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Tomorrow's Answers Today

PaperCon 2011
Rethink Paper – Lean and Green

Effective Paper Machine Slime Control and No Vapor Phase Corrosion

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eka

“Evolution” of Effective PM Slime Control Alkaline Fine Paper (North America)

- The evolution of using oxidizing biocides
- What are the current issues/problems?
- A **“new”** technology to address the current and **“old”** issues

"Evolution" of Effective PM Slime Control Alkaline Fine Paper (North America)

1980-1990
Non Oxidizing Biocide(s)
→
1985-2000
"Strong" Oxidizers w/ Biocide
→
1995-2005
"Mild" Oxidizers w/ Biocide
→
2000-Present
"Mild" Oxidizers w/o Biocide

Issues:
- Cost
- Performance

Issues:
- Ox Control
- Interactions
- Performance

Issues:
- Cost
- Performance

Issues:
- **Cost**
- **Vapor phase corrosion**

“Evolution” of Effective PM Slime Control
Alkaline Fine Paper (North America)

1980-1990	1985-2000	1995-2005	2000-Present
Non Oxidizing Biocide(s)	“Strong” Oxidizers w/ Biocide	“Mild” Oxidizers w/ Biocide	“Mild” Oxidizers w/o Biocide

Issues:
- Cost
- Performance

Issues:
- C[illegible]Co[illegible]l
- In[illegible]ons
- [illegible]or[illegible]ce

