IPM for Commercial Grain Storage: Industry Perspective

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Areawide IPM for Stored Grain

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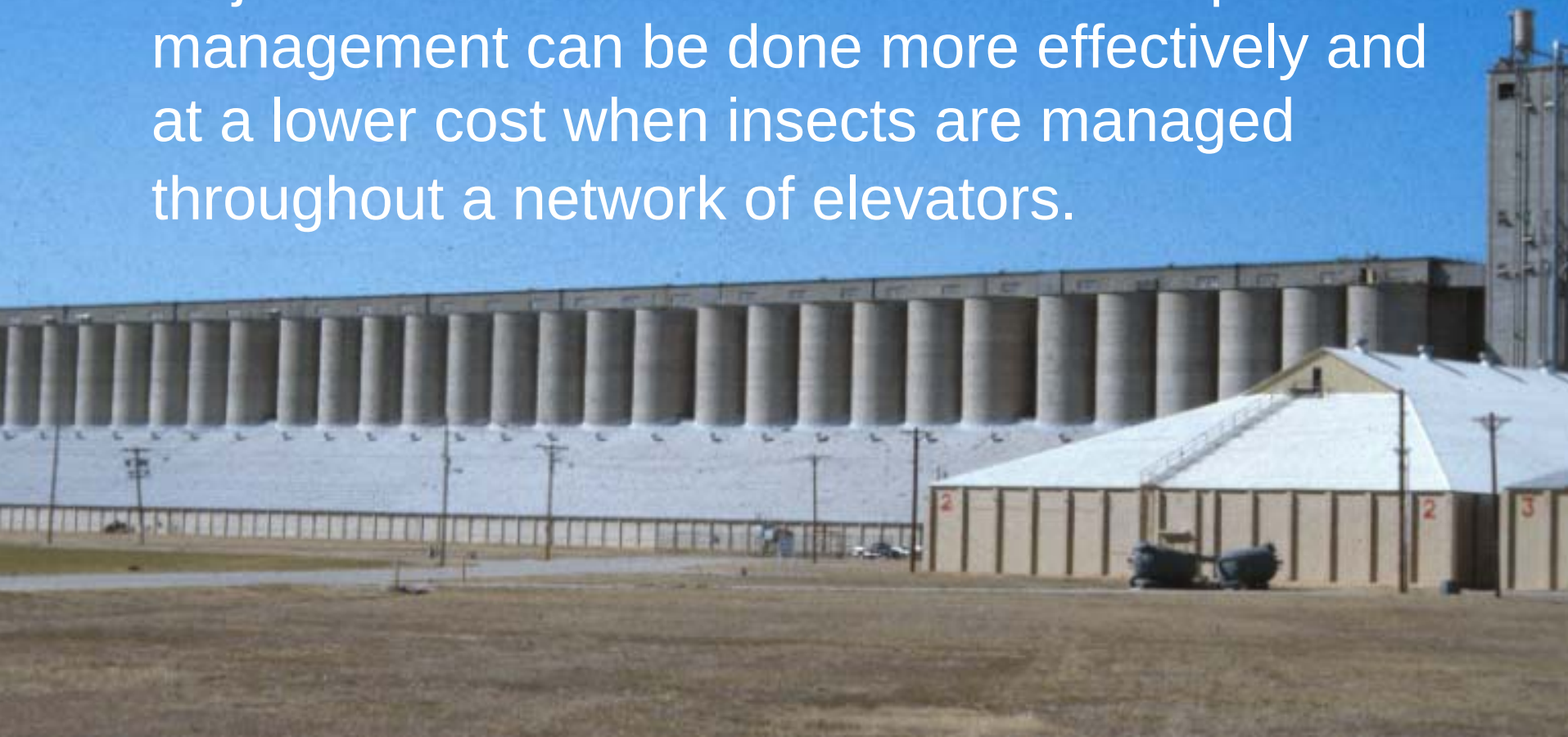
- Objective: to determine whether insect pest management can be done more effectively and at a lower cost when insects are managed throughout a network of elevators.



