Ice Melt Products – Are deicer claims full of baloney?
Some Common Deicer Claims

- “Safer for the environment”
- “Green”
- “Safer on concrete”
- “Won’t harm ___________”
- “Less corrosive”
- “Works longer”
- “Safer than salt”
Carl Sagan

- 1970s-80s well-known astronomer, scientist, author, educator
- Hosted and narrated “Cosmos,” TV series originally aired on Public Broadcasting Stations
- Invested much of his career in improving public understanding of science and defending its rational nature
- *Coined the phrase “Baloney Detection Kit”*
• What is a Baloney Detection Kit?
  – A set of tools for skeptical thinking and detecting false and/or misleading claims

• Why is a Baloney Detection Kit needed?
  – To “understand a reasoned argument and – especially important – to recognize a fallacious or fraudulent argument”\(^1\)

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\(^1\) “The Demon-Haunted World - Science as a Candle in the Dark by Carl Sagan” (New York: Random House, 1995).
Why do we need a Baloney Detection Kit for Deicer Claims?

- There are many claims being made in the deicer market, and we need help determining their validity.
- “Truth-in-advertising” regulations are not consistently enforced.
- There are no regulations for full disclosure on product content labeling.
- We tend to believe what we are told when claims sound plausible. Who has time to investigate anyway?
- We need to be able to make the most informed ice melter purchasing decisions.
How do claims originate (recipes for baloney)?

- Misunderstanding or by honest mistake
  - Over-simplifying complex issues
  - Making invalid extrapolations and assumptions

- Intentional acts of deception and manipulation
  - Suppressing evidence or telling half-truths
  - Exploiting technical “blind spots”
  - Cherry-picking favorable data, while hiding unfavorable data
Tools in the Deicer Claims “Baloney Detection Kit”

**Magnifying Glass**
- Take a closer look to determine where the data came from that backs up the claim.

**Fan**
- Blow away some smoke to see what’s underneath.

**Winch**
- Tug on the logic chain. Every link must hold up under scrutiny.

**Level**
- Ensure the playing field is level.

**Shop Manual**
- Check for validation with trustworthy references when troubleshooting.
Let’s examine two real world examples…
Magnesium chloride is safer for the environment than other chloride-based deicers.
Magnesium chloride is **not** safer for the environment than other deicers.
Claim: “Safer for the environment.”

• Get out the magnifying glass and take a closer look.
  – What is the basis for this claim?
    • It is based on the lower chloride content of solid MgCl$_2$ deicer.
    • Some have extrapolated the claim to liquid MgCl$_2$.

• Get out the fan and blow away some smoke.
  – Why is the chloride content of solid MgCl$_2$ lower?
    • Because the product is a hexahydrate salt – six water molecules for every MgCl$_2$ molecule – dilute compared to other chloride salts.
  – Does this lower chloride content apply to liquid MgCl$_2$ also?
    • No. Chloride content is determined by the concentration of the solution and the molecular weight of the salt.
Claim: “Safer for the environment.”

- Get out the winch and tug on the logic chain.
  - Does chloride content alone determine if there will be any environmental impact?
    - NO, ABSOLUTELY NOT.
  
- Chloride content + application rate determines if there will be any environmental impact.
Claim: “Safer for the environment.”

• Get the level out and check the playing field.
  – Are application rates the same for diluted and concentrated products?
    • NO, ABSOLUTELY NOT.
    • A diluted product will not melt as much as a concentrated product, so more would have to be applied to achieve the same melting performance.
    • A fair comparison should be based on equal ice melting, not equal weight or equal volume.
Claim: “Safer for the environment.”

• Get out the shop manual and check for validation.
  – What credible, independent studies are available that address this claim?

  • **University of Colorado Roadside Vegetation Study (2008).**
    – “The assertion therefore, that liquid magnesium chloride-based deicers have no negative environmental impacts, or that they provide a more environmentally friendly alternative* to NaCl-based sand and salt deicers for roadside vegetation is both inaccurate and misleading*.”

  • **Guidelines for the Selection of Snow and Ice Control Materials to Mitigate Environmental Impacts, National Cooperative Highway Research Program, “NCHRP”, 577 (2007).**
    – The potential for aquatic impact is considered equal when comparing magnesium chloride to competitive products.

* emphasis added
Claim: “Safer for the environment.”

- Continue validating…
  - More from NCHRP 577.
    - Equal melting potential can be used as a basis for comparing chloride introduction into the environment.

<table>
<thead>
<tr>
<th>Chloride Introduction into the Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting Potential equal to 100 lb of 23% NaCl brine at 20°F</td>
</tr>
<tr>
<td>NaCl</td>
</tr>
<tr>
<td>14.0 lb chloride</td>
</tr>
</tbody>
</table>

- Given all the variables involved, the chloride introduction from these products is essentially the same.
Conclusions: “Safer for the environment.”