Issues:
- Cost
- Performance

Issues:
- **Cost**
- **Vapor phase corrosion**

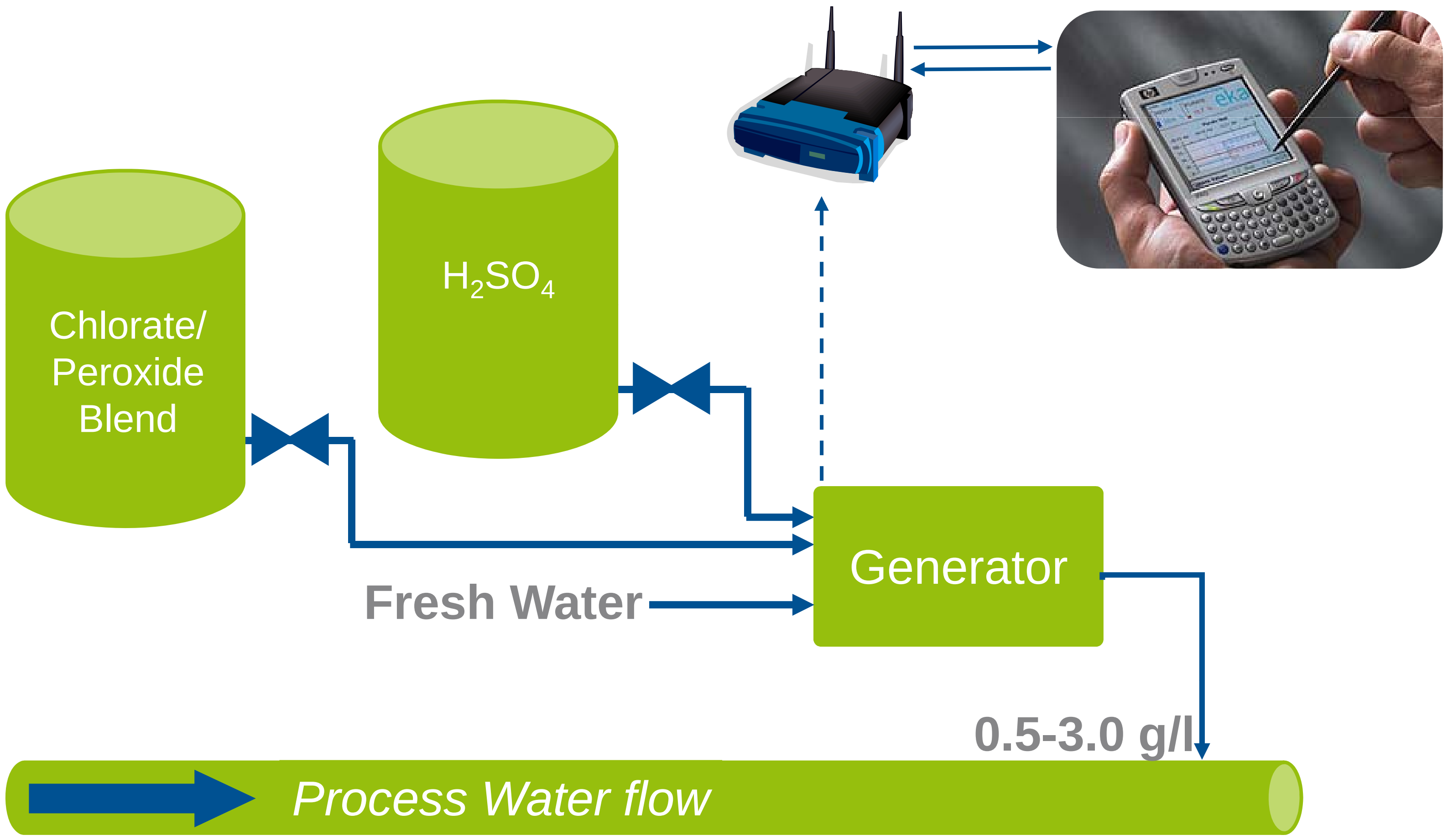
Eka Purate® ClO_2

- It is a blend of sodium chlorate ($NaClO_3$) & peroxide (H_2O_2)
