Assess and Compare Alternatives

Step 4

Assess & Compare Alternatives

Weighing Alternatives

Compare Potential Alternatives

- **Evaluate** and **screen out** potential alternatives for **hazards** to avoid regrettable substitutions.
- **Evaluate performance** characteristics of potential alternatives.
- **Assess costs** associated with potential alternatives.
- Additional factors could be assessed such as **social impacts, life cycle evaluations, materials management.**

Chemical substitutes **are not the only, and may not be the best**, kinds of replacements for your targeted hazardous chemical.

Screening Alternatives for Hazards

In assessing potential alternatives:

- Does the potential alternative have **known hazards**?
- Are there **gaps in knowledge** about the potential alternative's hazards?
- Does it **significantly reduce the highest risk hazards to workers** even though the alternative also presents some hazards?

Examine Advertising Claims

Methylene Chloride Replacement

This n-Propyl Bromide based solvent has proven to be a practical and effective replacement for methylene chloride in vapor degreasing, ultrasonic cleaning, cold immersion, wipe, carrier, deposition, and flush applications.

Health, Environmental, and Safety Benefits

The health, environmental, and safety benefits of replacing methylene chloride with n-Propyl Bromide include:

- Not regulated under NESHAP
- Not regulated by the DOT
- Does not generate hazardous waste
- Not considered a carcinogen
- Is not an ozone depleting substance

Small Group Exercise: Screening for Hazards

The scenario presents alternatives to paint strippers with **Methylene Chloride**. Your group is to do a rapid screening of these alternatives.

- Which alternatives **should be eliminated** from consideration because of their hazard characteristics? Explain your reasons.

- Was **adequate hazard information available** for all the alternatives you considered?

- **Which alternatives did your group retain for further consideration**? Why?

Assessing Performance Potential

- **What function does targeted hazardous chemical play** in your company's product, process or service?

- **Do potential alternatives adequately replace the functional performance** of that hazardous chemical?

Questions to Ask About Performance

- Will use of this alternative **meet market quality demands**?
- Will this alternative **provide equal or better operational efficiency and productivity**?
- Will using this alternative **adequately ensure product durability**?
- Will use of this alternative **require substantial worker retraining**?

Example: Process Re-Design

Wood furniture factory makes process change to eliminate Methylene Chloride adhesive.

- Major change required testing, significant time.
- Stronger bond with water-based adhesive.
- Increased productivity with heat to reduce drying time.

Example: System Change

Plastic pallets allow cheaper transportation, but pose fire threat without toxic chemical flame retardant.

- Alternative flame retardants fail strength, weight needs,
- Can revert to wood pallets, or
- Make system change with more protective warehouse fire control systems to eliminate need for flame retardants.

Assessing Costs

Types of costs to consider in evaluation of possible safer alternatives:

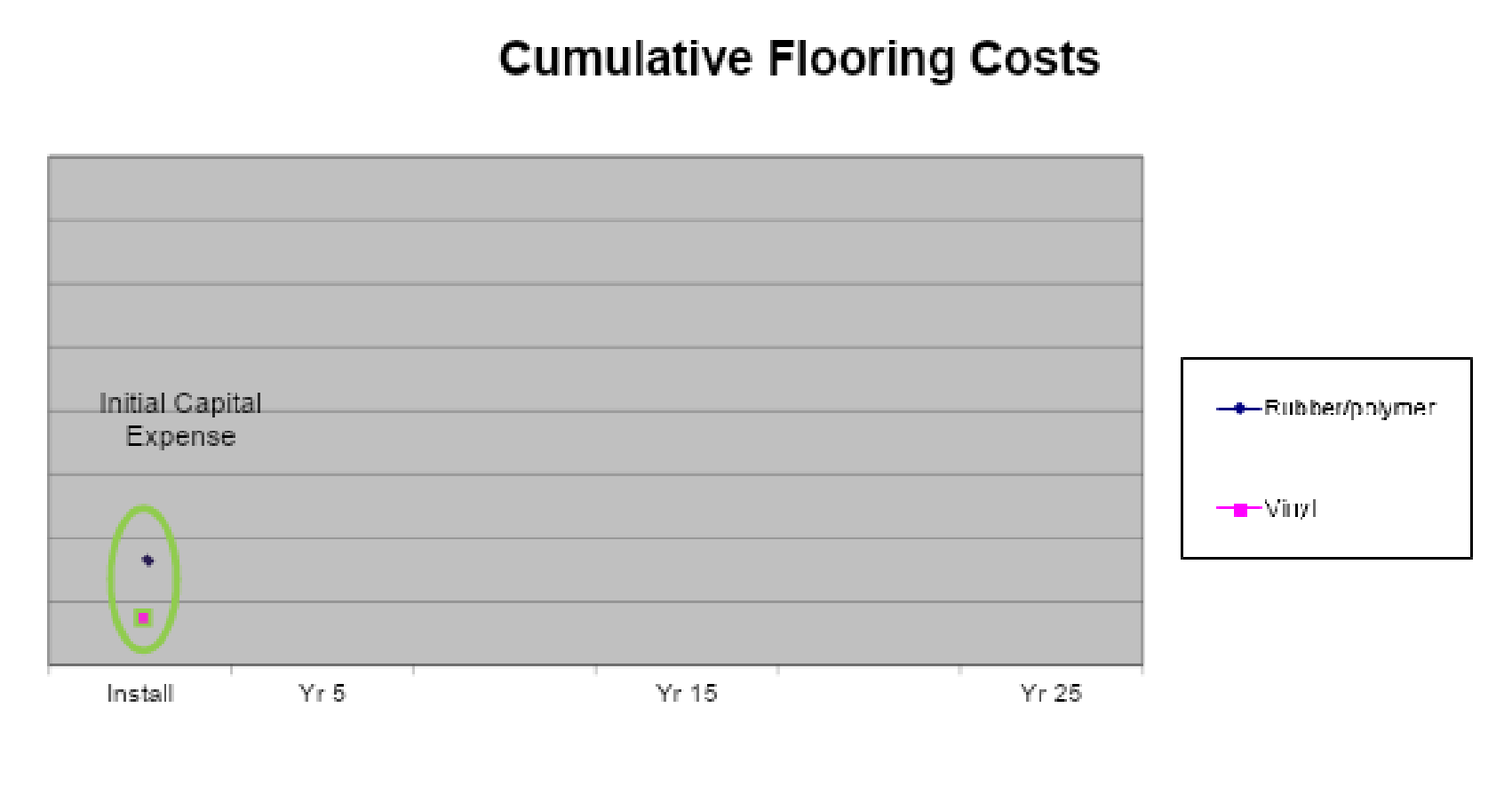
- **Operating costs/savings**
  - Material costs
  - Efficiency costs/improvements
  - Regulatory costs
  - Reduced control equipment and personal protective equipment costs
- **Capital costs**
  - Initial investment in structures, equipment, etc.
  - Payback period (if operational savings)
- **Labor costs/savings**
  - Additional training, new hires for needed skills, etc.
  - Increased productivity, reduced absenteeism from reduced chemical hazards
  - Avoided medical costs
  - Reduced liability risks
- **Non-tangible benefits**
  - Improved company image, sales