How the Areawide IPM Concept Applies to Stored Grain

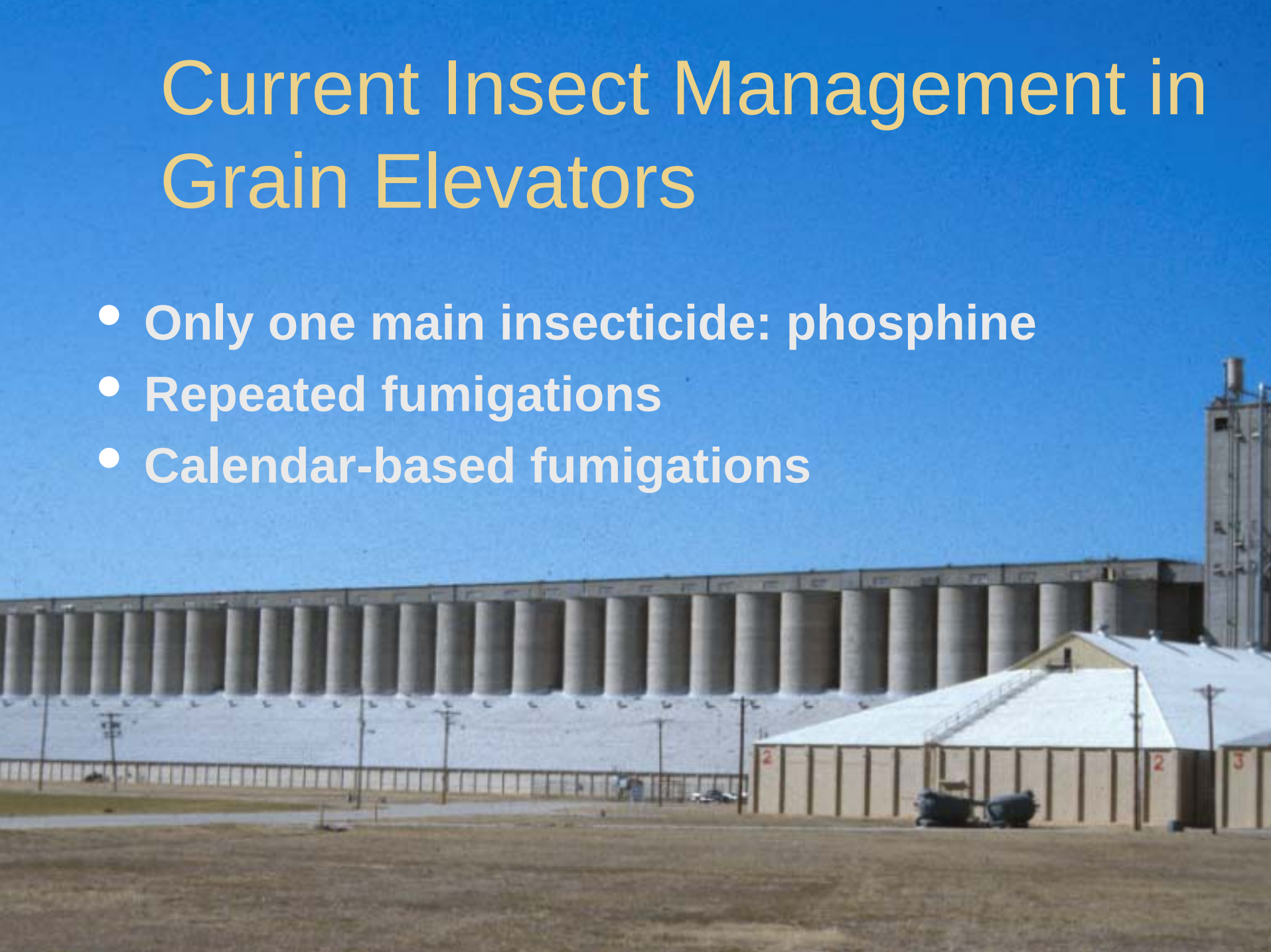
- Areawide IPM is particularly important for stored wheat because insects are moved through the marketing system along with the grain. If insects are not controlled at one location, they can be spread to many other locations, which increases the cost of pest management.

Areawide IPM Project for Stored Grain

- We have two years of field data from 16 elevators in Kansas and Oklahoma.
- Goal: reduced need to use insecticides through insect sampling and risk analysis software.
- The cost effectiveness of this program will be evaluated during the next 2-years.

Current Insect Management in Grain Elevators

- **Only one main insecticide: phosphine**
- **Repeated fumigations**
- **Calendar-based fumigations**



Problems with Current Insect Management Programs

- Poorly-targeted applications
- Kills natural enemies
- Insecticide substituted for preventative practices

Differences Between Current and Alternative Approach to Insect Management in Stored Grain