- Patented ClO_2 method
  - Chemical generation reaction:

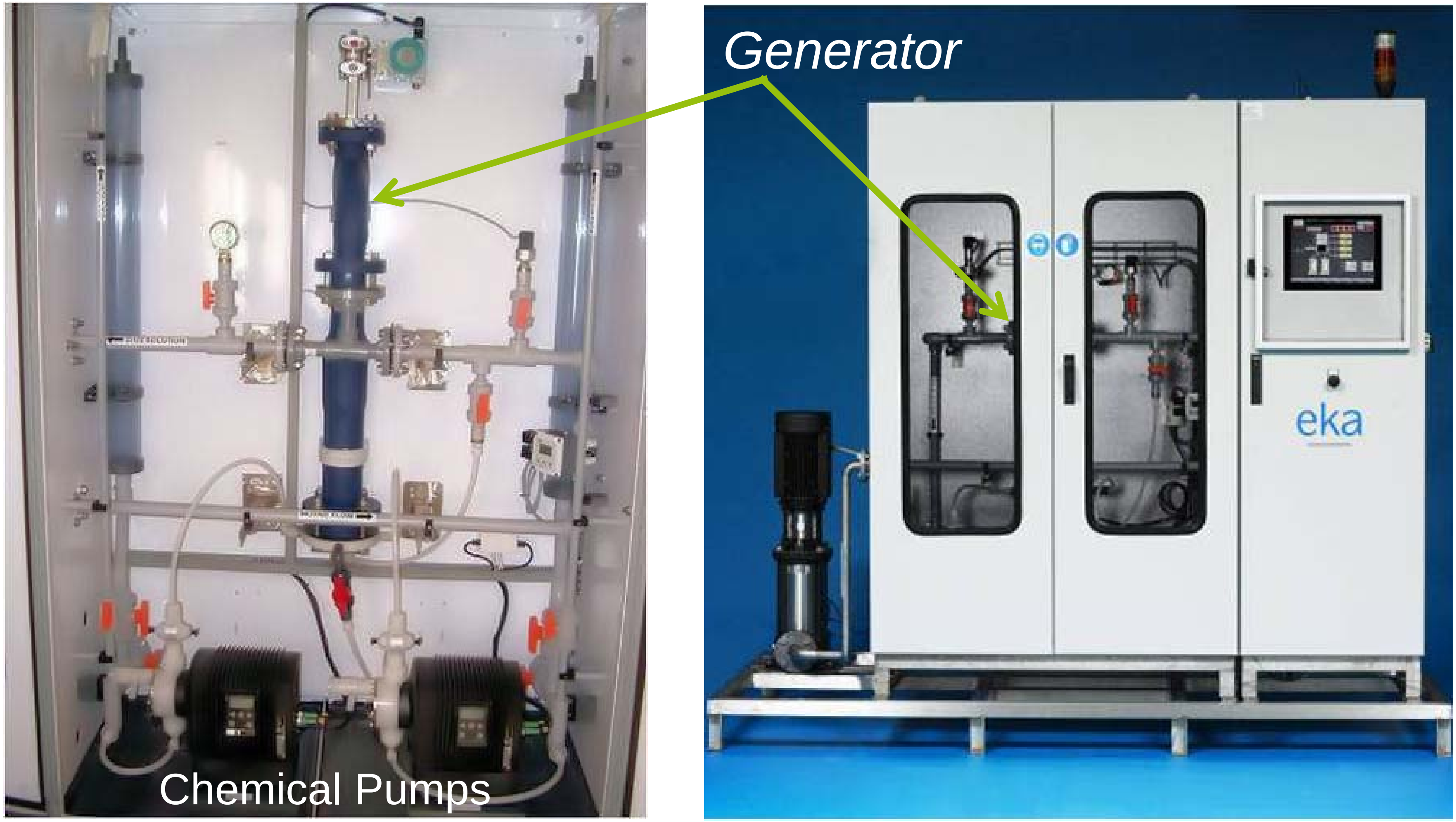
    $(2NaClO_3 + H_2O_2) + H_2SO_4 \rightarrow 2ClO_2 + O_2 + Na_2SO_4 + 2H_2O$

