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Tracking and Analysis of At-Risk Materials at Sandia National Laboratories

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Scenario: Scanning through the latest issue of Chemical & Engineer News, Jake reads that a major chemical manufacturer for resins and curing agents has filed for Chapter 11 Bankruptcy. While no immediate impacts to materials are known, the manufacturer tentatively plans to restructure and sell off its adhesive and coating resins business. How do we respond?

Scenario: Bob and Jan are conducting an early development build in which a cable is staked to a printed wiring assembly using Bond-Plus Adhesive. When they go to purchase Bond-Plus they find that the vendor has discontinued production because it contains a carcinogen. How do they select a replacement material and how do they communicate to colleagues that this material is unavailable?

Scenario: Robert is in charge of re-starting production for a widget that has not been manufactured since the mid-90's. He starts to work with our manufacturing partners and learns that the foam originally used is unavailable. How does he find a suitable replacement foam that meets all requirements?

Defining At-Risk Materials

A material is considered "at risk" if
obsolescence, discontinuation, scarceness, or unavailability
is likely to occur over the timeline for which it is relied upon

Outline

1. What's different today compared to 20 years ago
2. How we define a Risk
3. Overview of Risk Factors
4. Consequence Analyses
5. Vision for materials data management

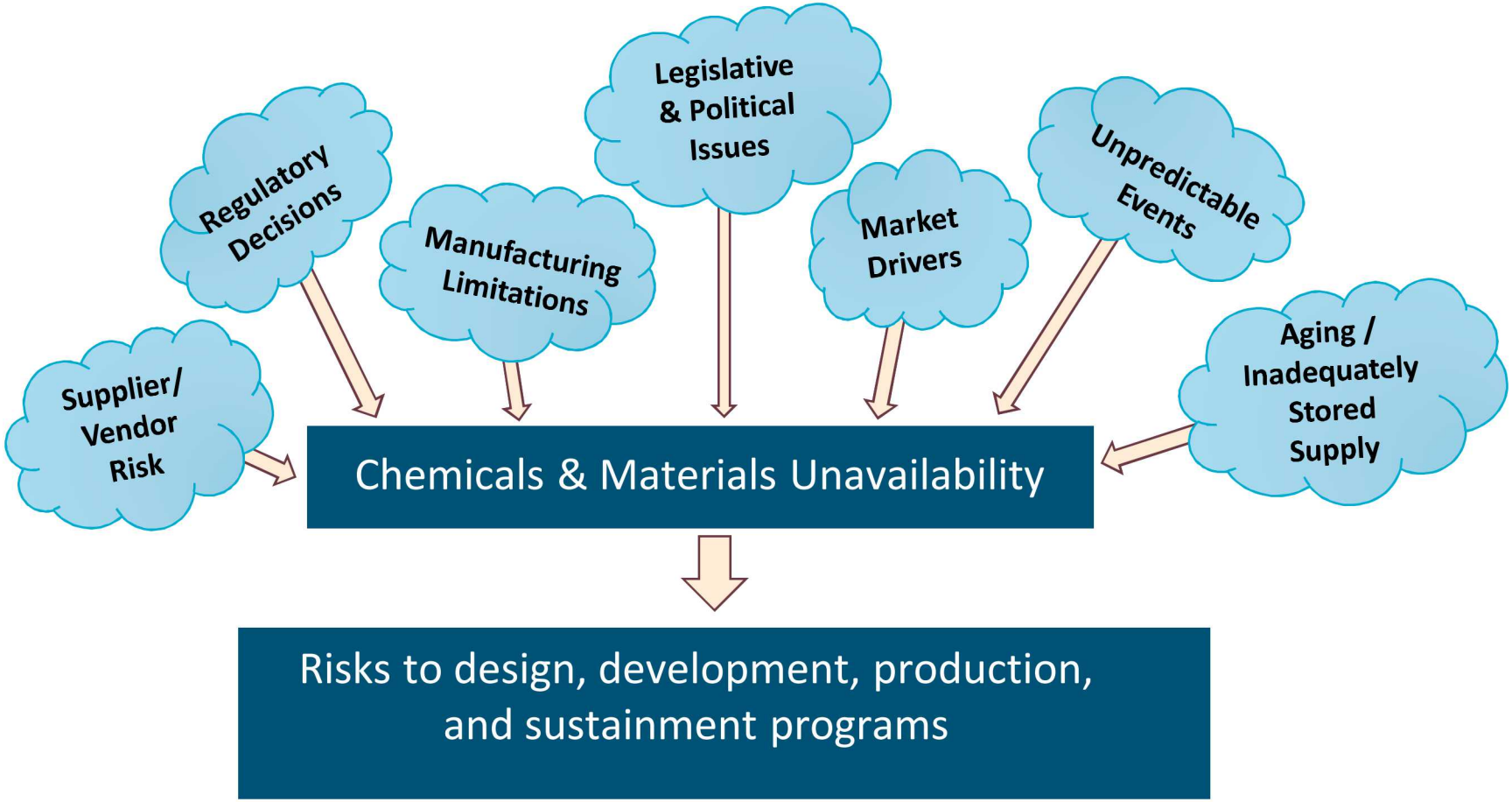
Materials and the Global Supply Chain

- The global supply chain of chemicals is driven by a broad range of customers: aerospace, health care, agriculture, food industry, specialty chemical industries, and consumer goods
