The background of the slide is a solid green color with a subtle, out-of-focus pattern of green leaves, likely from a plant like a lily or iris, creating a natural and fresh aesthetic.

# Joint Case Study: Conserving Energy through water management.

Mary Ellen Mika, *Supply Chain Manager, Steelcase*  
Keith Lane, *Regional Account Director, DuBois Chemicals*

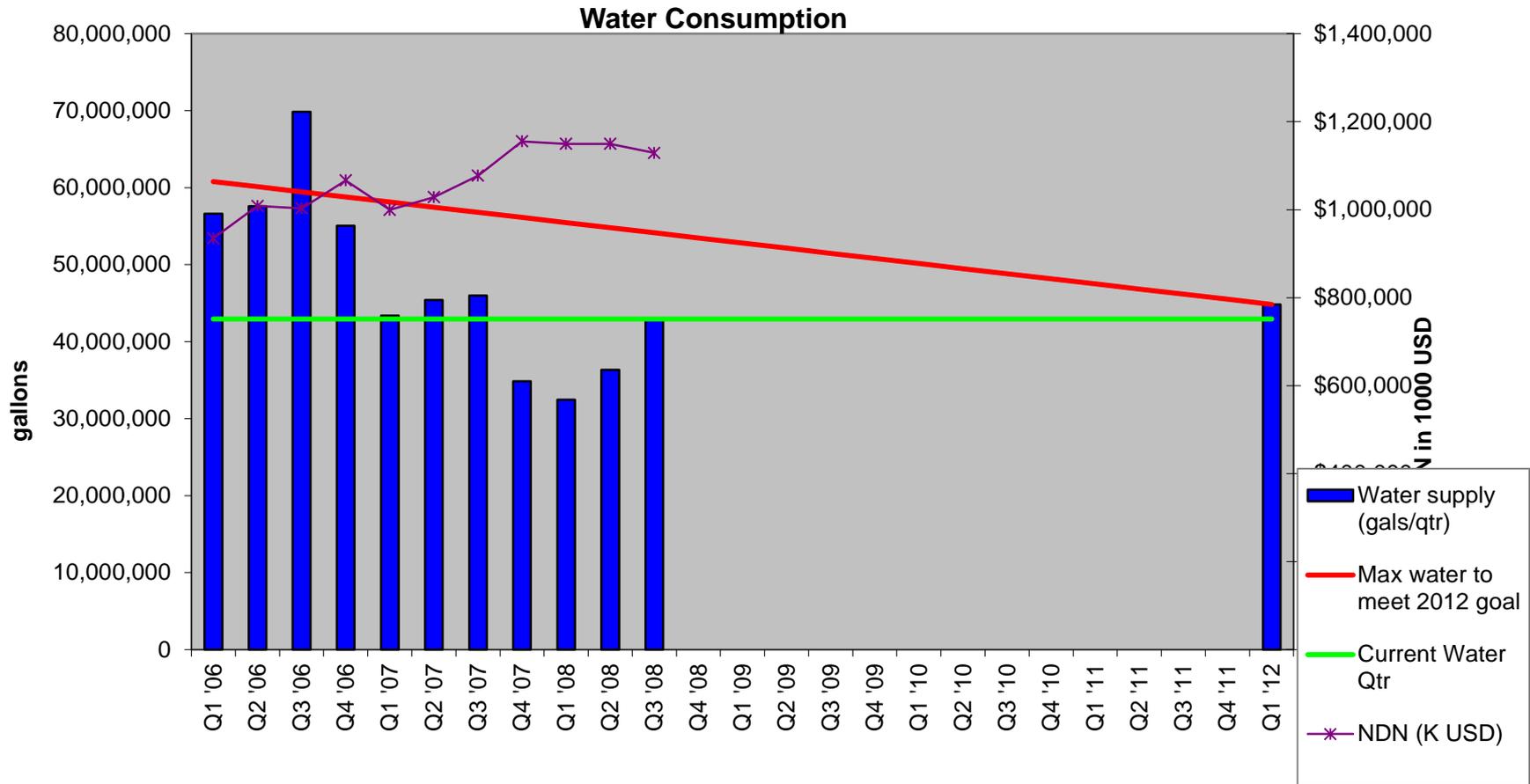
7 May 2009



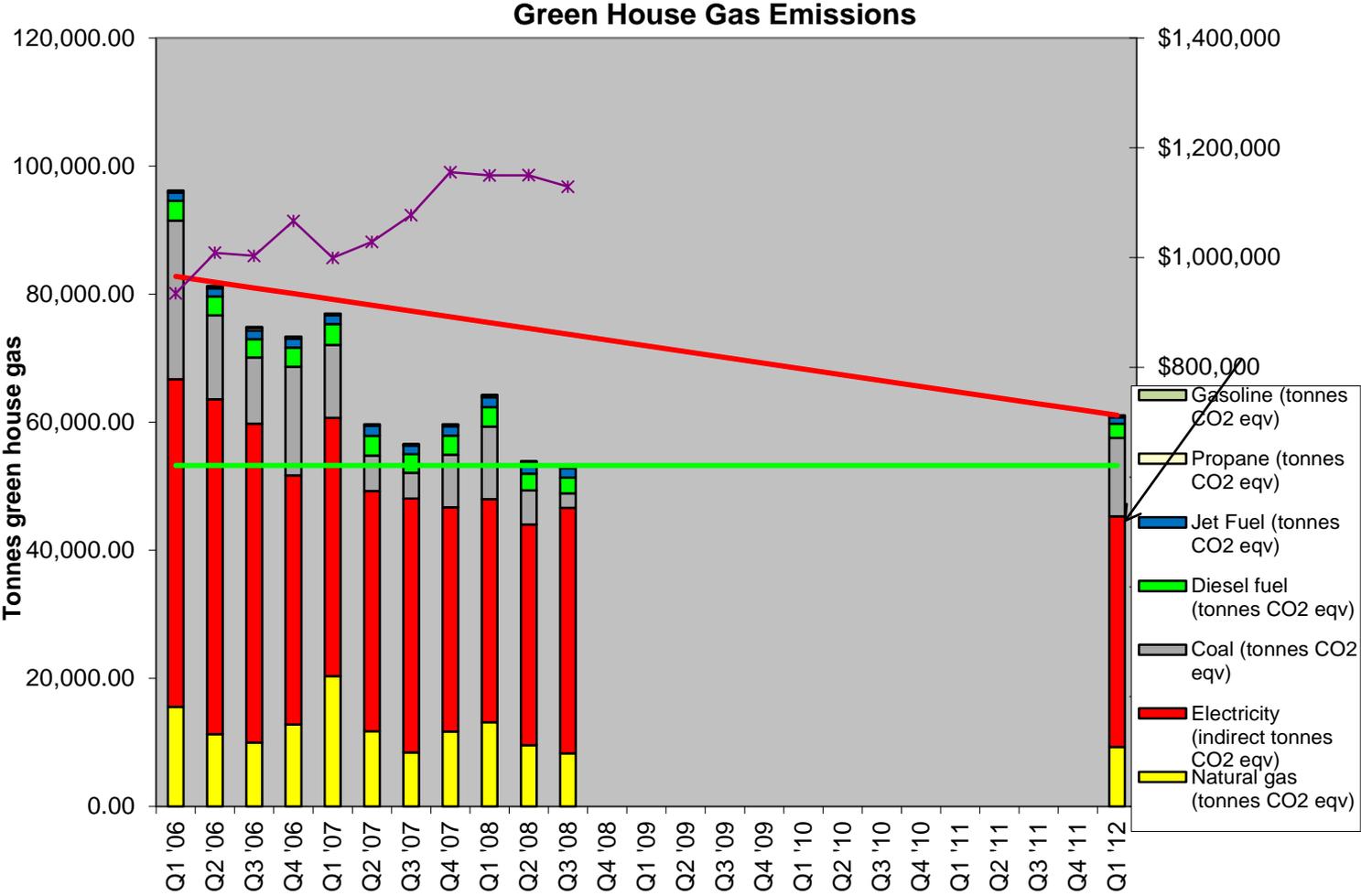
## Environmental Footprint Reduction Goal for Steelcase....