    (Chlorate + peroxide) plus (acid) → (**chlorine dioxide**)
- Lowest cost for small scale generation of ClO_2
- State of the art control
  - Generation of chlorine dioxide (efficiency and simplicity)
  - Application for disinfection & slime control

ClO_2 Generation



ClO_2 Generator



The Benefits of Using ClO_2

- **Widely used in Europe (Paper & Water) & North America (Water)**
- **Cost effective**
- **Improved runnability**
  - Less web breaks
  - Better retention – filler, sizing agents

The Benefits of Using ClO_2

- **Improved paper quality**
  - Less holes and spots
  - Less biofilm in pipes and towers
- Increased ORP
- Reduced Odors (No H_2S smell)
- Increased pH/less dissolved Ca++ level
- Lower demand for wet end starch
- **Reduced potential for vapor phase corrosion**

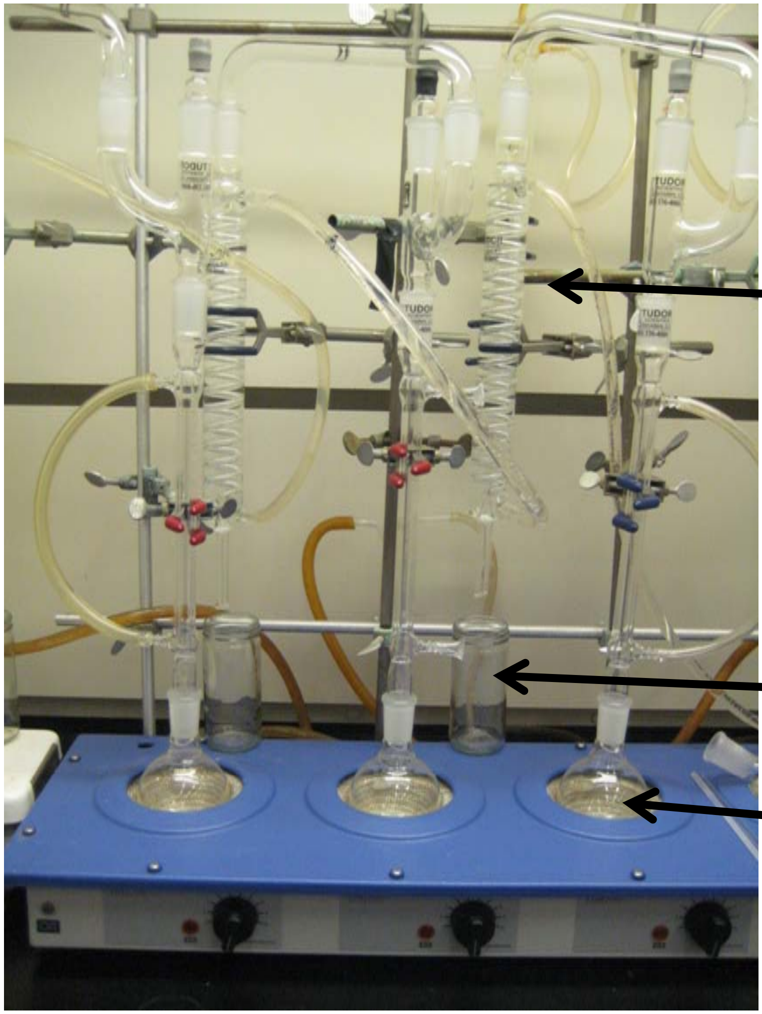
Corrosion with Oxidizer Hypo, Chloramines, and ClO_2

