Using TUR Planning to Improve Efficiency and Promote a Safer Work Environment

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Chemicals in Perspective

- Only a fraction will reach production or products
- BUT – a significantly smaller fraction will actually be “green”
- How do we achieve a robust global economy that prioritizes safer chemicals?
Drivers for Safer Chemicals

- Stakeholder pressures (e.g., NGOs, investors)
- Worker health concerns
- Industry certification requirements
- Market opportunities
- Expanding global/state regulations
- Growing customer pressures

Increasing incentives to innovate
Pollution Prevention vs Pollution Control

Pollution Control = end of pipe treatment or remediation

Pollution Prevention = greater efficiency with less or no toxic material

FACILITY

Toxics Use Reduction
Source Reduction
Efficiency Improvements
Resource Conservation

Toxic
Treatment
Toxic
Recycling
Toxic
Waste Disposal
Minimization
Massachusetts Toxics Use Reduction Act (TURA)

Helps Massachusetts companies and communities *reduce the use of toxic chemicals* while *promoting competitive advantage* of Massachusetts businesses.
Toxics Use Reduction Act (TURA)

- Users of large amounts of toxics must:
  - **Report** toxics use
  - **Pay** fees
  - **Plan** toxics reduction

- 2006 Amendments added Resource Conservation Planning Option
  - energy
  - water
  - other materials

Adopted 1989
Effective 1990
Expanded 2006
Core Principles of Toxics Use Reduction

- Focus on use
- Reduce toxics at the source
- Focus on inherent hazard of chemicals used
- Look for opportunities to eliminate or reduce hazard
- Identify actionable (i.e. affordable and effective) opportunities
Why focus on process, not emissions

- Identifies process or chemical inefficiencies
- Identifies potential cost savings
- Promotes worker safety
- Efficiently reduces risk
The Six TUR Techniques

1. Input Substitution
2. Product Reformulation
3. Production Unit Redesign/Modification
4. Production Unit Modernization
5. Improved Operations and Maintenance
6. Recycling which is integral to the process
Replacing Toxic Chemicals

Input substitution & Product Reformulation

“Acceptable” substitutes often considered to include any chemical not currently listed

This can lead to regrettable substitutions

Can lead to shifting of risks
## Examples of Factors to Consider

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<th>Is it Safer?</th>
<th>Is it Affordable?</th>
<th>Will it Work?</th>
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<td>Flammability</td>
<td>Materials</td>
<td>Process changes</td>
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<td>No shifting the risk</td>
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- No shifting the risk
Benefits of Toxics Use Reduction

Create safer working environment

Improve operational efficiency

Reduce costs, improve profit

Reduce potential for environmental impact

Avoid need for costly changes associated with chemical restrictions

Create more sustainable production and products
How TURI Helps Massachusetts Companies be “Greener”

Providing education and guidance on identifying and evaluating TUR opportunities

Funding research to develop safer alternatives to chemicals of concern

Convening and managing industry supply chain consortia and peer mentoring work groups

Providing grants to offset costs of implementation
Case Studies: Toxics Use Reduction

By using fewer hazardous products, you’ll visit this facility a lot less often.
Independent Plating

- Reduced the use of toxic chemicals by more than 500,000 pounds, including:
  - Cyanide compounds by 95%
  - Hexavalent chromium compounds by 88%
  - Hydrofluoric acid by 100%
  - Various acids, bases and metal compounds

- Used TURI incentive grant to switch from hexavalent chromium to trivalent chromium on several production lines

“Constant improvement is embedded in our culture and it stems from the TURA planning process. ... By using safer materials we are viewed as a leader by our customers, are protecting worker health, and saving money in the process.”

- Charles Flanagan – President
ChemGenes Corporation

- Reduced the use of chloroform >55% and hexane >35%
- Improved manufacturing efficiency, saving $215,000 in chemical purchases, regulatory fees and disposal costs
- Reduced solid waste by 17,000 lb/year
- Additional 70% reductions in the use of hexane and ethyl acetate, through installation of a solvent recovery and recycling system

“Toxics Use Reduction is a tool that we use continuously in our facility because we’ve found that the benefits are extensive – we are protecting worker health and the environment, improving efficiencies and saving money.”

- Anuj Mohan, Chief Operating Officer
Stainless Steel Coatings

Stainless Steel flake in hard, USDA-approved industrial coating

TUR Goals

- Reduce Volatile Organic Compounds (VOCs)
- Eliminate Hexavalent Chromium
- Reduce equipment turnovers
- Reduce energy use
SSC’s TUR Initiatives

### Product Reformulations
- Replace solvents
  - Xylenes reduced 57%
  - Lowered VOCs
  - Maintained performance
- Replace metallic coating element
  - Eliminated hex-chrome
  - Higher quality performance
  - More expensive on per-unit basis but less needed: lower material cost

### Operations & Maintenance
- Revised project scheduling
  - Reduced use of cleaning solvents
  - Reduced hazardous waste disposal
- Hazardous waste storage
  - Drums fitted with new lids, allowing for one-handed operation
- New shipping boxes reduce packaging waste
Results at Stainless Steel Coatings

- 100% removal of hexavalent chromium
- 52% less hazardous waste production
- Saved over $15,000 per year in reduced waste disposal costs
- Reduced energy costs by about 25%
- 14,500 lbs/year of CO₂ saved

“Making environmental improvements, reducing toxics use and saving energy has saved us money, making us more competitive. But something more subtle is that we stand out among our suppliers, customers and community. We keep our small facility clean, our factory is low impact, our people enjoy working here and it all pays off.”