By our 100<sup>th</sup>  
anniversary (2012)  
we are committed  
to reducing water  
and energy use  
(among many other  
environmental  
metrics) by at least  
25%.

# Water Reduction Progress at Steelcase



# Energy Reduction Progress at Steelcase (shown as GHG reduction)



# Water = Energy

- Water savings just one factor in Energy savings equation.
- Total Cost of Ownership encompasses process as a whole to take advantage of synergies.
- Other factors contributing to energy savings are
  - fewer chemical stages
  - chemicals with lower design operating temps
  - counter flow system raising temperature through out
  - lower overall temperature reducing water loss due to evaporation

# Items that Reduce Water Consumption

less evaporation

elimination of inputs/outputs

100% re-use of water in any number of stages

make up of chemical stages with water from following stage

# Items that Reduce Energy Consumption

Lowering of “delta T” by reducing heat required in chemical stages.

Pre wash (where able to use) raising temperature of process parts with otherwise “cast off” heat.

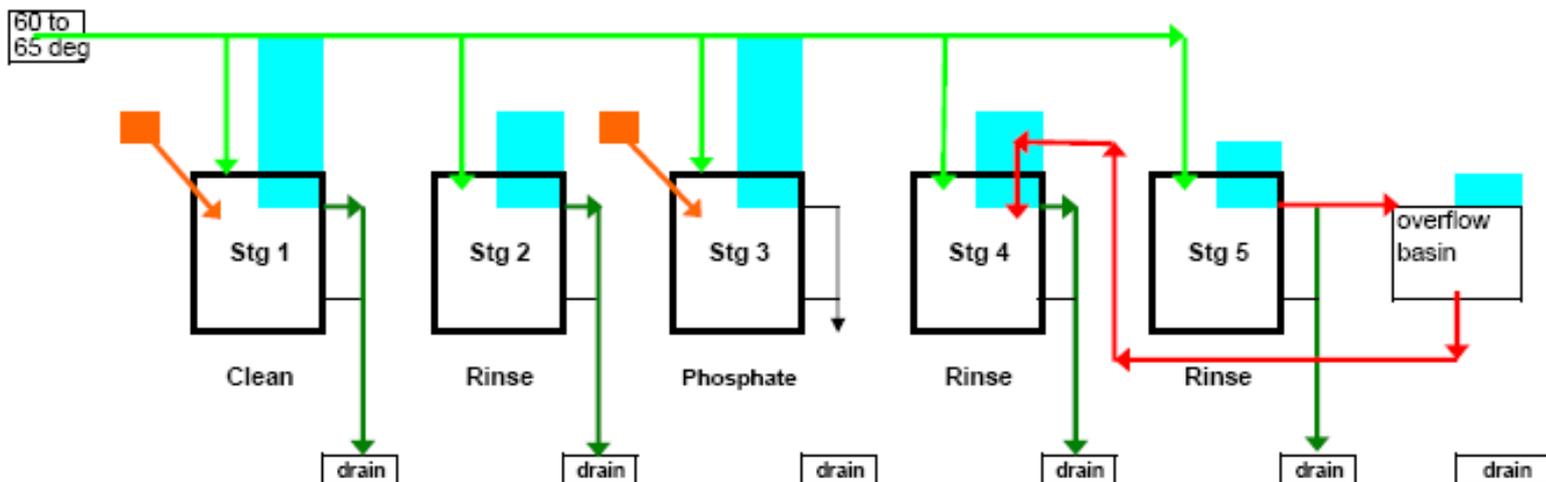
Raising of “delta T” by using carry over heated fluid from chemical stages for there make up instead of cold water supply.

Reducing min/max temperature differential in system through water reuse of water from one input (last stage in system).