- **Liquid phase**
  - SS is resistant
  - No issues reported
- **SS pitting due to chlorides**
  - Chloride levels are normally a problem
  - No issues reported
- **Vapor phase**
  - Corrosion in wet end mist area (cat walks, ceiling, frame, etc.)
  - Corrosion in dryer section (dryer can surface, dryer section ventilation, dryer felt carrying rolls, etc.)

Vapor Phase Corrosion Testing Hypo, Chloramines, and ClO_2

- Lab studies to simulate WW evaporation and condensation – measuring the condensed vapor components
- Lab studies to document the impact of the WW vapors have on corrosion coupons
- Paper Machine testing for the components in the condensed vapor from the first section of drying

Evaporation & Condensation Lab Apparatus

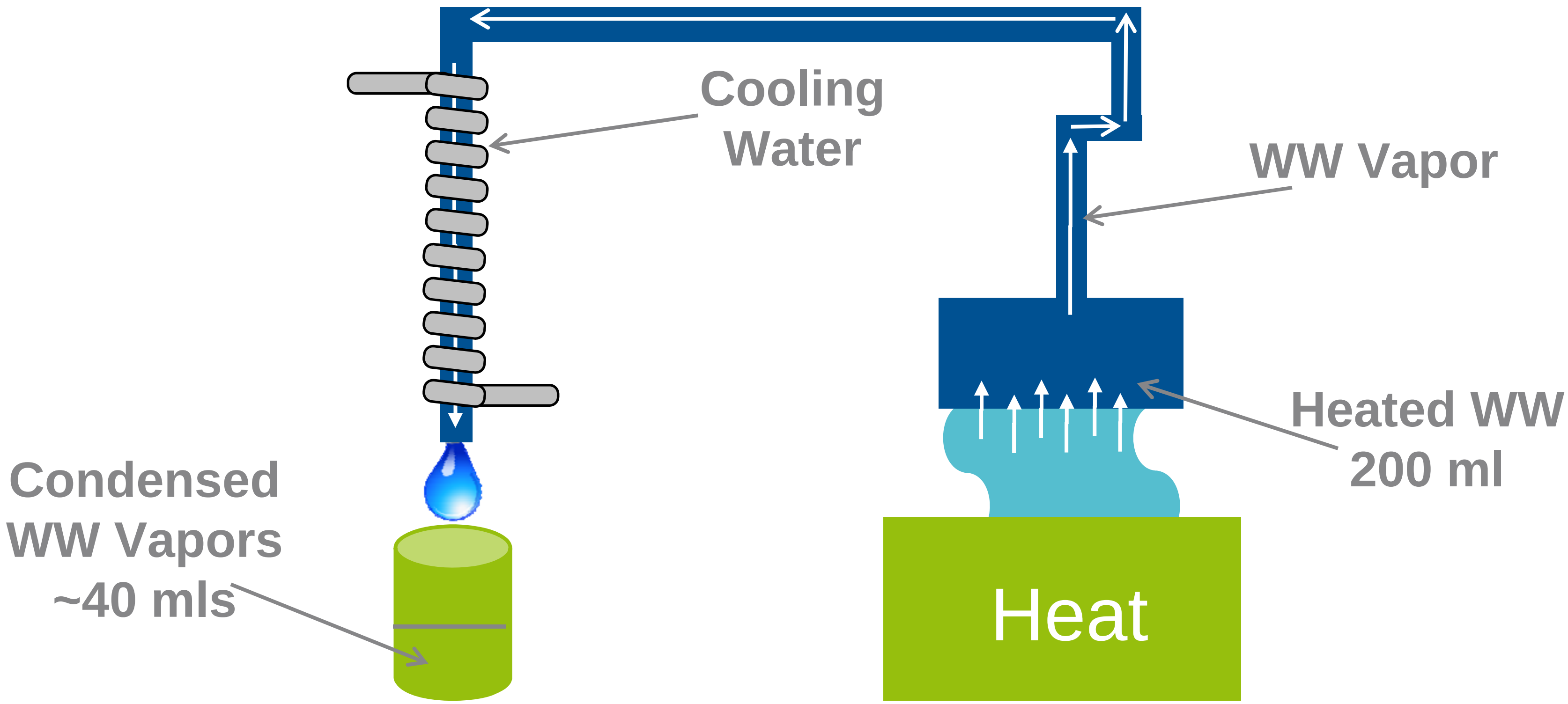