Example: Process Re-Design

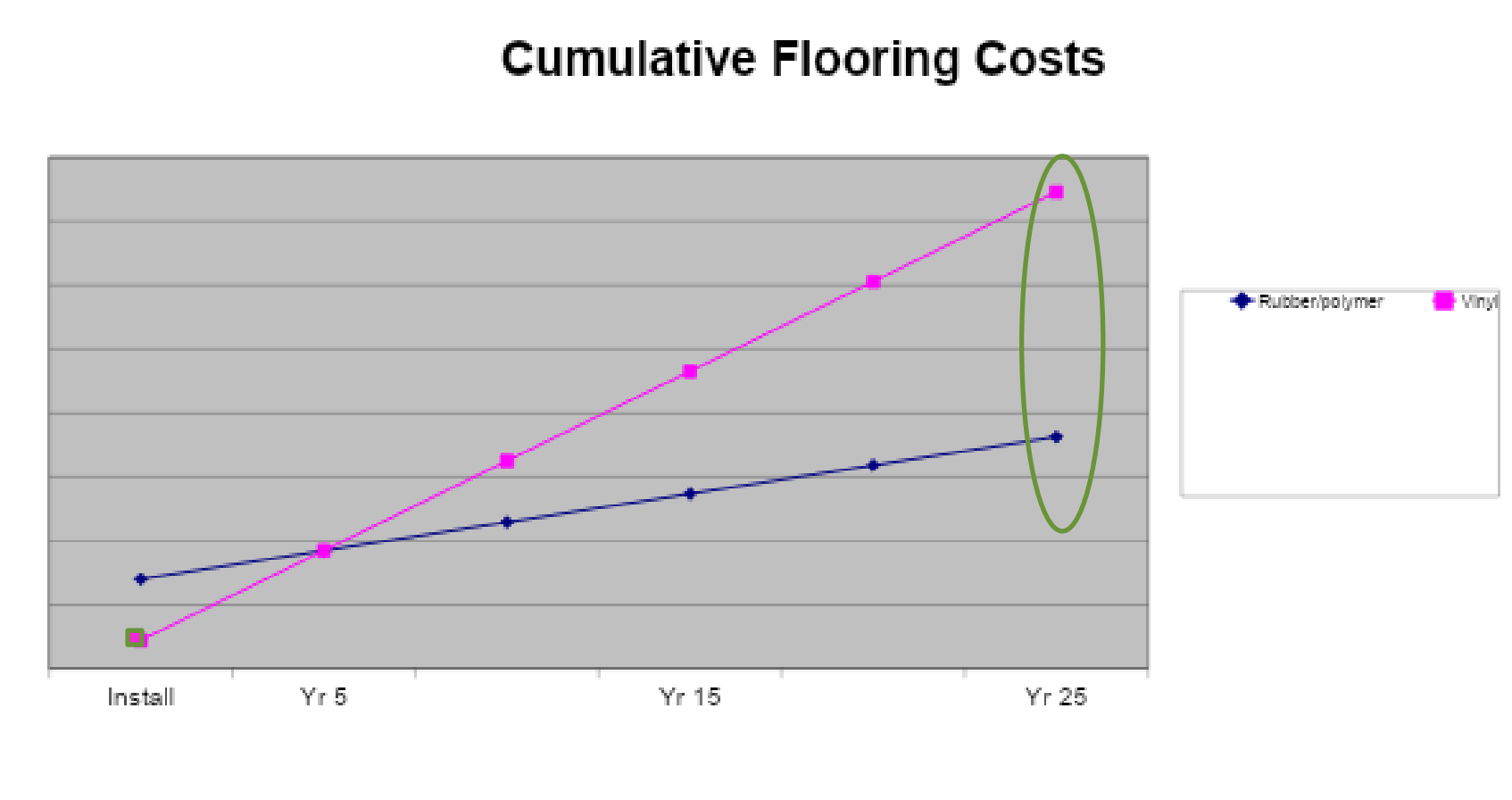
- **Cost factors in adopting water-based adhesive process as safer alternative:**
  - While **water-based adhesive >$/gallon** than **Methylene Chloride** adhesive, higher solids content of water-based adhesive resulted in lower volume used, **net cost savings**.
  - **Energy cost of heat required to cure water-based adhesives** compensated for by faster drying, **increased throughput**.
  - Operational savings paid for capital costs in short term, provided **greater long-term profitability**.

Comparing Costs of Change

Capital Costs vs. Lifecycle Costs



Capital Costs vs. Lifecycle Costs



Small Group Exercise: Performance and Cost

For each alternative, assess the relative pros and cons with respect to:

- Product or service quality implications
- Production or operational efficiency implications
- Implications for worker training
- Key cost factors

Challenges of Performance/Cost Assessments

- Major challenges for doing this kind of assessment in your organization?

- How could you overcome some of the barriers?

Summary and Review

- In this lesson we learned how to assess and compare alternatives, which includes:
  - **Screening** potential alternatives to avoid regrettable substitutions.
  - **Evaluating performance** characteristics of potential alternatives.
  - **Assessing costs** associated with potential alternatives.