# Steelcase - Atlanta Plant - STD. washer

Pretreatment Washer - Current State as of : 06-11-07

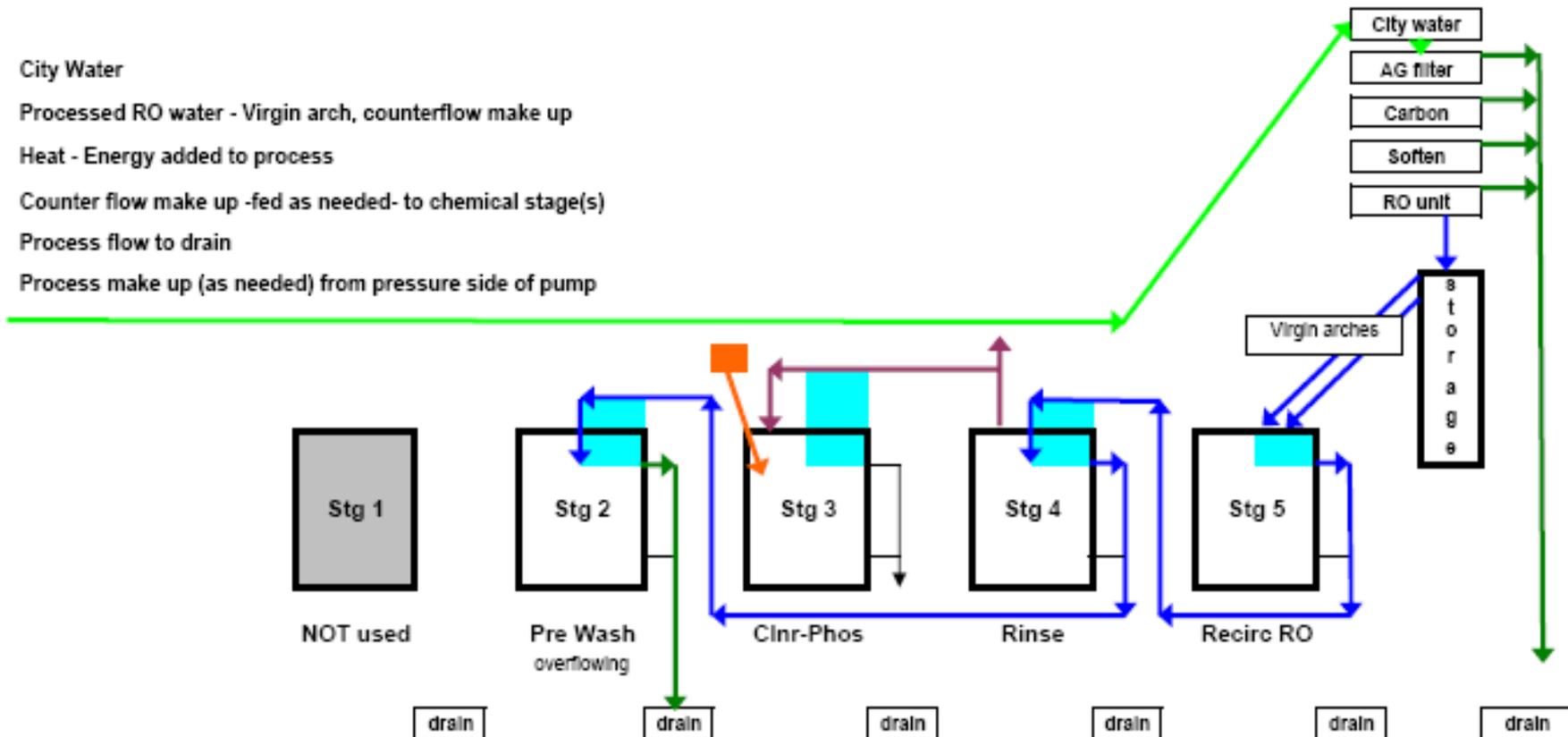
- Evaporation to atmosphere
- City Water
- Processed RO water - Virgin arch, counterflow make up
- Heat Energy added to process
- Counter flow make up
- Process flow to drain



