Automated Compliance With The National Standard For Greener Chemical Products and Processes

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California Green Chemistry Initiative (2007)

**GOAL**

*Change the way business is conducted in California
“Cradle to Cradle”*

Pending National Standard (ANSI) 2010

**GOAL**

*Define “‘green” chemical characteristics and manufacturing factors*

Green Chemistry Legislation Pending 12-15 Other States

**GOAL**

*Model after California*
California Green Chemistry Initiative

- Senate Bill 509
  - Specify “chemical hazard traits and environmental and toxicological endpoints” – January 2011
  - Implement Toxic Information Clearinghouse – January 2012

- Assembly Bill 1879
  - Identify & prioritize chemicals of concern (COCs)
  - Establish process for evaluating COCs & their alternatives – January 2011

- Public Access to Information

- Public Utilization of Processes
National Standard for Greener Chemical Products and Processes

- Public Stakeholder Initiative – Initially ~ 85
- Sponsored by Not-for-Profits
  - Green Chemistry Institute — *a division of the American Chemical Society*
  - NSF International — *nongovernmental standards development organization*
- Kick-Off Meeting March 2009
- Three Task Groups
  - Chemical Characteristics
  - Manufacturing Process Factors (*Five subcommittees*)
  - Integration
- Draft Standard Pending – June 2010
  - Public Comment
  - Eventually becomes an American National Standards Institute (ANSI) Standard
Basic Elements in the Pending National Standard

### Chemical Characteristics

- **Ecological**
  - Air + Water + Soil Green Scores
  - 24 Endpoint Criteria
- **Health**
  - Acute + Chronic Health Green Scores
  - 18 Endpoint Criteria
- **Safety**
  - Fire + Reactivity + 4 Special Green Scores
  - 8 Endpoint Criteria

### Chemical Process

- **Renewable Source Materials**
  - 6 Endpoint Criteria
- **Process Mass Efficiency & Waste**
  - 8 Endpoint Criteria
- **Energy Consumption**
  - 5 Endpoint Criteria
- **Water Usage**
  - 5 Endpoint Criteria
- **Process Safety**
  - 10 Endpoint Criteria
2003 Specified 43 “Green” Chemical Characteristics Criteria

2003 Implemented Web-based “Green” Munitions Analytical Compliance System (G–MACS)
  - Existing Munitions “Evaluate” Capability
  - New Munitions “Design” Capability

Utilized By All JMC Demil Sites Since 2003

Interest From ≥ 6 NATO Countries

Interest From California

Interest From Industry (e.g., Cosmetic)
“GREEN” SCORING PROCESS

Munitions – Chemicals – Products – Processes – Wastestreams

FINAL GREEN GRADE
(0 - 100%)

ECOLOGICAL SCORE
(0-100%)
- Water Score (8 ENDPOINTS)
- Air Score (7 ENDPOINTS)
- Soil Score (6 ENDPOINTS)

HEALTH SCORE
(0-100%)
- Acute Health Score (8 ENDPOINTS)
- Chronic Health Score (8 ENDPOINTS)

SAFETY SCORE
(0-100%)
- Fire Score (1 ENDPOINT)
- Special Score (4 ENDPOINTS)
- Reactivity Score (1 ENDPOINT)

42/43 ENDPOINTS IN THE PENDING NATIONAL STANDARD
Current Munitions Analytical Compliance Suite (MACS)

MACS CENTRALIZED DATABASES
- Munitions Characterization – MIDAS
- Demil Processes
- Constituent Chemicals
- Chemicals Released
- Concern Criteria
- Green Criteria
- Health Data
- Environmental Data
- Safety Data
- Transportation/Storage Factors
- Hazardous Waste Forms
- Regulations

MACS–1
Demil (Web)

INC–FRCS
(Web)

MACS–2
Ranges (Web)

RATS
Range Assembly (Concept)

TRACS
Munitions & Waste (Web)

MACS–PODS
(Client–Server)

MACS–3
Theoretical Compliance Analyses (Web)

G–MACS
Green Munitions (Web)

G–PACS
Green Munitions Process (Web)

G–WACS
Waste (Web)

MACS–COC
Chemicals of Concern

RDX
Potential G-MACS Users

**EVALUATION CAPABILITY (G–MACS)**
- Program Managers
- Acquisition Staff
- Program Environmental/Health/Safety Staff
- Other Agencies (e.g., AEC, CHPPM, EPA, States)

**MANUFACTURING CAPABILITY (G–PACS)**
- Project Managers
- Site Environmental/Health/Safety Staff
- Manufacturing Contractors

**DESIGN CAPABILITY (G–MACS)**
- Design Engineers
- Design Contractors
- R&D Environmental/Health/Safety Staff

**DEMIL CAPABILITY (G–WACS)**
- Program Managers
- Site Environmental/Health/Safety Staff
- Ammo Planners
## “Green” Lifecycle Considerations
(Within Each/Across All)

|--------------|------------------|----------------------------------|-------------------------------|---------------------|----------------------------------|-------------------------|

### Alternatives

- **G–MACS**
  - (Design Mode)

- **G–PACS**
  - (Evaluate Mode)

- **G–WACS**

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**CCS**
Integrated “Green” Munition, Chemical & Engineering Standards Compliance Systems

**GREEN SUSTAINABILITY GRADE (0–100%)**

- **Chemical or Product Green Grade (0 – 100%)**
  - Ecological Green Score = Air + Water + Soil Green Scores = 21 Endpoint Criteria
  - Health Green Score = Acute + Chronic Health Green Scores = 16 Endpoint Criteria
  - Safety Green Score = Fire + Reactivity + 4 Special Green Scores = 6 Endpoint Criteria

- **Process Chemical Green Grade (0 – 100%)**
  - Ecological Green Score = Air + Water + Soil Green Scores = 21 Endpoint Criteria
  - Health Green Score = Acute + Chronic Health Green Scores = 16 Endpoint Criteria
  - Safety Green Score = Fire + Reactivity + 4 Special Green Scores = 6 Endpoint Criteria

- **Process Engineering Green Grade (0 – 100%)**
  - Renewable Source Materials Green Score = 6 Endpoint Criteria
  - Process Mass Efficiency & Waste Green Score = 8 Endpoint Criteria
  - Energy Consumption Green Score = 5 Endpoint Criteria
  - Water Usage Green Score = 5 Endpoint Criteria
  - Process Safety Green Score = 10 Endpoint Criteria

- **Wastestream Green Grade (0 – 100%)**
  - Ecological Green Score = Air + Water + Soil Green Scores = 21 Endpoint Criteria
  - Health Green Score = Acute + Chronic Health Green Scores = 16 Endpoint Criteria
  - Safety Green Score = Fire + Reactivity + 4 Special Green Scores = 6 Endpoint Criteria

CCS
Conclusions

• Web-based “Green” Munition Assessments Already Fulfill Most National Green Standards

• “Green” Munitions Capabilities Transferable
  ➢ Design for Demil
  ➢ Munitions Manufacturing
  ➢ Munitions Acquisition
  ➢ Demil Stockpile Analyses

• Utilization of “Green” Munitions Capabilities in California – Benefits
  ➢ Munitions Manufacturers
  ➢ Range Utilization
  ➢ Impact Other States “Green” Programs – Demil Operations
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For a remote demonstration of CCS Capabilities, or more information, contact

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