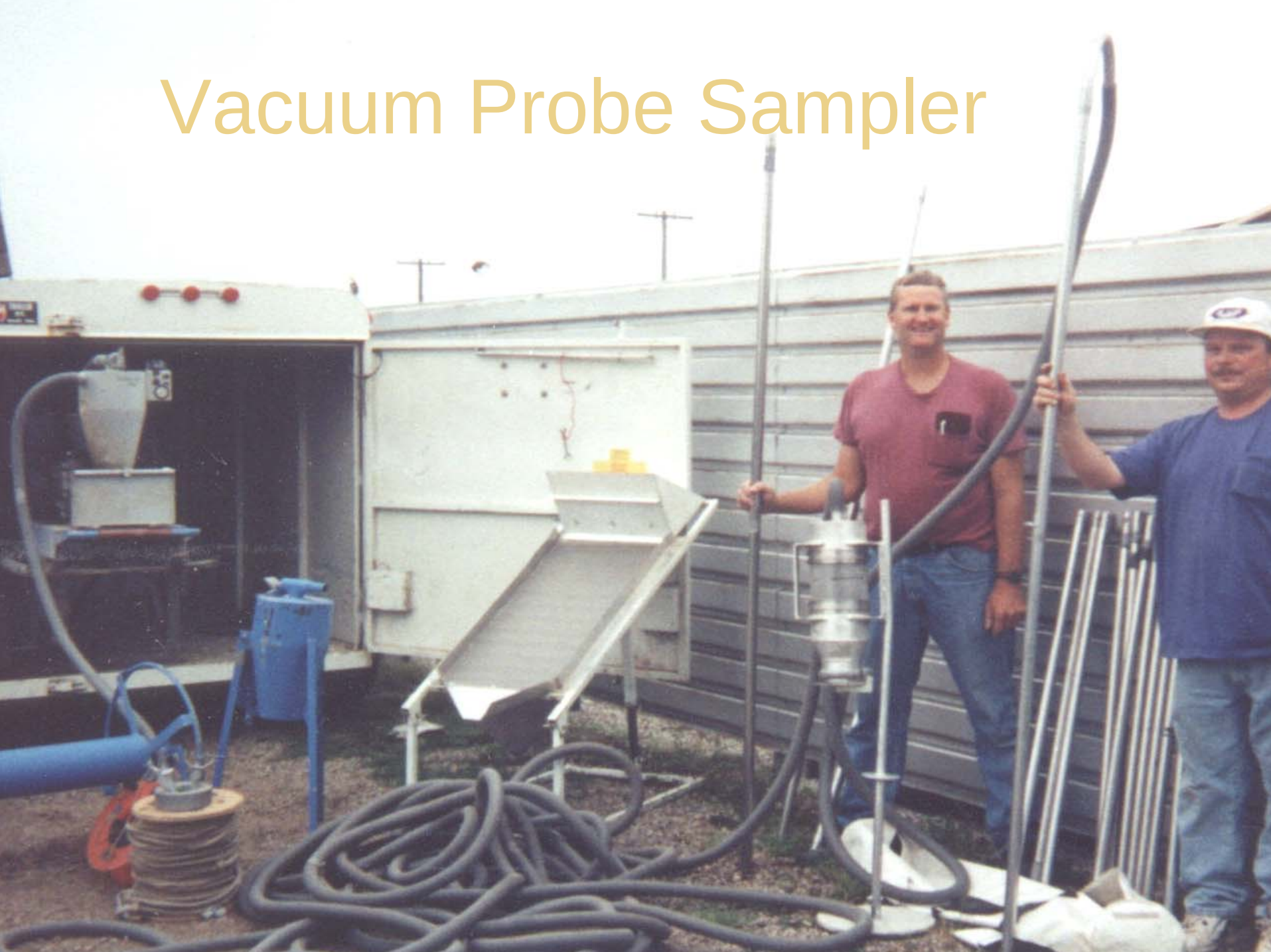
	Current Approach	Alternative Approach
Risk-management tool	Preventative and/or periodic fumigation	Accurate information on insect densities
Decision-making	Based on personal experience	Risk analysis software recommends treatment based on sampling and predicted insect density
Grain Cooling	Variable, usually done too late to control insects	Automatic controllers allow early cooling to suppress insect growth
Sanitation	Variable	Targeted to be cost-effective
Fumigation	Based on schedule or inadequate data	Done only when insect density exceeds threshold

Anticipated Results of Alternative Approach

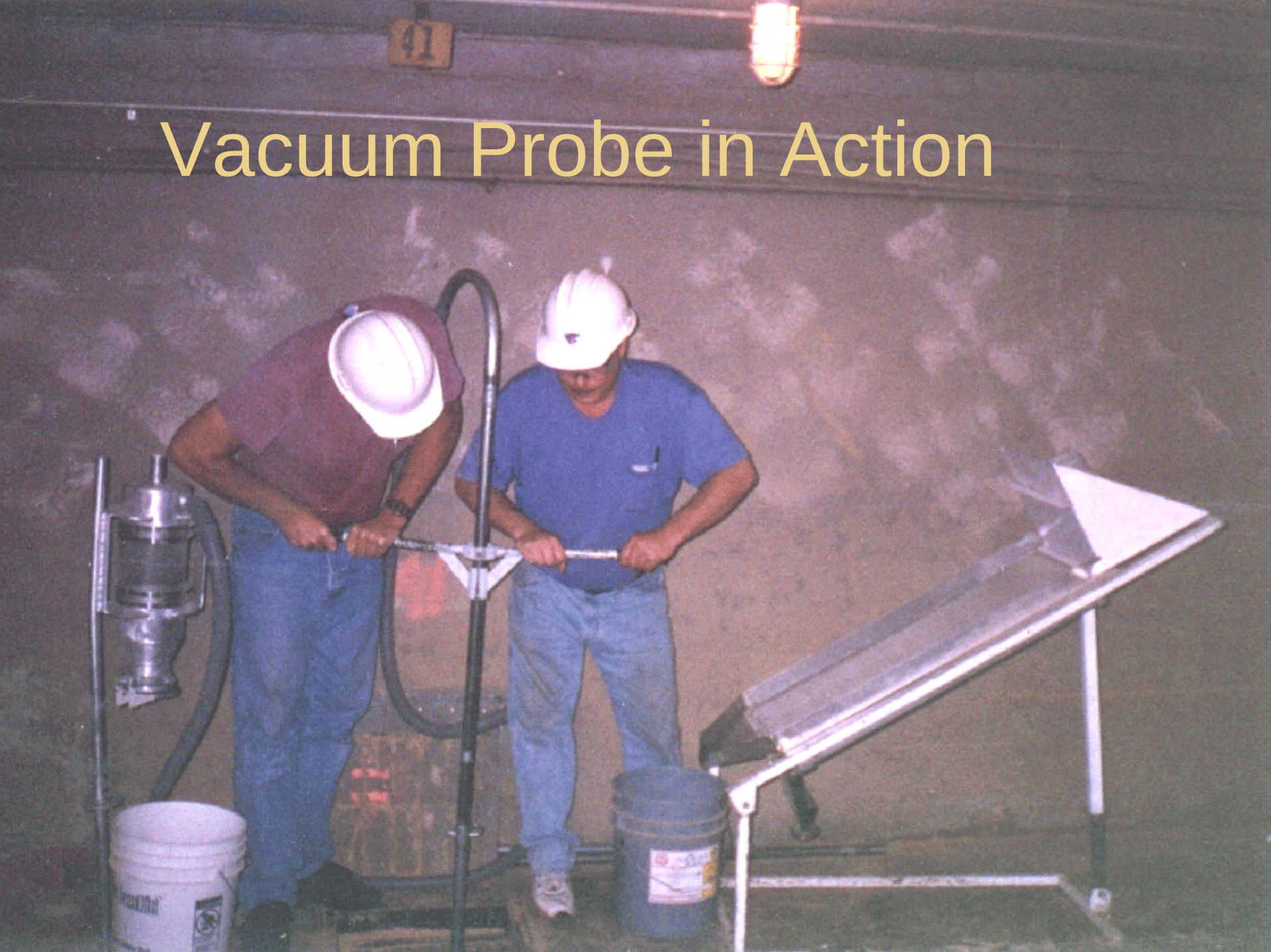
- Reduction in insect damaged grain, insecticide use, and management costs.
- Reduction in worker exposure to insecticides and decreased insecticide resistance in insects.
- Improvements in grain management will reduce insecticide residues on grain and increase U.S. competitiveness in the world market.

