Health, Safety and Environmental Requirements for Composite Materials

Kathleen A. Hazer representing Aerospace Industries Association

Conference on Environmental, Safety and Health Considerations - Composite Materials in the Aerospace Industry

October 20, 1994
Data required by chemical users to evaluate new materials

Many data elements are regulatory requirements

Data elements are grouped by the stage of product development

- emphasis on practical aspects of use

- tied to SACMA/AIA working groups
PHASE I (PRE-ENGINEERING) EVALUATION

I. General Data: for the product

- Chemical identification for each chemical
- % (wt.) of each chemical present in product, including impurities
- CAS number for all chemicals
- Physical properties of the material
  - vapor pressure at 25°C
  - VOC content (mass percent which is volatile per 40 CFR 51.165)
II. Toxicology: for resins, fibers, adhesives and their constituents

- Primary skin and eye irritation
- Oral LD-50 or inhalation LD-50; dermal LD-50
- Guinea pig sensitization
- Genotoxicity-Ames test
PHASE I (PRE-ENGINEERING) EVALUATION

III. Industrial Hygiene: for the product

- Manufacturer's handling procedures

- Initial glove material and protective clothing material recommendation
PHASE I (PRE-ENGINEERING) EVALUATION

IV. Medical Concerns

- Existing medical condition(s) potentially aggravated by exposure
- First-aid treatment
PHASE I (PRE-ENGINEERING) EVALUATION

V. Fire/Safety: for the product

- Storage requirements
- Incompatibilities
- Flash point
- NFPA rating
- Exotherms
  - Conditions for occurrence
  - How to handle exotherm
  - Chemical identity of chemicals/classes that are released
VI. Environmental: for the product

- Toxic Substances Control Act Status
- SARA 313 listing
- SARA 311/312 hazard classifications
- Shipping codes (DOT, IATA, UN/NA)
- RCRA waste codes
I. Toxicology: for resins, fibers, adhesives and their constituents

- One to four week subchronic toxicity
  - inhalation or dermal
  - tied to effects shown in acute tox tests

- Genotoxicity
  - Mouse Lymphoma
  - In Vivo Rat Bone Marrow Cytogenetics
II. Industrial Hygiene: for the product

- Identification of chemicals that off-gas
  - when taken from cold storage to room temperature
  - during hot-iron operations in lay-up
  - when a heat gun is used during cure
  - during normal cure cycle
II. Industrial Hygiene: for the product (continued)

- Physical characterization of dust from machining operations on cured materials
  - % fibers / % particulates
  - % respirable

- Chemical characterization of dust from machining operations on cured materials
  (eg., are original sensitizing constituents being released)
PHASE III (PRE-PRODUCTION)
FEASIBILITY

I. Toxicology

- Need for specific studies to be based on an evaluation by manufacturer's and user's toxicologists

- Specific studies should be tied to health effects revealed in completed tox tests or effects observed in the workforce
II. Industrial Hygiene

- Monitoring methods for air and surfaces
  - collection medium
  - analytical method

- Recommended TWA/STEL

- Is a "SKIN" notation needed for TWA?

- Specific glove material and protective clothing material recommendation
III. Medical Concerns

- Bio-monitoring methods for early exposure monitoring

- Special clinical exams
  - part of routine, annual physical
  - additional exams indicating exposure
PHASE III (PRE-PRODUCTION)
FEASIBILITY

IV. ENVIRONMENTAL: for the product and constituents

- TSCA PAIR/CAIR Status
- TSCA Inventory status Section 8(b) and Section 5
- Section 8(d) list status
- Section 4 test rule status
- Section 8(e) submissions
- Aquatic toxicology
  - Acute LC-50 daphnia
  - Acute LC-50 minnows