NAVSEA's Approach for Managing the Risk of Hazardous Material (HM) Usage in New Acquisition

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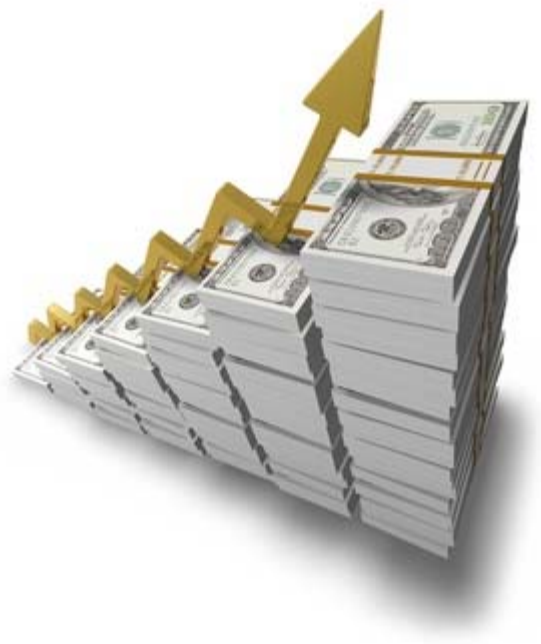
Why do we care about HM

- Increases Life-Cycle Costs
  - Special handling/stowage
  - Waste disposal



- Adds Compliance Constraints
  - Permitting may be required
- Presents ESOH risks
  - User safety
  - Environmental impact
- Threatens Sustainability
  - Future availability of HM may impact the lifecycle of a system

HM Historical Challenges

- Lack of common approach to HM avoidance.
  - Multiple chemical avoidance lists exist among the different Navy (and DoD) Acquisition Program Offices.
- Expansive universe of chemicals of concern
  - How to decide what chemicals to include or prioritize
- HM managed independently of system safety
- OEM's have to stock various materials for same application based upon individual programs
  - Lack of commonality
  - Potential sustainability concerns
  - Increased cost to DoD for parts and materials
  - Inability to implement other program's lessons learned

Efforts to Standardize HM Management

- NAVSEA technical community recognized the need to standardize, strengthen, and improve the approach to hazardous materials avoidance in acquisition programs
  - 2008: NAVSEA 04RE Prohibited and Controlled Chemical List Guidance
  - 2010: NAVSEA 05P25 HM Avoidance Process Letter
  - 2012: NAVSEA 05P5 Prohibited and Controlled Chemical List Revision 1
    - Baseline for 2013 National Aerospace Standard (NAS) 411-1
  - 2015: NAVSEA Hazardous Material Avoidance Process Design, Practices, and Criteria (DPC) Manual
    - Knowledge sharing, lessons learned, and process improvement between NAVSEA technical community, Program Executive Offices, NMCPHC, FFC, NAVAIR, SPAWAR, Shipyards, and OEMs
  - 2016: NAS 411-1 revision

How NAVSEA is Standardizing

NAVSEA 05 HM Avoidance Process DPC Manual (T9070-AL-DPC-020/077-2)

- Signed out by NAVSEA CHENG (NAVSEA 05) on 28 Sept 2015
- Applicable to all new ship and weapon system/equipment acquisition programs, modernization programs, logistics revisions and system life-cycle management
- Outlines roles and responsibilities for acquisition programs and the technical community
  - Invoke the requirements of the DPC Manual within all appropriate documents
    - Should be integrated into the Statement of Work and/or Requirement Specifications prior to contracting
    - Can be referenced in contract documentation
    - Should be referenced in the Systems Engineering Program, System Safety Management Plan, Hazardous Materials Management Program Plan, and other design documents (as contractually required and appropriate)
  - **Management of HM is based upon application and associated risk**
    - Defines HM identification, risk assessment, acceptance, and tracking process

Handle HM Risks the Same as All Other System Safety Hazards

How We are Standardizing

- DPC Manual promulgates the **NAVSEA List of Targeted Chemicals (N-LTC)**
  - Standardized chemical list for incorporation into Acquisition Program documentation
  - Divided into three tiers: Prohibited, Restricted, and Tracked (aligns with definitions per MIL-STD-882E, Task 108)
  - Complements Aerospace Industry Association Hazardous Material Target List (HMTL) published in NAS 411-1
    - All prohibited/restricted chemicals listed on NAS 411-1 are listed on N-LTC
      - N-LTC updated to reflect changes to chemical tiers as accepted by DoD and implemented in 411-1
    - N-LTC includes chemicals that are unique to shipboard environment
      - **N-LTC is the NAVSEA tailored version of the NAS 411-1 as defined by the NAS 411-1 language**
      - NAS 411-1 maintained as the smaller chemical universe to control costs associated with HM management
        - Chemicals required to build an aircraft carrier are significantly different from those required to build a tank, jet, or helicopter

NAVSEA Unique Concepts

- **Application Exceptions**
  - Identification of NAVSEA 05 application exceptions to restricted tiers
    - NAVSEA technical community has identified and approved the risk associated with specific applications for certain restricted chemicals (included as notes in manual)
      - These approvals are specific to NAVSEA
      - Many of these applications are common across DoD
      - **Programs still need to accept risk**
    - Reduces waiver burden from chemicals in commonly accepted applications
    - Examples include:
      - Industry Standard Metal Alloys (chromium, lead, nickel, etc.)
      - Mercury used in general purpose lighting, LCD displays, and battery residual
      - Copper used in piping, cables, printed circuit boards, wire, terminals, or electrical applications that require bonding or grounding