What Equipment is Needed to Use the Alternative Approach?

Vacuum Probe Sampler

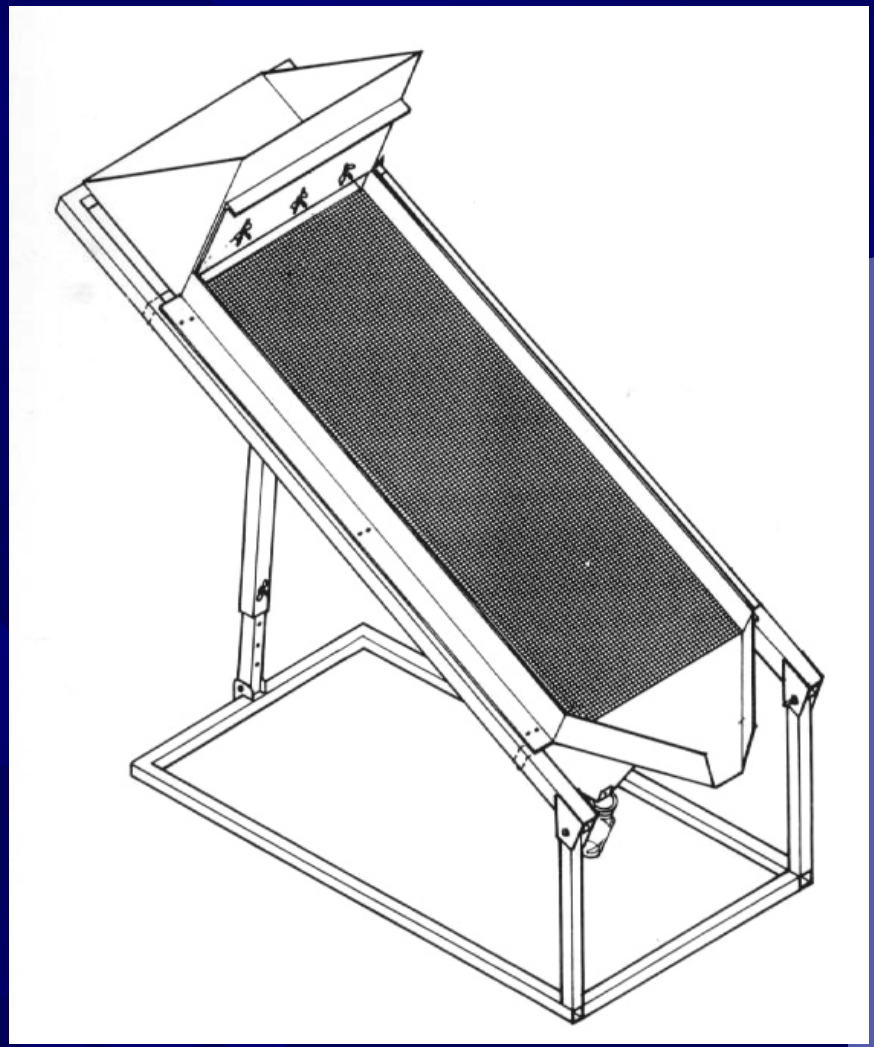


Vacuum Probe in Action



Inclined Sieve

- The sieve collapses so that it can be carried in the manlift.
- The inclined sieve allows us to rapidly separate the insects from 1 gallon samples of grain so that we can leave the grain at the elevator and carry away only the insects.