Cooling Water Condenser

Condensed Vapors from WW

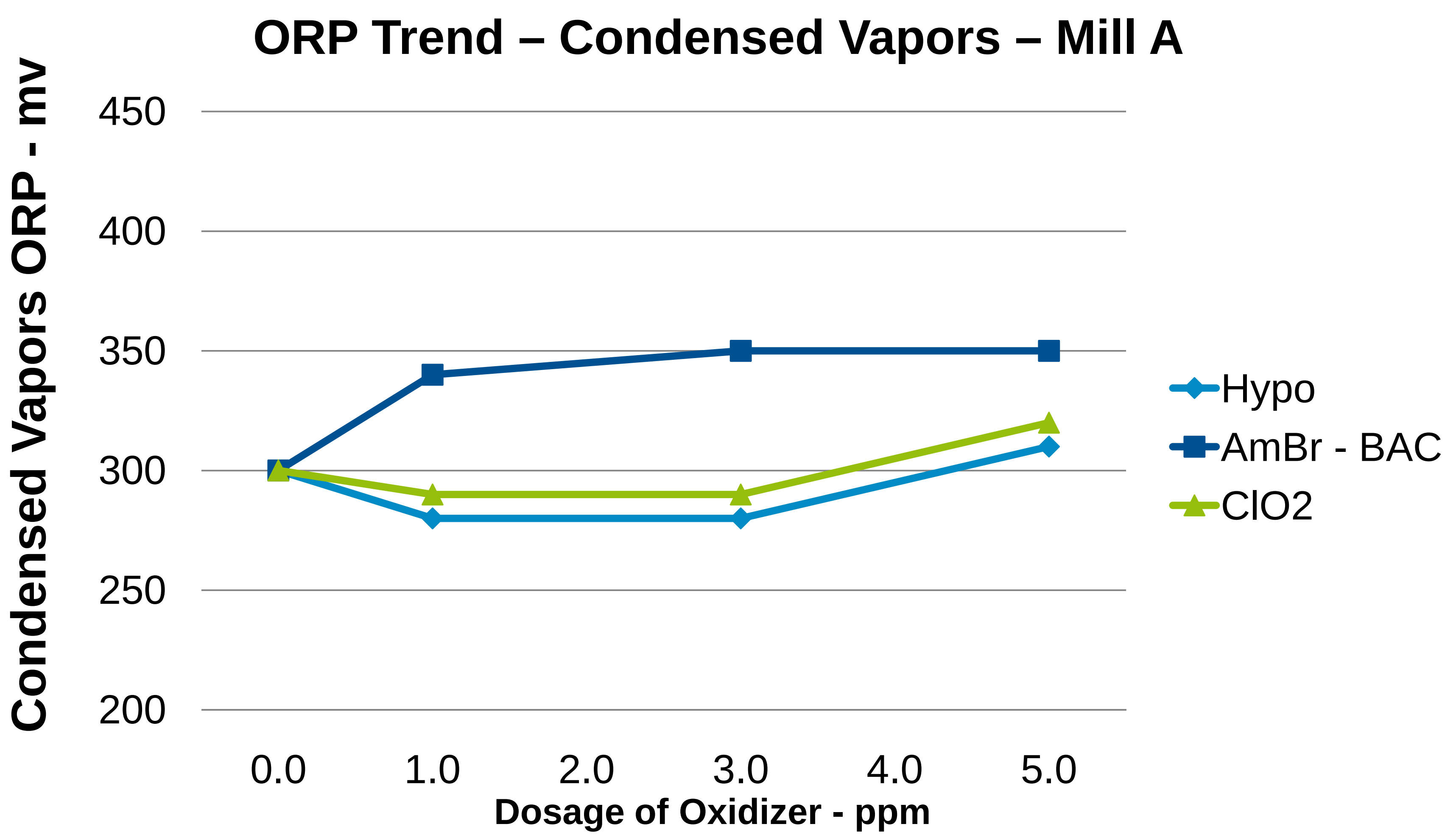
WhiteWater

Evaporation & Condensation Lab Apparatus

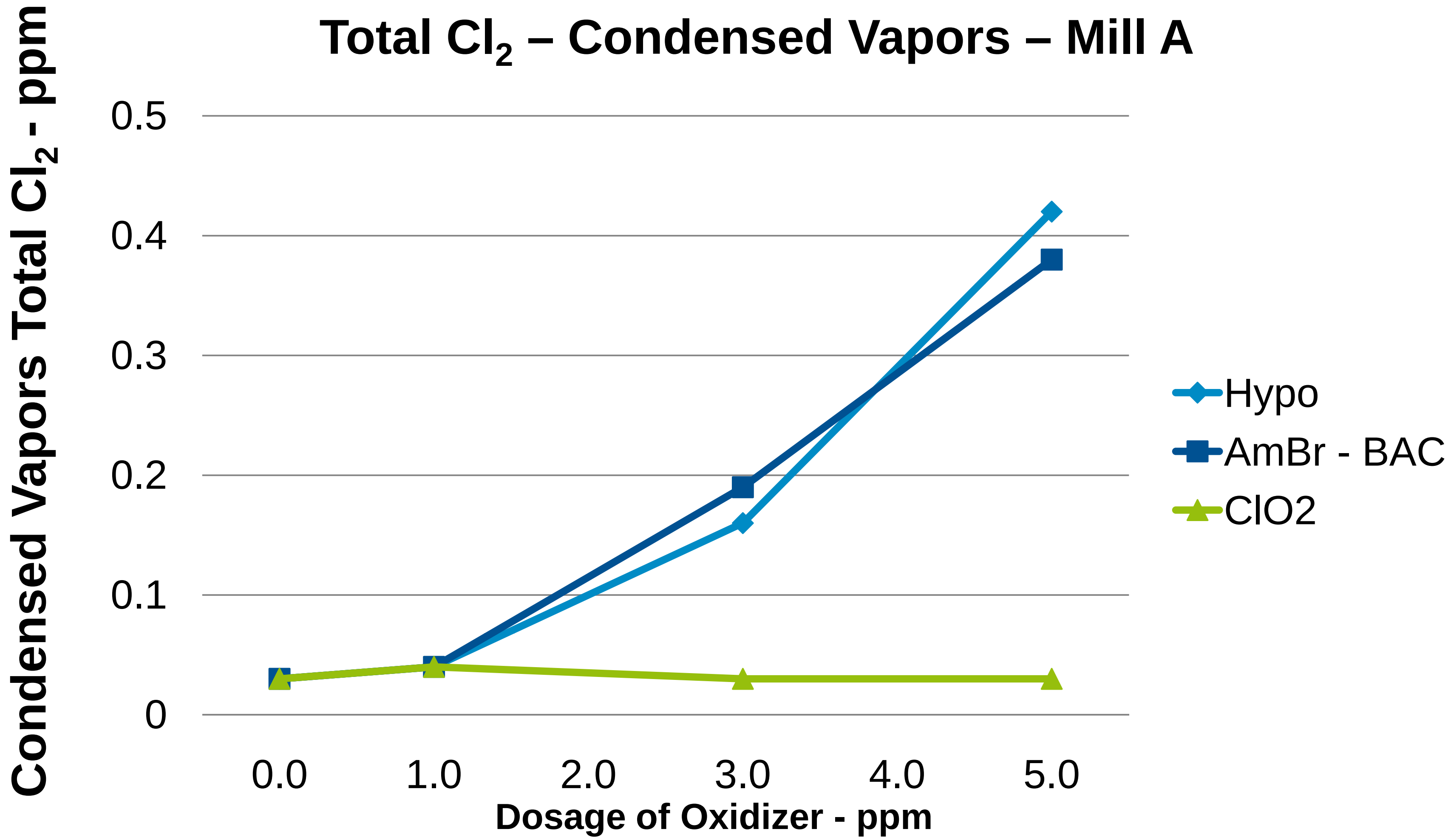


Untreated, Hypo, Chloramines (MCA or BAC),& ClO_2 Hypo, BAC, MCA , & ClO_2 @ varying ppms					
	pH	ORP	Total Cl2	ClO_2	Conductivity
WW	X	X	X	X	X
WW after test	X	X	X	X	X
Condensed WW Vapors	X	X	X	X	X