- Two business model for manufacturers

- High Volume products risk greater exposure to Legislative controls
- Niche products risk obsolescence

1) https://www.investopedia.com/ask/answers/042015/what-types-industries-are-main-consumers-products-chemicals-sector.asp

Why Now? More Risk Factors



The materials' lifecycle needed for Sandia's missions has changed compared to 30 years ago.
Designs are more complex, supply chains have become globalized, and regulations have impacted materials.

Calculating Risk for At-Risk Program

At-Risk Materials are analyzed by the likelihood and consequences of the unavailability

$$Risk = Likelihood_{Unavailability} \times Consequence_{Unavailability}$$

1. **Likelihood**: Objective and measurable figures of merit based on a variety of Risk Factors
2. **Consequences:** Requires more detailed information about function and requirements of material. More difficult to quantify. Can be dependent on the organizational responsibility.

Detailed Risk Factors to Determine Likelihood

Legislative risk factors can be leading or lagging indicators

- Regulatory (leading)
- Market or Geopolitical (lagging)

Detailed Risk Factors to Determine Likelihood

Supplier risk factors can be unpredictable

- Supplier solvency potentially tracked through Dun & Bradstreet data
- Obsolescence can occur when vendor changes formulation

Detailed Risk Factors to Determine Likelihood

Technical Risk are systemic to our times

- Knowledge has been lost as people retire
- Processes have expired
- Unknowns associated with new materials

Consequence Analyses

Consequences of a material unavailability

Cost

Schedule

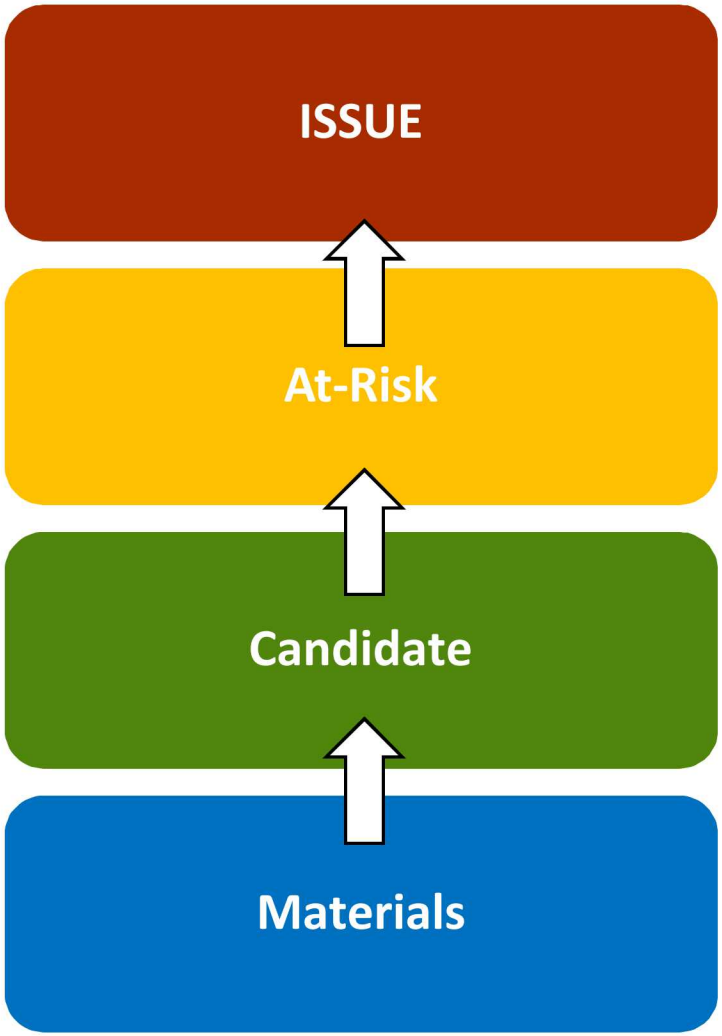
Performance over System Lifetime

Cost and schedule are immediately tangible consequences.