Processing Samples

Area-Wide IPM Database

Area-Wide IPM Decision Support Database

GMPRC, Agricultural Research Service -
Kansas State University - Oklahoma State University

Automatic Aeration

Grain Quality

Grain Shipping and Receiving

Insect Sampling

Internal Movement

Pesticides

Sanitation

Thermocouple

Bin Boards

HOBOs

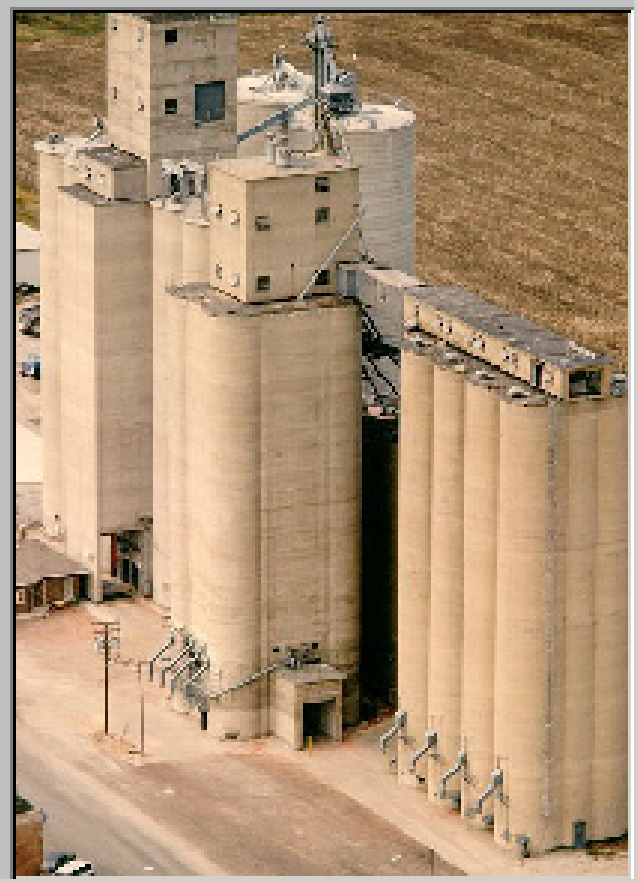
Characterize Elevators

Characterize Bins

Characterize Aeration

Risk Analysis

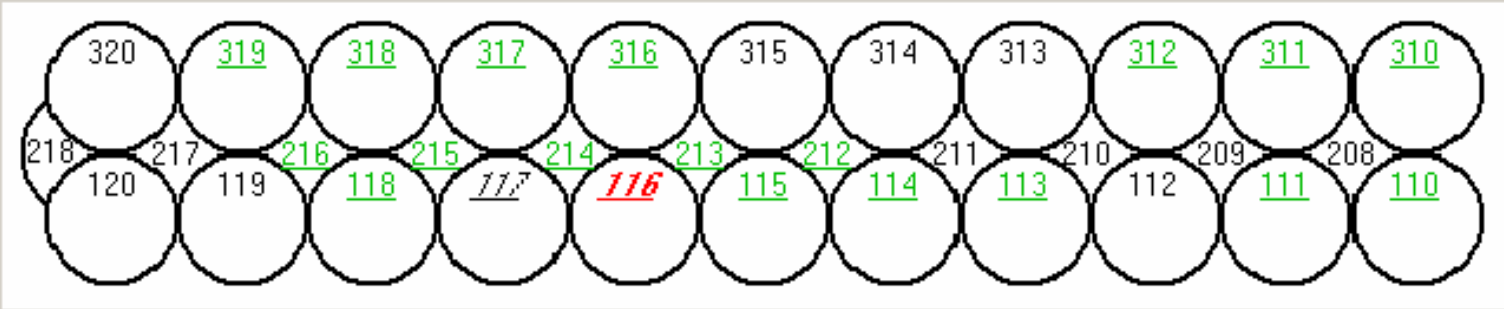
Exit Database



Risk Analysis

Elev: IDIL Bin: 116 View Report Econ. Analysis Risk: 2 Months Rules ? Print Page

West | Central | North



Risk Analysis | Insects | Thermocouples - Data | Thermocouples - Graph | Grain Quality | Bin Characteristics | Bin Boards

Grain	Moist.	Temp.	Insects / kilogram 3/27/2001	1 Month	2 Months	3 Months
Wh	12.9	75.1	1.2	3.7	11.6	36.6

future insect densities

Management Option:

Fumigate

This grain is at risk, fumigate now.

Hot Spots

3 hot spot

High: 85 at Cable 1, Sensor 9

(Custom Risk Rules)

Risk Report

IDIL

(4 at Risk, 36 Safe, 38 w/o Insect data, 5 w/ hot spots)