NAVSEA Unique Concepts

- **Standardized severity**
  - NAVSEA technical community has standardized the assignment of severities associated with chemicals
    - Historical attempts at HM risk assessments did not have proper justifications for severity assignments
    - Prohibited and Restricted chemicals are listed in the N-LTC with a severity based upon MIL-STD-882E definitions
      - Known Carcinogens assigned Catastrophic Severity
        - Exposure to a known human carcinogen can result in cancer which can result in death
      - Likelihood of getting cancer is dependent upon the application including dose, frequency of exposure, routes of exposure, etc.
        - Probability
      - **It is at the discretion of the program to assign probabilities specific to their applications**

DPC Manual Revision

Manual currently being updated

- Chemical Changes
  - ODS Class II elevated to Prohibited/HFCs to Restricted
    - Montreal Protocol and Clean Air Act
  - Persistent Organic Pollutants (POPs) are prohibited
    - Includes chlordane as well as DDT, Heptachlor, Aldrin, etc.
  - Updates to NAS 411-1 from 2013 to 2016
  - Toxic Substances Control Act (TSCA) and TSCA PBT
  - PFOS (Prohibited)/PFOA (Restricted)
  - Other chemicals as directed by SECNAV and CNO
- Creation of new application exceptions
- Standardized Hazard Assessment Report (HAR) form
  - NAVSEA published a standardized form in NAVSEA 5100.12-M
  - Integrated the standardized form into the HM Avoidance DPC with instructions on populating fields related to a HM Risk

DPC Manual Update (cont.)

- Severity assignments updated per technical paper developed by Navy Marine Corps Public Health Center (NMCPHC)
  - NAVSEA worked with NMCPHC to develop a scheme to correlate the severity definition to chemicals
  - The severity for personnel exposure to HM determined based upon the intrinsic nature of the chemical constituents (ie. What information is on the SDS)
    - Correlate the classifications per the Global Harmonization System (GHS) found on Safety Data Sheets (section 2) to severities
    - Severities have been assigned to chemicals using both MIL-STD-882E and NAVSEA 5100.12-M definitions
    - Based solely on personnel exposure hazards, not environmental constraints
  - Programs may vary specific HM severities from those listed for chemicals based upon information on product SDS
  - NMCPHC severity assignment scheme published in NMCPHCINST 6270.8E, *Health Hazard Assessment*

HM Risk Assessment Matrices

NAVAL SEA SYSTEMS COMMAND

RISK ASSESSMENT MATRIX				
SEVERITY / PROBABILITY	Catastrophic (1)	Critical (2)	Marginal (3)	Negligible (4)
Frequent (A)	High	High	Serious	Medium
Probable (B)	High	High	Serious	Medium
Occasional (C)	High	Serious	Medium	Low
Remote (D)	Serious	Medium	Medium	Low
Improbable (E)	Medium	Medium	Medium	Low
Eliminated (F)	Eliminated			

MIL-STD-882E

NAVSEA 5100.12-M

		Severity							
		CVN Loss [2] (1)	Ship Loss [2] (2)	Catastrophic (3)	Critical (4)	Significant (5)	Marginal (6)	Negligible (7)	N/A
Frequency and Probability	Frequent (A)	High	High	High	High	High	Serious	Medium	
	Probable (B)	High	High	High	High	Serious	Serious	Medium	
	Occasional (C)	High	High	High	Serious	Serious	Medium	Medium	
	Infrequent (D)	High	High	Serious	Serious	Medium	Medium	Low	
	Rare (E)	High	Serious	Serious	Medium	Medium	Low	Low	
	Remote (F)	Serious	Serious	Medium	Medium	Low	Low	Low	
	Improbable (G)	Serious [3]	Serious [4]	Medium	Low	Low	Low	Low	
	Eliminated [5] (H)								

NAVSEA HM Avoidance Process vs NAS 411-1

- NAVSEA will continue to maintain the NAVSEA HM Avoidance Process Manual
  - N-LTC updates are off-cycle with NAS 411-1
  - NAVSEA 5100.12-M risk matrix
  - Implementation of the standardized severities in accordance with NMCPHCINST 6270.8E
  - The application exceptions are unique to NAVSEA
    - Risk Assessments already executed and approved by technical community

Lessons Learned

- Legacy pull through systems with known alternatives
- TEMPALTS
- Unmanned Systems
- Hexavalent Chromium!
  - Identification
  - Asking for forgiveness rather than enact change
- Communication between design engineers and safety
- MIL-SPECs

Future efforts

- Issue HM Avoidance DPC Manual Revision
- NAVSEA will work with SECNAV (EI&E) and SECNAV (RD&A) for publication of prohibited chemical memorandum
  - Currently, no published acceptance process for the other prohibited chemicals like there is for ODS Class 1 and Hexavalent Chromium
- NAVSEA will continue to support DoD/AIA NAS 411 working groups
  - Updates to the NAS 411-1 list of chemicals
  - Development of NAS 411 (series) Hazardous Material Risk Assessment Guidance
  - Implementation of standardized severities across DoD
  - Common applications of chemicals

Questions or For Copies of the HM Avoidance DPC Manual

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