Performance, including Reliability analyses and aging, demands knowledge of functional requirements that are not always understood across the product lifecycle

- What happens to widget X if Bond-Plus is unavailable?
- If the “new and improved” Bond-Plus-Plus is used, will it have the same long-term performance as the original material?

Escalation and Prioritization for At-Risk Materials



- Unavailability is occurring or will occur→ realized risk
- Mitigation is required to prevent unavailability
- **Reactive posture**

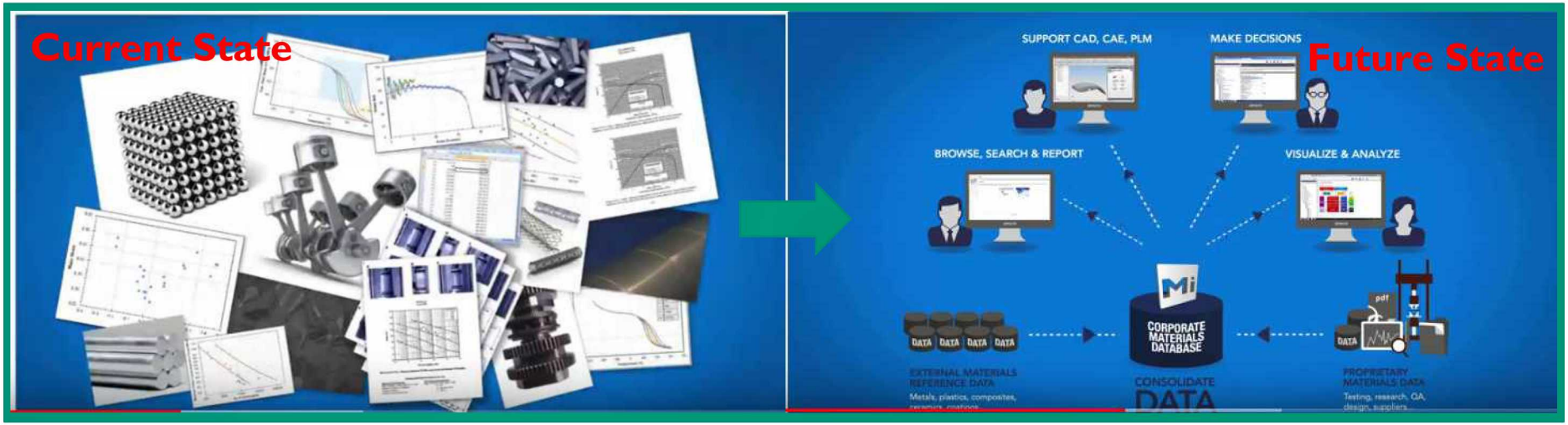
- Material is at risk of unavailability **– mitigate**
- Prioritize using Risk Priority Number
- If criteria exceeds Risk Priority Number threshold, escalate

- Material is potentially at risk and is placed on a Watchlist as a Candidate
- Prioritize using more detailed risk factors
- If threshold reached then escalate to At-Risk

- All materials used at SNL (thousands) in database
- Semi-automated scan of broad risk factors flags material when threshold is reached (legislative, supplier, technical)

Question: How do we get the design community to pick materials wisely so At-Risk Materials do not become ISSUES?

Transitioning Current State to Future State



1. Challenging materials information search
   - No central repository for properties data
   - Multi-step manual process required to conduce "where-used" searches
   - Data curation is limited
2. Static information on materials availability
   - Inconsistent tracking of risk factors
   - Inconsistent prioritization of resources assigned to manage at-risk materials
   - Information disparities across partner organizations
3. Integrated materials management
   - Capture all materials specification into Granta database
   - Associate materials properties with specifications
   - Link CAD design tools to databases
   - Share with partner organizations
   - Deploy and educate users to make wise materials decisions or find replacements early
   - Automatic tracking of materials unavailability risk-factors

Vision for an Integrated At-Risk Materials Program