Print Done

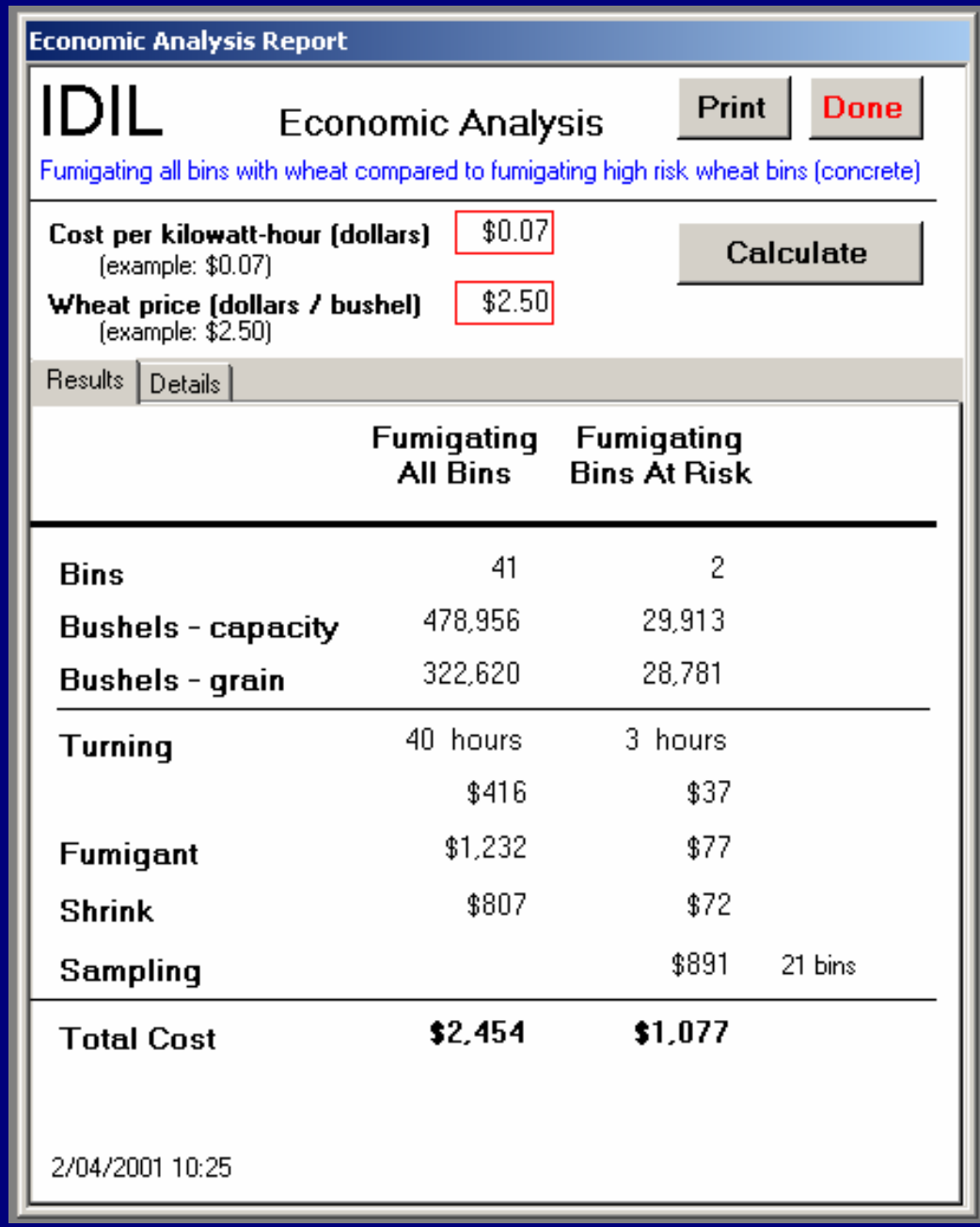
Analysis time: 10 sec.

Bin	Risk	Date	Gr.	Moist.	Temp.	Insects / kg Current	Future Insects / kg 1 Month	2 Months	3 Months	Management Option	Hot Spots
1	Safe	3/26/2001	Co	12.5	75.0	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
2	Safe	3/26/2001	Mi	12.5	75.0	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
3	Safe	3/26/2001	Mi	12.5	75.0	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
11	Safe	3/26/2001	Mi	12.5	75.0	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
17	Safe	3/26/2001	Mi	12.5	75.0	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
101	Safe	3/27/2001	Wh	12.9	54.6	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
107	Safe	3/27/2001	Wh	12.3	48.4	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
108	Safe	3/26/2001	Co	12.5	75.0	0.0	0.0	0.0	0.0	Cool w/ Aeration	0 Hot spot
109	Safe	3/26/2001	Co	12.5	75.0	0.0	0.0	0.0	0.0	Cool w/ Aeration	0 Hot spot
110	Safe	3/26/2001	Co	12.5	75.0	0.0	0.0	0.0	0.0	Cool w/ Aeration	0 Hot spot
111	Safe	3/26/2001	Mi	12.5	75.0	0.0	0.0	0.0	0.0	Cool w/ Aeration	0 Hot spot
113	Safe	3/27/2001	Wh	13.0	51.6	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
114	Safe	3/26/2001	Co	12.5	75.0	0.0	0.0	0.0	0.0	Cool w/ Aeration	0 Hot spot
115	Safe	3/26/2001	Co	12.5	75.0	0.0	0.0	0.0	0.0	Cool w/ Aeration	0 Hot spot
116	Risk	3/27/2001	Wh	12.9	75.1	1.2	3.7	11.6	36.6	Fumigate	3 hot spot
117		3/26/2001	Wh	0.0	0.0	0.0	0.0	0.0	0.0	No Insect Data	2 hot spot
118	Safe	3/27/2001	Wh	12.5	52.0	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
202	Safe	3/26/2001	Co	12.5	75.0	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
203	Safe	3/26/2001	Co	12.5	75.0	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
204	Safe	3/27/2001	Wh	13.5	46.9	0.4	0.4	0.4	0.4	No Action Required	0 Hot spot
205	Safe	3/27/2001	Wh	12.8	43.5	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
212	Safe	3/27/2001	Wh	13.4	45.4	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
213	Safe	3/27/2001	Wh	11.5	48.2	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
214	Safe	3/27/2001	Wh	13.0	50.1	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
215	Safe	3/27/2001	Wh	13.5	60.9	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
216	Safe	3/27/2001	Wh	12.9	58.7	0.0	0.0	0.0	0.0	No Action Required	0 Hot spot
301	Risk	3/26/2001	Wh	11.6	59.2	25.0	25.0	25.0	25.0	No Action Required	2 hot spot
302	Risk	3/27/2001	Wh	13.3	71.4	54.2	121.7	273.2	613.3	Fumigate	2 hot spot

