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”***

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]

[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…

Claim: “Safer for the environment.”

Magnesium chloride is safer for the environment than other chloride-based deicers.

Claim: “Safer for the environment.”

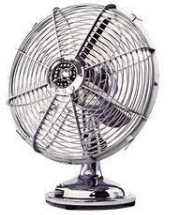
Magnesium chloride *e environment than other*
ed deicers.

Baloney

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.

Chloride Introduction into the Environment Melting Potential equal to 100 lb of 23% NaCl brine at 20°F		
NaCl	$CaCl_2$	$MgCl_2$
14.0 lb chloride	14.6 lb chloride	15.3 lb chloride

    - 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*
[3] *GUIDES FOR THE USE OF ENVIRONMENTAL MARKETING CLIAMS: The Application of Section 5 of the Federal Trade Commission Act to Environmental Advertising and Marketing Practices. Federal Trade Commission, July 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 uni… s…

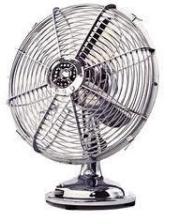
- *Magnesium chloride … damaging to concrete than calcium chloride.*
- *The study use… nditions, not accelerated methods.*

Baloney

Claim: “Safer on concrete.”

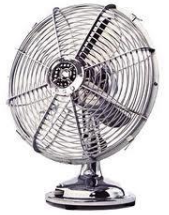
- Take a closer look.
  - Did a major university do this study?
    - Yes.
  - Were there other product comparisons made in the study?
    - Yes. Rock salt was also included in the study.
  - How did rock salt’s performance compare to $CaCl_2$ and $MgCl_2$?
    - Considerably less concrete damage under 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^{o}F
        - » Real World: Near or below 32^{o}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^{o}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.

Claim: “Safer on concrete.”

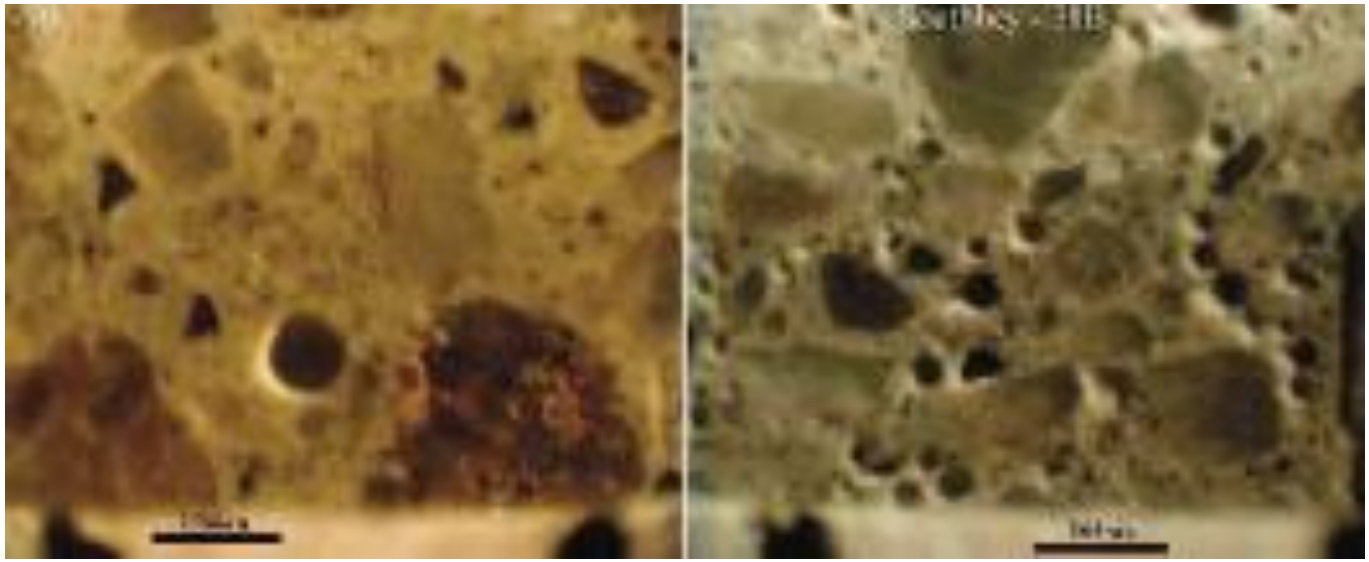
- Check for validation.
  - What credible, independent studies are available that address this claim?
    - Portland Cement Association Study (2006)
      - 36+ years of testing $CaCl_2$ and NaCl under actual outdoor winter conditions showed essentially no impact on concrete that was properly formulated, 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?

Baloney Detection Kit Tools

- 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.

Baloney Detection Kit Tools

- 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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