# Water and Wastewater Reduction Using a Pollution Prevention Intern

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# WHO IS PPI?

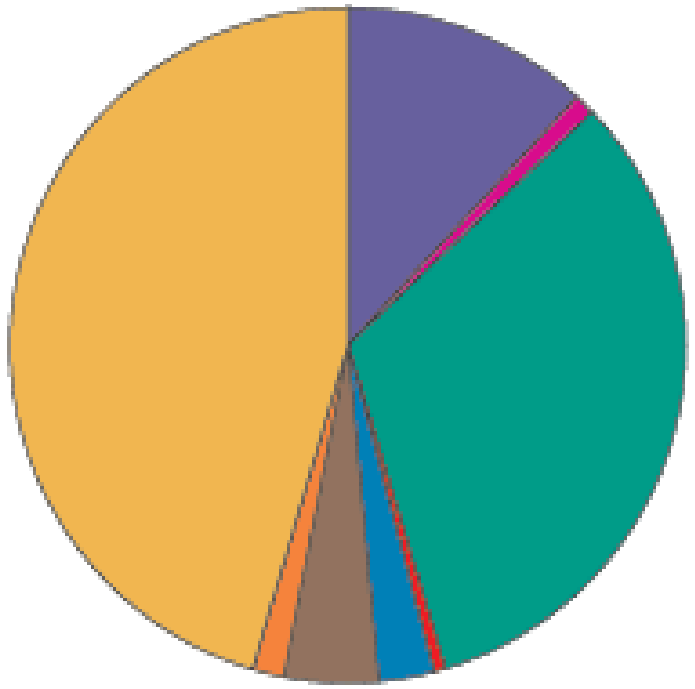
## Kansas State University

### College of Engineering
### Engineering Extension

### Pollution Prevention Institute

**P2 Intern Program**
**Small Business Environmental Assistance Program**
**Food Recovery**

# Water Use in the United States



2010 withdrawals by category, in million gallons per day

| | |
|---|---|
| Public supply | 42,000 |
| Self-supplied domestic | 3,600 |
| Irrigation | 115,000 |
| Livestock | 2,000 |
| Aquaculture | 9,420 |
| Self-supplied industrial | 15,900 |
| Mining | 5,320 |
| Thermoelectric power | 161,000 |

Values do not sum to 355,000 Mgal/d because of independent rounding

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# Definitions

## "source reduction" (P2 Act)

Any practice which reduces the amount of:

- hazardous substances
- pollutants
- contaminants

entering a waste stream or otherwise released into the environment **prior to recycling, treatment, or disposal**

- Includes practices that reduce or eliminate the creation of pollutants through
  - increased efficiency (raw materials, energy, water, or other resources use)
  - protection of natural resources/conservation

## "prevention of pollution" (ISO 14001)

Use of processes, practices, techniques, materials, products, services or energy to avoid, reduce or control (separately or in combination) the creation, emission or discharge of any type of pollutant or waste, in order to reduce adverse environmental impact"

Can include:

- source reduction or elimination
- process, product or service changes
- efficient use of resources
- material and energy substitution
- Reuse, recovery, ~~recycling;~~ reclamation, and ~~treatment~~.

# Pollution prevention (P2) intern program

Link engineering & environmental sciences students with industry to work on dedicated P2 projects that reduce environmental emissions and costs

# Intern Program Elements

- P2 training at K-State
- Placement x 10 weeks
- Support
  - Technical assistance
    - Site visit
    - Email & listserv
  - Equipment
- Intern retreat
- Final reports and presentations

- Partnership with EPA, KDHE, Engineering Extension, KS industry
- Supported by
  - K-State faculty & research
  - Industry professionals (e.g. UE Systems, Westar)

# Recommended Projects

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water ($10^6$ gallons) | — | 25.4 | 187 | 2.44 | 10 | 6 | 2.08 | 7.75 | — | 10.2 | 8.26 | 53.5 | 313 |
| Energy (MWh) | 1,533 | 1,623 | 3,209 | 4,895 | 2,600 | 5,723 | 979 | 4,322 | 487 | 2,859 | 8,331 | 2,813 | 39,374 |
| Natural Gas (MMBTU) | — | — | — | — | 49,866 | 534 | 600 | 210 | — | 266 | 32,510 | 36,918 | 120,904 |
| Solid Waste (tons) | 1,025 | 5,506 | 417 | 6,243 | 257 | 318 | 86 | 519 | — | 170 | 226 | 1318 | 16,085 |
| Cost saved or avoided ($1K) | $442 | $1,245 | $2,388 | $622 | $734 | $552 | $205 | $1,758 | $45 | $399 | $986 | $748 | $10,125 |
| Greenhouse Gases (MTCO2e) | 1,089 | 1,213 | 2,718 | 3,483 | 4,524 | 3,996 | 607 | 4,260 | 346 | 2,843 | 9,906 | 5,996 | 40,981 |

