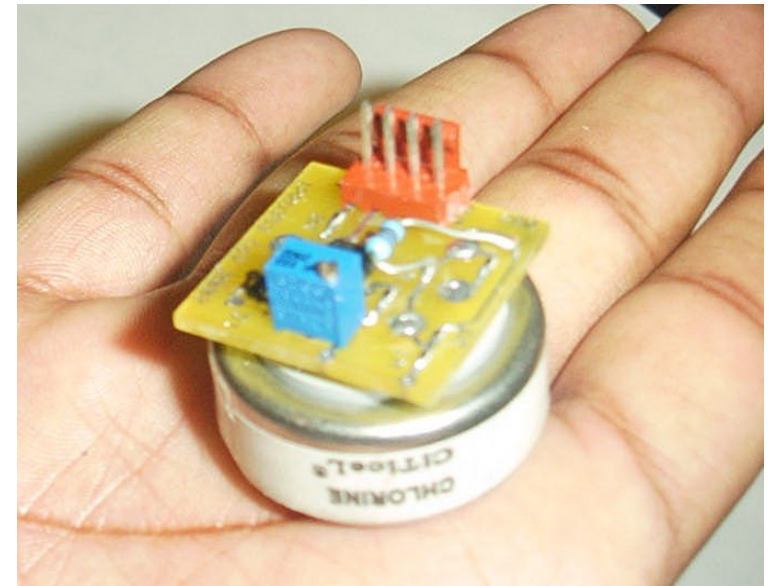
## PERT Chart: Progress Plan IPRO-353 Spring 2002





# Electronic

- Develop potentio-stat boards
  - Original boards kept short-circuiting
    - Numerous components
    - Soldering sensitive
  - New boards developed
    - Fewer components



# Mechanical



- Sensor housings
  - Revise Autocad drawings
    - Sensor location
    - New sensor dimensions
    - P-stat board dimensions
    - Weatherproofing
  - Mounting issues
    - Incompatible mounting holes
    - SupplyNet boxes
    - Brackets

# Testing

- Chlorine sensors
  - IIT sensors defective
  - Temporary sensor found
    - New problems arise
- Potentio-stat boards
  - Incompatibility with new sensors
  - Simplified design
- ChlorAlert system
  - Component problems
  - Component delivery delays



# Business Plan



Company name: ChemAlert IIT/UTLX

Principal product: ChlorAlert system

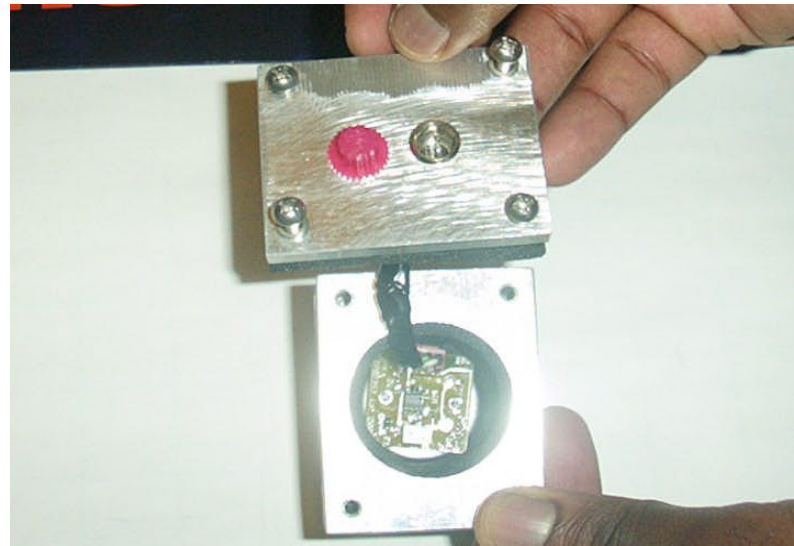
# Problem

- Non-Accidental Leaks
  - Small leaks usually occur in manways of railway tank cars
  - No visible way to detect the leak
- Significance of gas leaks
  - Personal safety issues
  - Environmental issues
  - Legal issues