|           |               |         |         |            |              |       |       |  |  |  |
|-----------|---------------|---------|---------|------------|--------------|-------|-------|--|--|--|
| Conc      |               |         |         |            |              |       |       |  |  |  |
| pH        |               |         |         |            |              |       |       |  |  |  |
| Temp      |               | 140-145 | 105     | 140+       | 100          | 80    | 88    |  |  |  |
| Cond      |               |         |         |            |              |       |       |  |  |  |
| Flow, GPM | Total 26+ gpm | 10 gpm  | 5-8 gpm | 4+ make up | 1 gpm from 5 | 8 gpm |       |  |  |  |
| Discharge | Total 22 gpm  | 10 gpm  | 5-8 gpm |            | 1 gpm        |       | 5 gpm |  |  |  |

## Pretreatment Washer - Start up plan

- City Water
- Processed RO water - Virgin arch, counterflow make up
- Heat - Energy added to process
- Counter flow make up -fed as needed- to chemical stage(s)
- Process flow to drain
- Process make up (as needed) from pressure side of pump



NOTE: information in boxes projected for comparison purposes.

|           |  |  |  |               |         |  |               |         |  |  |  |  |
|-----------|--|--|--|---------------|---------|--|---------------|---------|--|--|--|--|
| Conc      |  |  |  |               |         |  |               |         |  |  |  |  |
| pH        |  |  |  |               |         |  |               |         |  |  |  |  |
| Temp      |  |  |  | 80-90         | 95-105  |  | 85-95         | 75-85   |  |  |  |  |
| Cond      |  |  |  |               |         |  |               |         |  |  |  |  |
| Flow, GPM |  |  |  | c-flow from 4 |         |  | c-flow from 5 | 2-4 gpm |  |  |  |  |
| Discharge |  |  |  |               | 1-2 gpm |  |               |         |  |  |  |  |

# Cost Reduction Summary

## Steelcase Inc. Atlanta GA

Projected "TCO" Summary - Ped Line Washer - Updated 12-31-07

| <u>Metric</u>     | <u>KPI</u>                       | <u>Time Frame</u> | <u>Basis for Reduction</u>  | <u>Percent Reduction</u> | <u>\$'s per Unit</u>                  | <u>Financial Impact</u> |
|-------------------|----------------------------------|-------------------|---|--------------------------|---------------------------------------|-------------------------|
| ENERGY            | BTU's                            | annual            | Stg 3 temp reduction 140 to 110<br>Stg 1 turn burner off  | -50%<br>-100%            | \$1.18 / CCF *                        | \$ (173,082.52)         |
| LABOR             | menu items<br>(cost & frequency) | annual            | Impact of RO water on process<br>eliminating "hard" scale & sludge                                | -68%                     | per "event" **                        | \$ (14,978.60)          |
| WATER / SEWAGE    | Gallons, US                      | annual            | 100% use & reuse of<br>"purified" water (via counter flow)<br>current at approx. 6,000,000 gal/yr | -88%                     | \$3.00 / CCF ***                      | \$ (21,176.32)          |
| PROCESS CHEMICALS | Gallons, US                      | annual            | fewer chemical charge-ups<br>lower chemical concentrations<br>fewer chemical stages               | -10%                     | \$3.00 to \$5.00<br>per Gal., premium | \$ (5,000.00)           |

**"TCO" (Total Cost of Ownership) impact on Steelcase** **\$ (214,237.44)**

**"TCO" (Total Cost of Ownership) impact on a Steelcase "production hour"** **\$ (107.12)**

# Technical Challenges to Overcome

- Lower overall temps...lower flows... neutral pHs...  
leaves potential for more bio growth issues.
- Counter flow system advantage of reuse also leaves all waters going to all stages so issues like bio will end up everywhere... these issues are very manageable but do require attention and an action plan.

# **In conclusion...**



**The enormous benefits of a total cost of ownership focus far outweigh the obstacles to overcome, including personal, professional, and the technical issues previously mentioned.**

**thank you.**