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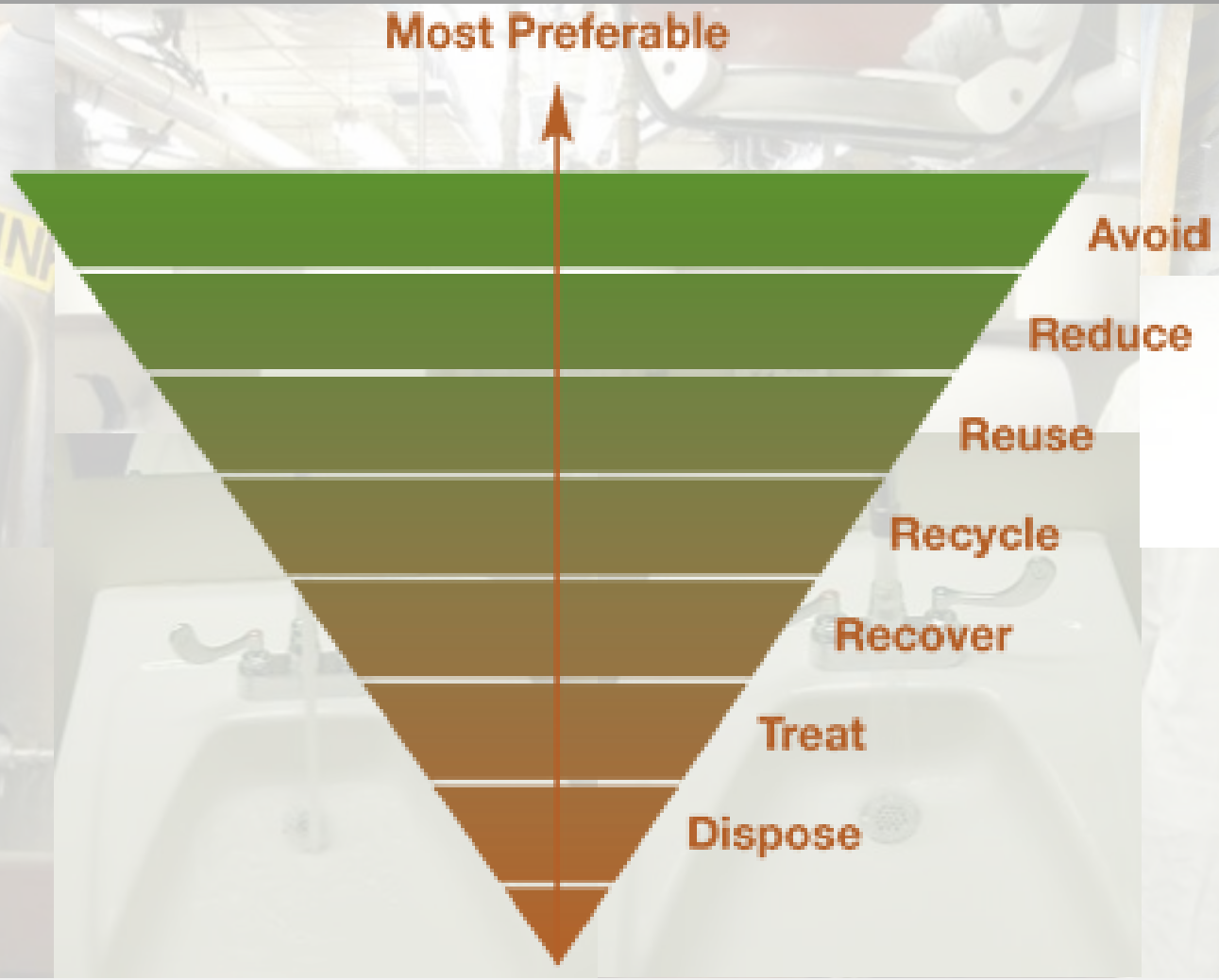


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Sources: www.sustainsuccess.co.uk/the-resource-efficiency-hierarchy
www.evolverecycling.com/images/epa-graphic.png

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# Why interns?

1. Fresh perspective
2. Someone to ask “why?”
3. Time to tackle projects
4. Gives a place to start

# Compass Minerals (Lyons)

2017 Case Study

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# Water Fountains

- Run continuously using city water
  - Keeps cool and free of dust
- Boiler Room
  - 0.5 gpm → 263,000 gal/yr.
  - Approx. $790/yr.
- Mill
  - No nozzle
  - 3.0 gpm → 1.6 million gal/yr.
  - $4,700/yr.
- Estimated Annual Savings
  - 1.3 million gal. city water, $3,900

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# Vacuum cooling water recycle

- Vacuum Compressors
  - Only one runs at a time
  - Mfg. recommends: 21-28 gpm (cooling water temp. 70-80 °F)
  - Existing: approx. 54 gpm
- Control Room Heat Pump

  Approx. 38 gpm (50-100 °F)
- Wet Scrubber

  Approx. 8.7 gpm well water
- Estimated Annual Savings*

  25 million gallons onsite well water (15% of well output), $2,200

*Does not include initial investment or maintenance costs

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# Mineral scrubber

- Currently receives approx.
  38.5 gpm PI Water
- Mineral build-up, cleaned every 2-4 weeks
- 100-120°F condensate
- Estimated annual savings*
  - 20 million gallons interceptor water
  - $1,600

*Does not include initial investment or maintenance costs

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2017

- Nov. 9: Webinar for hosts, "Applying for a P2 Intern," www.sbeap.org
- Dec. 8: Host industry screening begins

2018

- Jan. 8-10: intercession –
  "CE 690: Industrial Environment Sustainability Practices"
- March 23: interns paired/introduced to host industries
- May 21-24: intern training (as intercession)
- May 29-Aug. 3: intern with host companies
- Mid-September: intern presentations at K-State

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# Questions or recommendations?

Industry applications due **December 8**

http://www.sbeap.org/intern-program

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