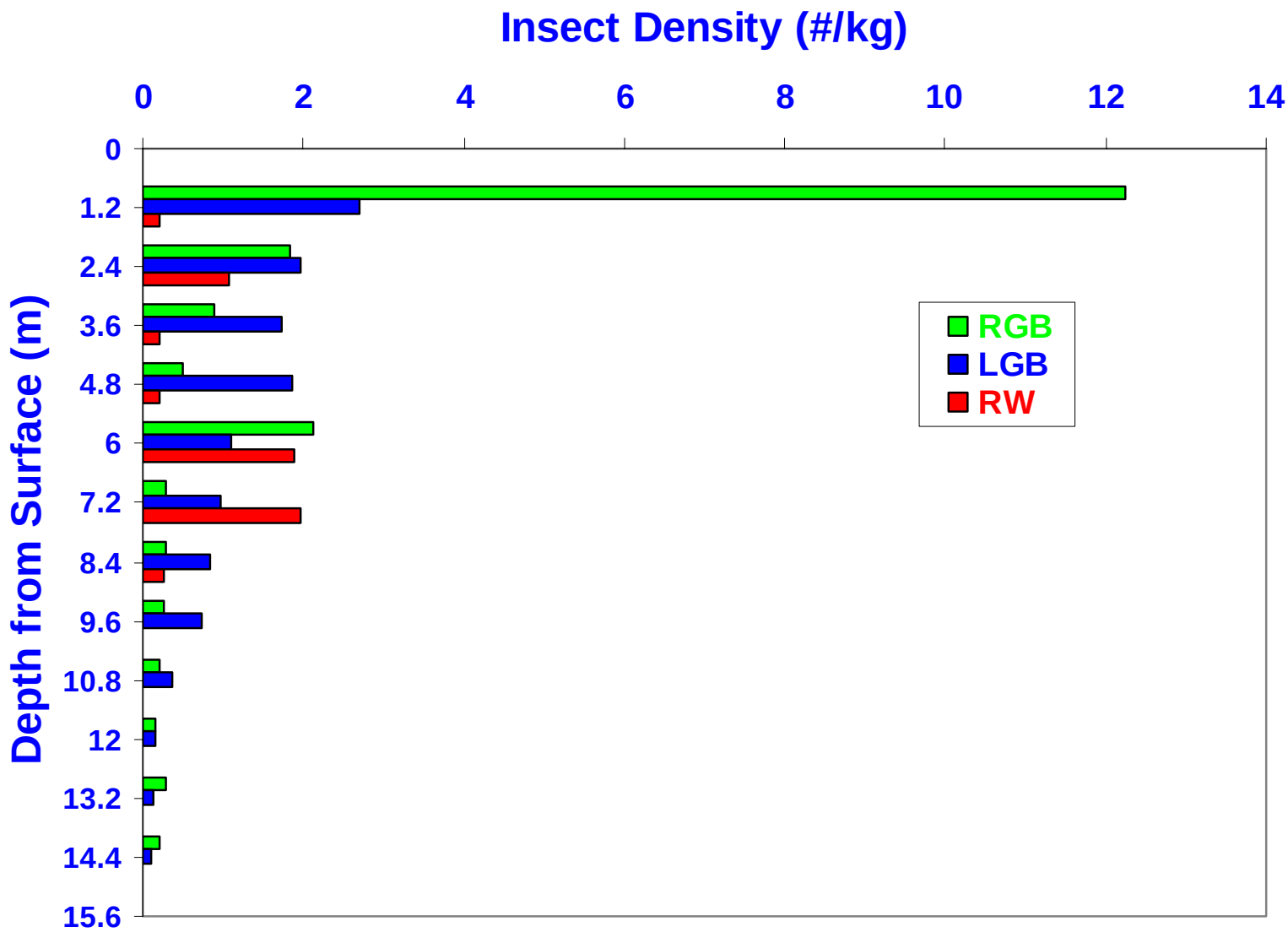
Economic Analysis provides a comparison of the costs of:

1) Turning and fumigating all bins with grain at an elevator.