- Bob Audlee – Vice President
Case Studies: Resource Conservation
Analog Devices

Process water purification & reuse

Reduced energy use by more than 16 million KWH per year

Reduced water consumption by nearly 90 million gallons per

Reduced use of sodium hydroxide and hydrochloric acid for resin regeneration in deionized water production processes

“Our profitability increases with market advantage gained from customers with preference for socially-responsible companies.”

- Beth Tshudy – EHS Manager
Philips Lightolier

• Resource Conservation Initiatives:
  – Reduced water usage by 78%, saving 70 million gallons per year

• Specific challenge – addressing the potential contamination of critical rinse waters in high purity cleaning lines
  – Apply TUR thinking to identify and evaluate possible solutions
Flows of up to 60 GPM potentially contaminated by heat exchanger

Space limitations prevent use of traditional solution (large diversion/storage tanks)

**Solution**...Continuous Oil Monitor Technology as used on submarines

Alarms alert personnel to divert water from rinses if heat exchanger failure occurs

Monitored flow through meter is re-directed to a less critical application

Water Use Reduction: >11 M gal/year
Investment $19,000
Annual Savings $46,000
TUR Initiatives

Eliminated the use of approximately 1.25 million pounds of trichloroethylene

Eliminated more than 4 million pounds of air emissions, saving of more than $2 million

“We’ve implemented Toxics Use Reduction projects over the years that have literally saved us millions of dollars in operating costs. The return on investment as well as the benefits to the environment, have been very favorable.”

- Ron Westgate – TUR Planner
TUR is Not Just for Manufacturers

Small Business Example: Garment Cleaners

TURI conducts assessments then provides financial incentives and technical assistance
Garment Cleaning Key Assessment Criteria

Technical/Performance
- Cycle time and load capacity
- Difficult materials
- Pretreatment and finishing requirements

Costs
- Equipment
- Chemicals
- Energy

Health and Safety
- Exposures
- CNS effects
- Cancer
- Reproductive / Developmental toxics
- Flammability

Environmental
- Persistence
- Bioaccumulation
- Aquatic toxicity

Regulatory Obligations
- Air
- Water
- Waste disposal
Recommendation: Wet Cleaning

Washers and dryers use biodegradable detergents and conditioners

Finishing equipment re-shapes and dries the slightly damp clothes
MA Conversions to Wet Cleaning

Since 2008 TURI has given 17 grants to dry cleaners to switch from perc to dedicated professional wet cleaning

- Cleaners **save money** on solvent, waste, water, and electricity
- Cleaners are **fully satisfied** with the process and product
- There is **less regulatory oversight** and **risk of contamination**
- The **work environment** is greatly improved
- **Customers** are very pleased with quality
KMK Cleaners – Walpole, MA

40% reduction in electricity costs

Over 50% drop in water use

Saving about $1,500 per month in operating costs

“As a family run business, we’ve been interested in getting away from perc for quite a while, and professional wet cleaning was the right answer. It makes the shop a healthier place for my Dad and me, our employees, and for future generations.”

– Kristy Mead, Manager
AB Cleaners - Westwood, MA

Reduced electric use by almost 30%

Reduced water use by over 50%

Saving over $400 per month in operating costs

“We knew that perc was not good for us. I was concerned for the health of my pregnant wife and baby and also for my employees. With wet cleaning, there has been a huge improvement in the way the air smells and the clothes come out cleaner without any shrinkage or the feel of chemicals.”

– Joon Han, Owner
Industry/Supply Chain Collaborations

Wire and Cable Industry Initiative
- 2001-2004
- Prepare for and meet global restrictions

New England Lead-Free Electronics Consortium
- 2001-2011
- $1M in-kind contributions

Cr+6 Free Aerospace/Defense Industry
- 2012-present
- Identify and test safer alternatives for sealants, primers and conversion coatings
What Massachusetts Companies Experience

- 55% Increased attention to environmental practices
- 51% Improved worker health and safety
- 41% Realized financial savings
- 29% Improved production efficiency
Lessons Learned – What Matters

**Planning**
- Ask “why” – it leads to new ideas
- Doing good faith planning consistently opens up new opportunities

**Drivers**
- Anticipate regulatory and customer restrictions
- Customers prefer sustainable operations
- Companies use their discretion on implementation

**Metrics**
- Companies see progress when tracking use
- Companies determine appropriate normalization factors to accurately identify efficiencies