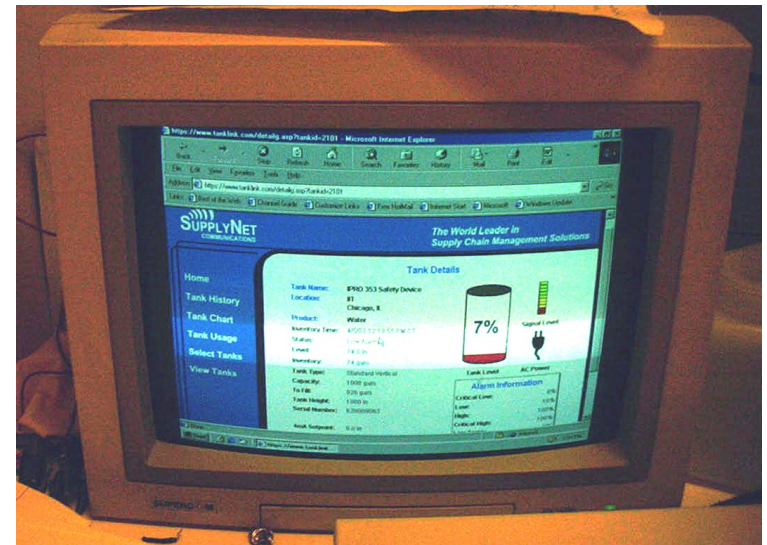
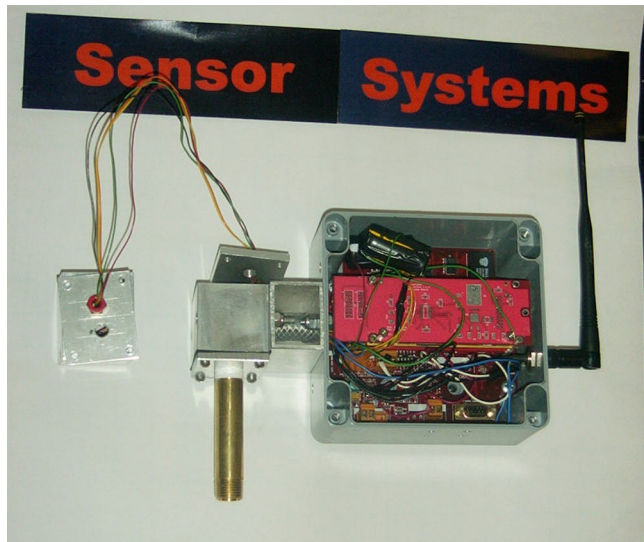
# How we solve the problem

- ChemAlert develops chemical sensor systems for the transportation industry
  - Initial transportation focus on railroads
  - Initial chemical focus on chlorine gas
  - Future sensors to include HCL, LPG, Chloromethane, CO,
- Sensor system
  - detects NARs
  - alerts customers



# The Product/Service

- Inexpensive product to detect minimal gas releases
- Provides a visible indication of a gas leak
  - Red light indicates a release had occurred
- Notification to the monitoring center
- Telemetry option with access via internet
- Temperature gauge indicating exposure to extreme temperatures



# Customers

- Potential customers include:

- Railways
- Tank car suppliers
- Tank car manufacturers
- Chemical industries

- Benefits to customers:

- Financial/Liability
- Quality of life







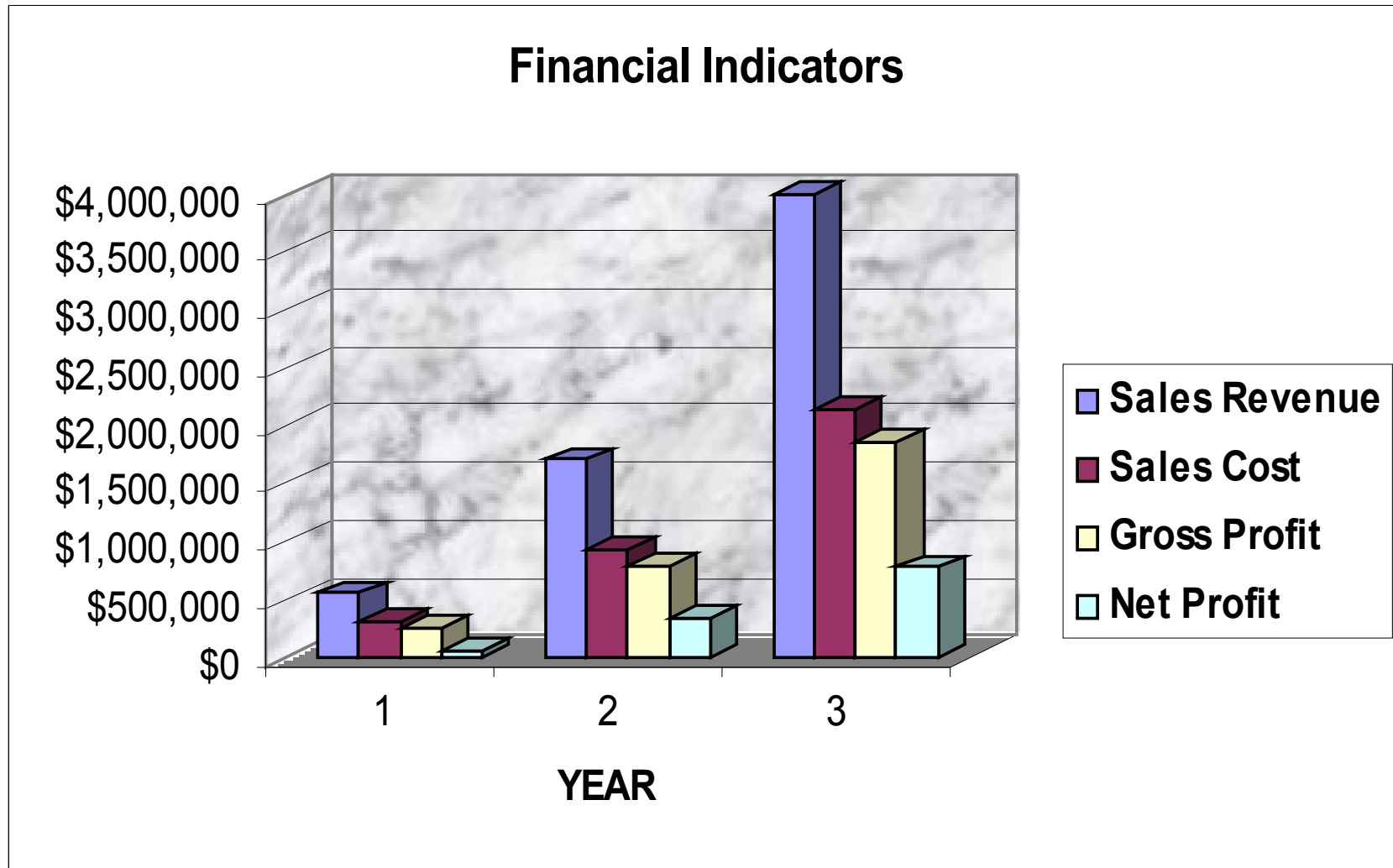
# Market size

- Approximately 16,000 tank cars transporting chlorine within the United States
  - UTLX
    - 6000 chlorine tank cars
    - Sales of \$9 million in the past year
- Expansion via
  - trucking industry
  - international sales
- About 65% of companies will use ChlorAlert
  - Reasons for extensive market capture
    - Product accuracy
    - Outstanding product benefits

# Financials - Cost

Component	Cost
Cell phone (from Transix)	\$500
Chlorine sensor (2 per ChlorAlert)	\$250@
Light bulb	\$30
Circuit board (for P-stat board)	\$20
Housing	\$20
Labor (assembly & testing)	\$55
<b>Fixed Cost</b>	
Manufacture Cost	\$1125
Salary, benefits	\$225
Taxes	\$112
Insurance	\$112
Utilities	\$112
Fixed Cost Total	\$1686
<b>Variable Cost</b>	
Sales Commission	\$50
Shipping & Freight charges	\$50
Promotions	\$12
Variable Cost Total	\$112
<b>TOTAL COSTS</b>	<b>\$1798</b>

# Financials - Income



# Path Forward

## ■ ChemAlert product development

- Completion of field test
- Refinement of the product
- Filling executive board positions

## ■ Marketing

- Buying wireless service and selling with ChemAlert system
- Selling ChemAlert products directly, while acting as a wireless distributor
- Sell ChemAlert individually and have customer find wireless service



# Risks

- Uncertainty of new product
  - Technical problems
    - Durability of sensor system
    - Nationwide transmission of data
  - Market issues
    - Finding customers
    - Raising capital
    - Growth
  - Competition



- Risk management
  - Build highest quality product
  - Update telecommunication system
  - Expand to include new customers



# Summary

- The ChlorAlert system
  - Increases safety
  - Decreases pollution
  - Saves money
- Success of the ChlorAlert system is assured
  - Accuracy
  - Innovativeness
  - Relative low cost
- Support for ChlorAlert system
  - Market viability
  - Growth potential



# Acknowledgements

Special thanks to:

- Union Tank Car Company
- Lemelson foundation NCIIA grant
- IIT IPRO
- IIT Entrepreneurship program
- BCPS machine shop