Toxics Use Reduction Institute

Toxics Use Reduction in the Pharmaceutical Industry

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Spring Continuing Education Conf
Lowell, MA

TURI
TOXICS USE REDUCTION INSTITUTE
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Overview of the Industry

- Pharmaceutical SICs – 2833-2836
- # of companies, and toxics reported in MA
- GCI Roundtable estimates solvents contribute to ~50% of materials used in manufacture of bulk active pharmaceutical ingredients (API)

Process Mass Intensity (PMI)

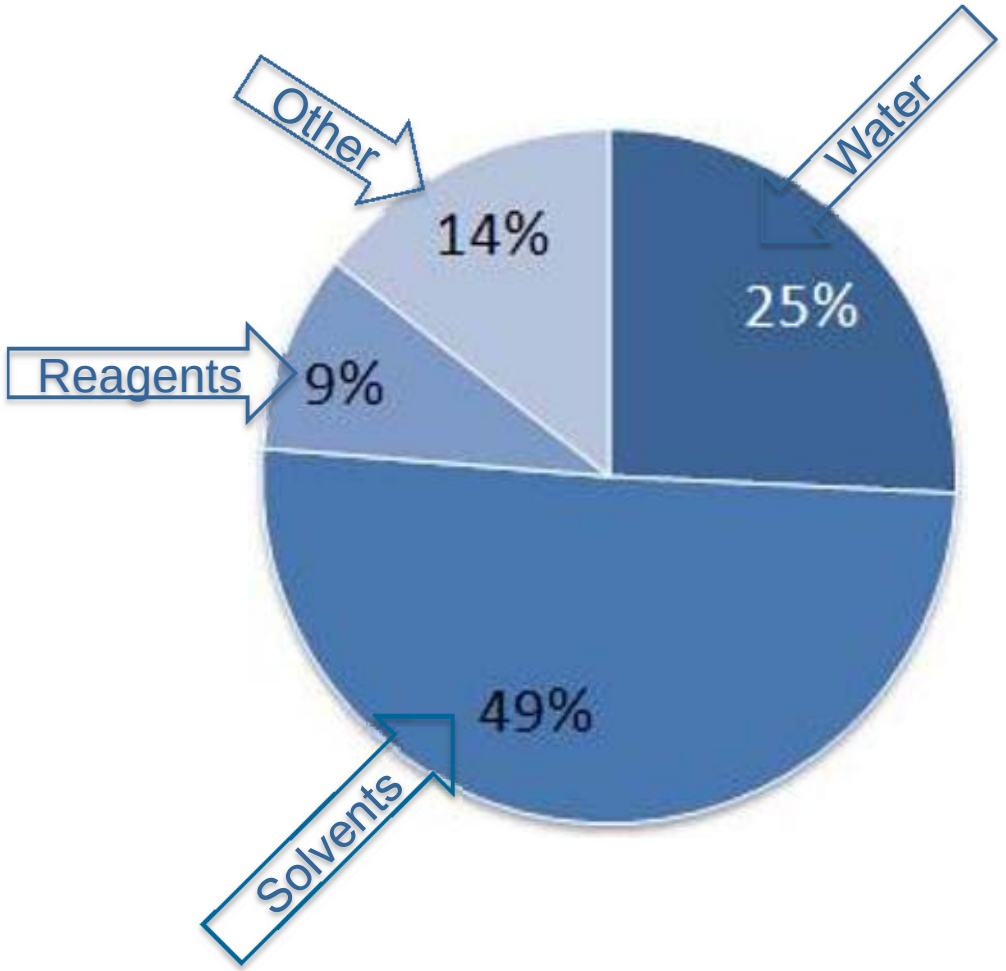
$$\text{Process mass intensity} = \frac{\text{quantity of raw materials input}}{\text{quantity of bulk API out}}$$

Where:

- Process is all steps of a synthetic path from commonly available materials to the final bulk API
- Raw Materials are all materials including water that are used directly in the process of synthesizing, isolating, and purifying the API
- Bulk API out is the final form of the active ingredient that was produced in the synthesis, dried to the expected specification

Composition of PMI

- Solvent and water contribute ~80% of the PMI
- Emphasizes need to reduce the use and hazard of the solvent



Environmental Factor

$$\text{E-Factor} = \frac{\text{Mass of Raw Material} - \text{Mass of Product}}{\text{Mass of Product}}$$

- The mass efficiency of processes can be compared using the E-Factor
  - Ideal E factor is 0 (petroleum refining is close)
  - Production of bulk and fine chemicals gives E-Factors of between 1 and 50.
  - Typical E-Factors for the production of pharmaceuticals lie between 25 and 100.
- Note that water is not considered in this calculation.
- The E-Factor does not account for toxicity

Agenda for this session

- Innovative ways pharma reduces its E-Factor
- TUR in pharma companies – a TUR Planner's experience
- Using Green Chemistry as source reduction tool for pharma

Wrap Up

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