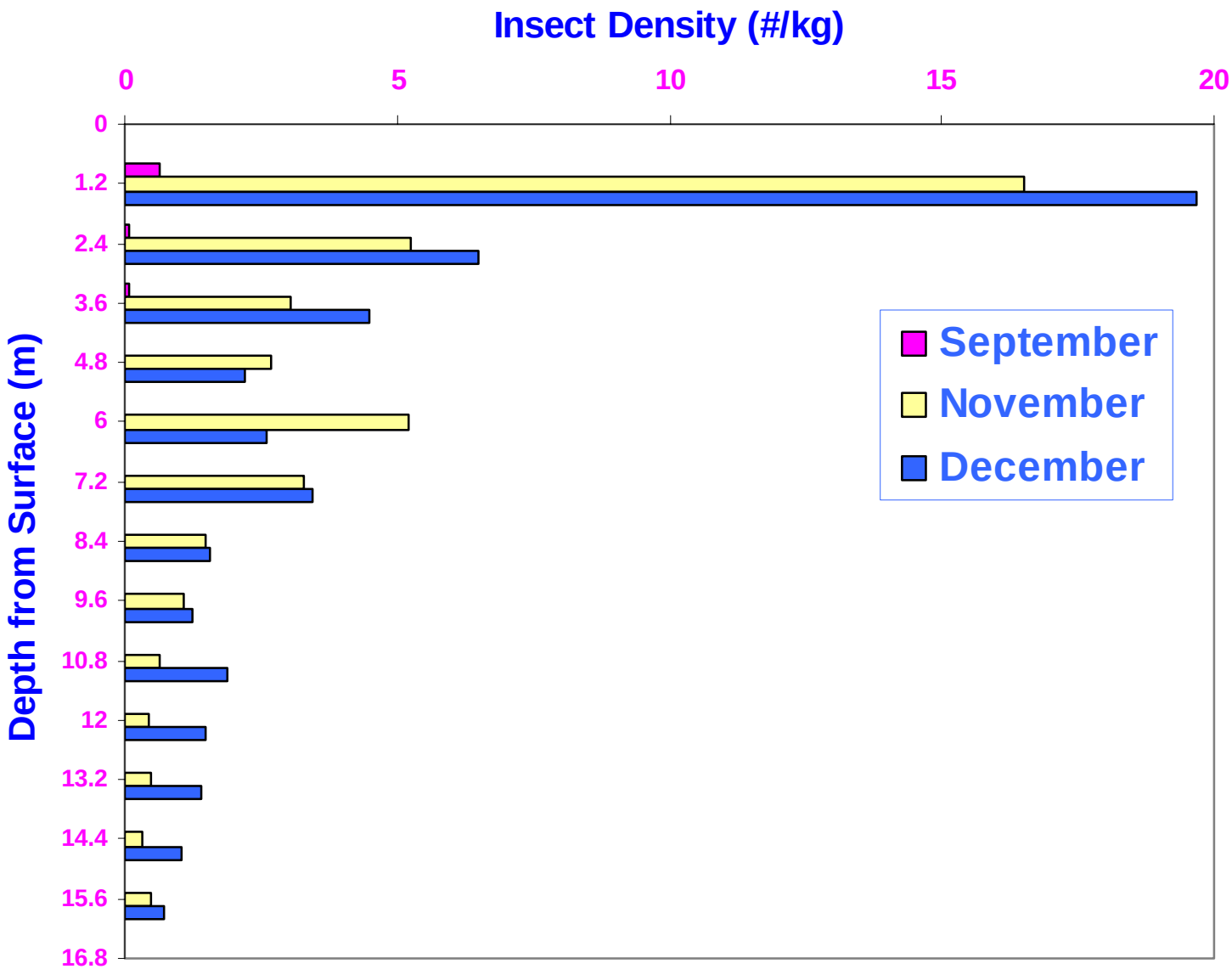
2) Sampling all bins with grain, and fumigating only those bins that are at high risk.



Vertical Distribution of 3 Insect Species in Concrete Silos (November)



Changes in Vertical Distribution of Insects



Average Insect Density in Grain Being Fumigated Compared With Grain not Being Fumigated

Month	Fumigated Grain		Not-Fumigated Grain	
	Density (#/kg)	# Samples	Density (#/kg)	# Samples
July	0.03	263	0.01	361
August	-		-	-
September	0.66	285	0.52	1,037
October	1.07	323	1.18	1,210

Grain Industry Perspective: Revisited

- We can use both current and future information provided by the study to improve efficiency in managing insect problems in grain elevators.

An Effective IPM Program Results In Higher Profits

- Marketing: higher margins.
- Fumigation practices: cost savings.
- Aeration practices: cost savings.
- Peace of mind: you know what condition your grain is in.

Marketing - Buyers Demand Quality

- Mills have a max. limit of 5 IDK or less.
- Buyers shy away from IDK wheat.
  - Increased cost to treat the grain.
  - Lowers quality standards of products.
    - lower product yields - fragments in flour, etc.

Insects or IDK Discovered At Destination

- Rejected shipment
- Treat Shipment at destination
  - Relay cost back to origin
  - Charges can be substantial
- Damage your reputation as a quality shipper

IPM Principles: One Last Time

- Prevention.
  - Sanitation: helps slow down insect immigration into new grain.
  - Aeration: slows down population growth (max at 90F,1/2 at 75F, stops at 65 F).
- Sampling: fumigate only when insect densities exceed a threshold.
  - Additional benefit: high insect populations are prevented, which decreases insect migration into other grain bins.