- Beware of “environmentally friendly” claims.
  - Environmental impact is too complex to be summed up in two words.
  - Don’t be “green-washed”.
  - The United States Environmental Protection Agency has deemed this type of language to be too vague, have little meaning and is unhelpful in making purchasing decisions.²
  - “…broad environmental claims should either be avoided or qualified, as necessary, to prevent deception about the specific nature of the environmental benefit being asserted.”³

² EPA530-F-92-024, October 1992
Let’s look at the second example...
Claim: “Safer on concrete.”

It was recently advertised that...

The study by a major university proves...

– Magnesium chloride is actually less damaging to concrete than calcium chloride.

– The study used “real world” conditions, not accelerated methods.
Claim: “Safer on concrete.”

It was recently advertised that...

The study by a major university proves...

- Magnesium chloride is actually less damaging to concrete than calcium chloride.
- The study used real-world conditions, not accelerated methods.
Claim: “Safer on concrete.”

- Take a closer look.
  - Did a major university do this study?
    • Yes.
  - Were there other product comparisons made in the study?
    • Yes. Rock salt was also included in the study.
  - How did rock salt’s performance compare to CaCl₂ and MgCl₂?
    • Considerably less concrete damage under the lab conditions than either of the other two products.
Claim: “Safer on concrete.”

• Blow away some smoke.
  – Did the laboratory study use “real world” conditions?
    • No
      – Exposure conditions
        » Lab: Complete immersion in concentrated solutions
        » Real World: 20 gallons per lane-mile diluted by precipitation
      – Temperature conditions
        » Lab: Daily heating to 72-73°F
        » Real World: Near or below 32°F
Claim: “Safer on concrete.”

• Continue fanning…
  – Why does it matter whether or not the laboratory used “real world” conditions?
    • Because chemical reactions depend on temperature and concentration.
    • Chemical reactions may occur at 72°F that never occur in a real winter.
  – But the results would be relative, wouldn’t they?
    • No. This is an assumption that is logical, but not necessarily true.
    • The relationship between lab results and real world performance must be proved, not assumed.
Claim: “Safer on concrete.”

• Check the playing field.
  – Did the university study treat NaCl, MgCl$_2$, and CaCl$_2$ objectively?
    • Yes. The playing field was level, but the “referees” made a bad call in assuming the lab results reflect real world performance.
  – Did the advertisement do the same?
    • No. The study used to support the ad was “cherry-picked”.
      – The reader is lead to believe that this is the one definitive study on this issue.
      – The truth is that there are other important studies to be considered.
• Check for validation.
  – What credible, independent studies are available that address this claim?
  • **Portland Cement Association Study (2006)**
    – 36+ years of testing CaCl$_2$ and NaCl under actual outdoor winter conditions showed essentially no impact on concrete that was properly formulated, finished and cured.
    – MgCl$_2$ was not a part of this study.
Claim: “Safer on concrete.”

• Tug on the logic chain.
  – Which study’s conditions more likely represents the “real world”?
    • 36+ years of actual outdoor winter weather deicing, or…
    • Less than a year in a lab with unrealistic conditions
  – Why was there no difference between NaCl and CaCl$_2$ in 36+ years of outdoor testing, but a big difference in the lab results?
    • Most likely, because the lab results did not represent “real world” results.
    • The assumption that lab results provide the same relative performance as that in the real world is not supported.
Conclusions: “Safer on concrete.”

- Beware of “Safer on concrete” claims.
  - Concrete damage is too complex to be summed up in a few words.
  - The criteria for formulating, finishing and curing concrete to achieve durability are well understood, but not always achieved.
  - Microscopic analysis, not simple visual assessment, is needed to determine the true cause of a concrete damage event.
Summary: Baloney Detection Kit for Deicer Claims

**Magnifying Glass**
- Does the claim jive with the label and/or MSDS composition?

**Fan**
- Is the claim backed up by objective references?

**Winch**
- Are there hidden gaps or assumptions built into the claim?

**Level**
- Are comparisons apples-to-apples, (ex. equal ice melt capacity)?

**Shop Manual**
- How does the claim stack up against objective science?
• As with a carpenter or a doctor, training and experience are needed to use their tools effectively.

• However, for those not trained or experienced…
  – In carpentry, there are do-it-yourself manuals.
  – In medicine, there’s WebMD.
• In deicing, there’s NCHRP 577.
  – Guidelines for the Selection of Snow and Ice Control Materials to Mitigate Environmental Impacts
    • 211 pages, 239 references
    • Independent, objective, fairly comprehensive
  – It’s not necessary to read and understand the entire report to investigate the validity of a claim.
    • Start with the conclusions for the section of interest.
    • If the answer is not there, then either drill into the report details or get objective technical help.
Questions?
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