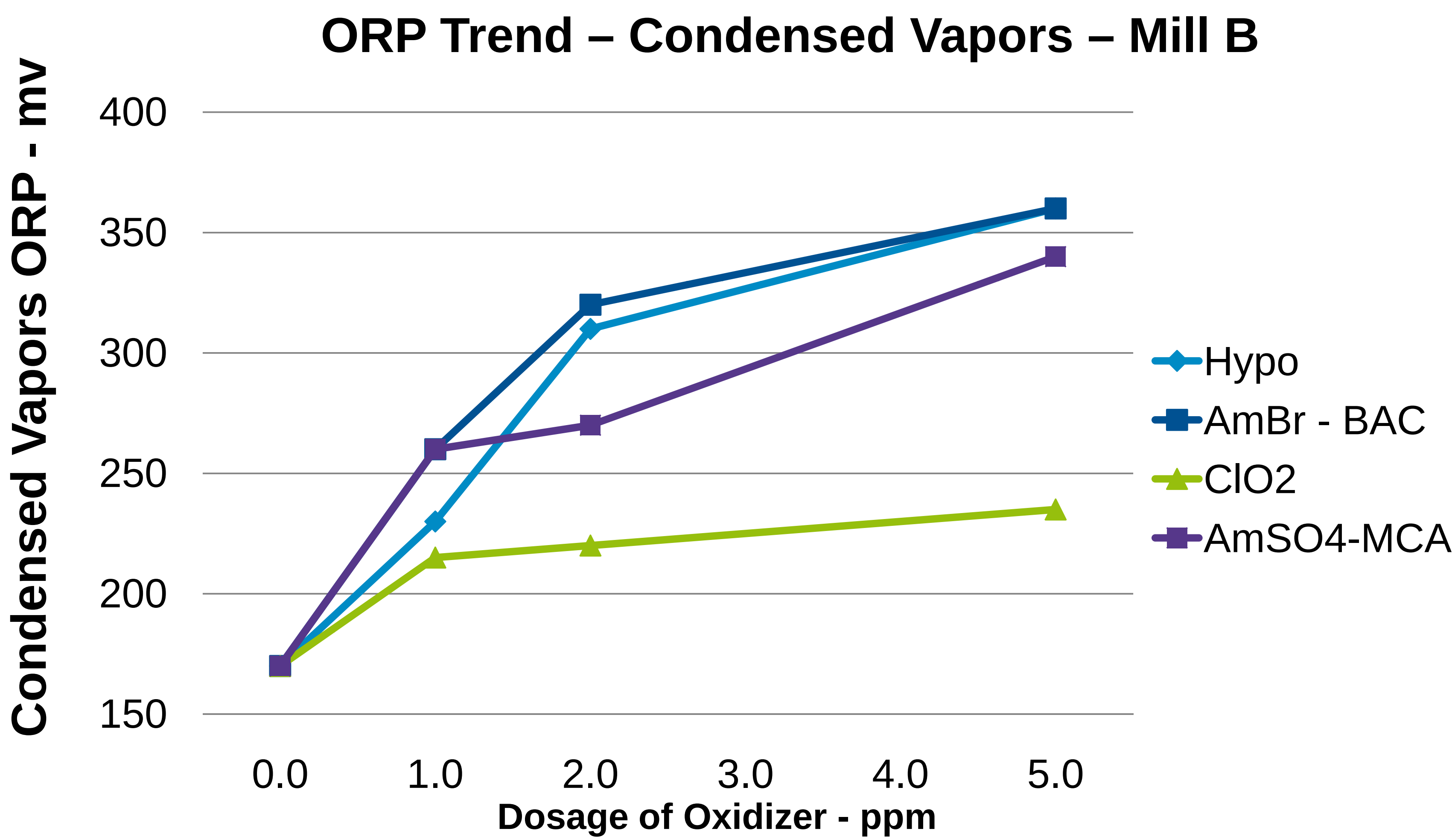
Lab Study – Condensed Vapors



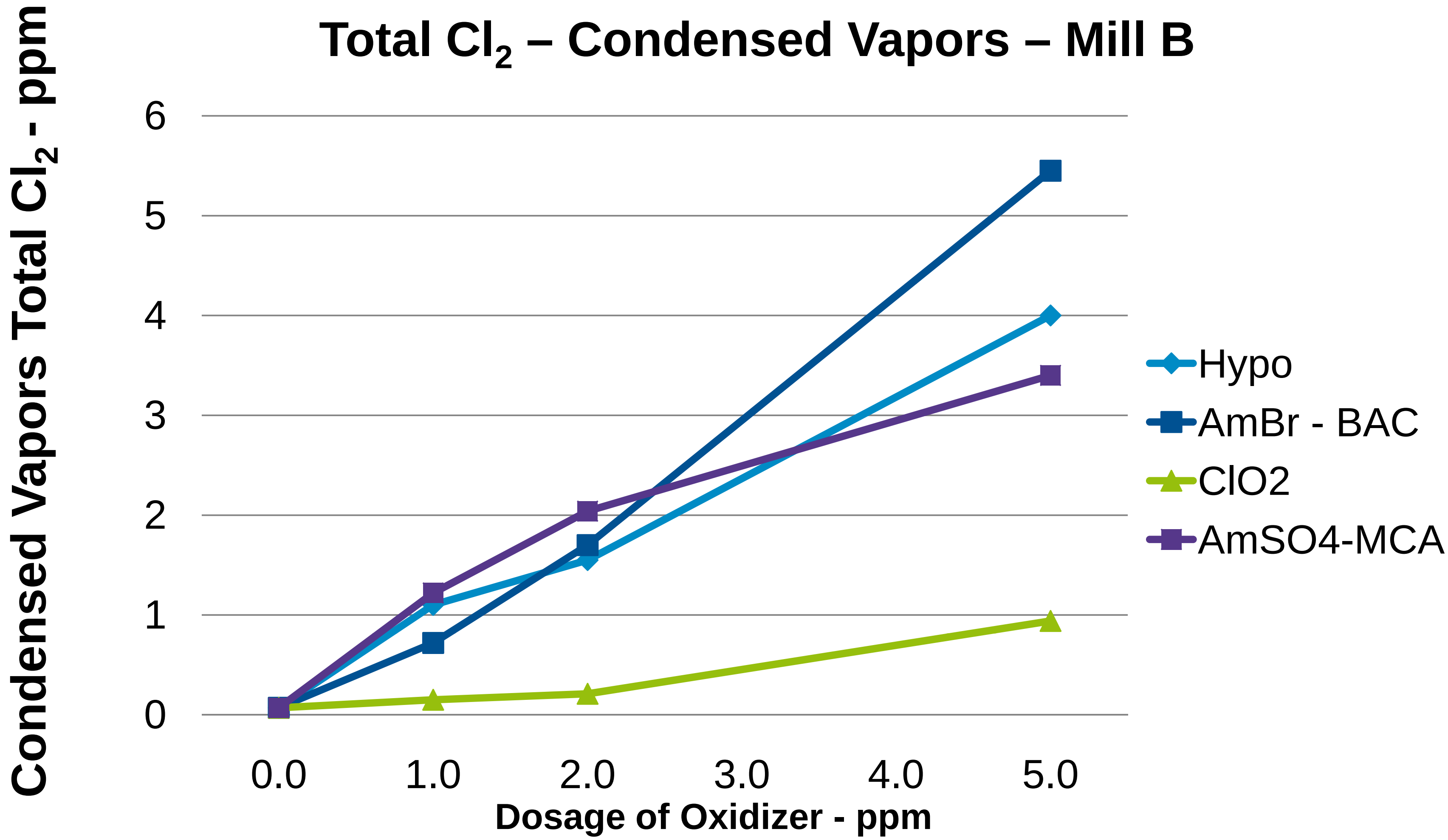
Lab Study – Condensed Vapors



Lab Study – Condensed Vapors



Lab Study – Condensed Vapors



Mill Study – Condensed Vapors

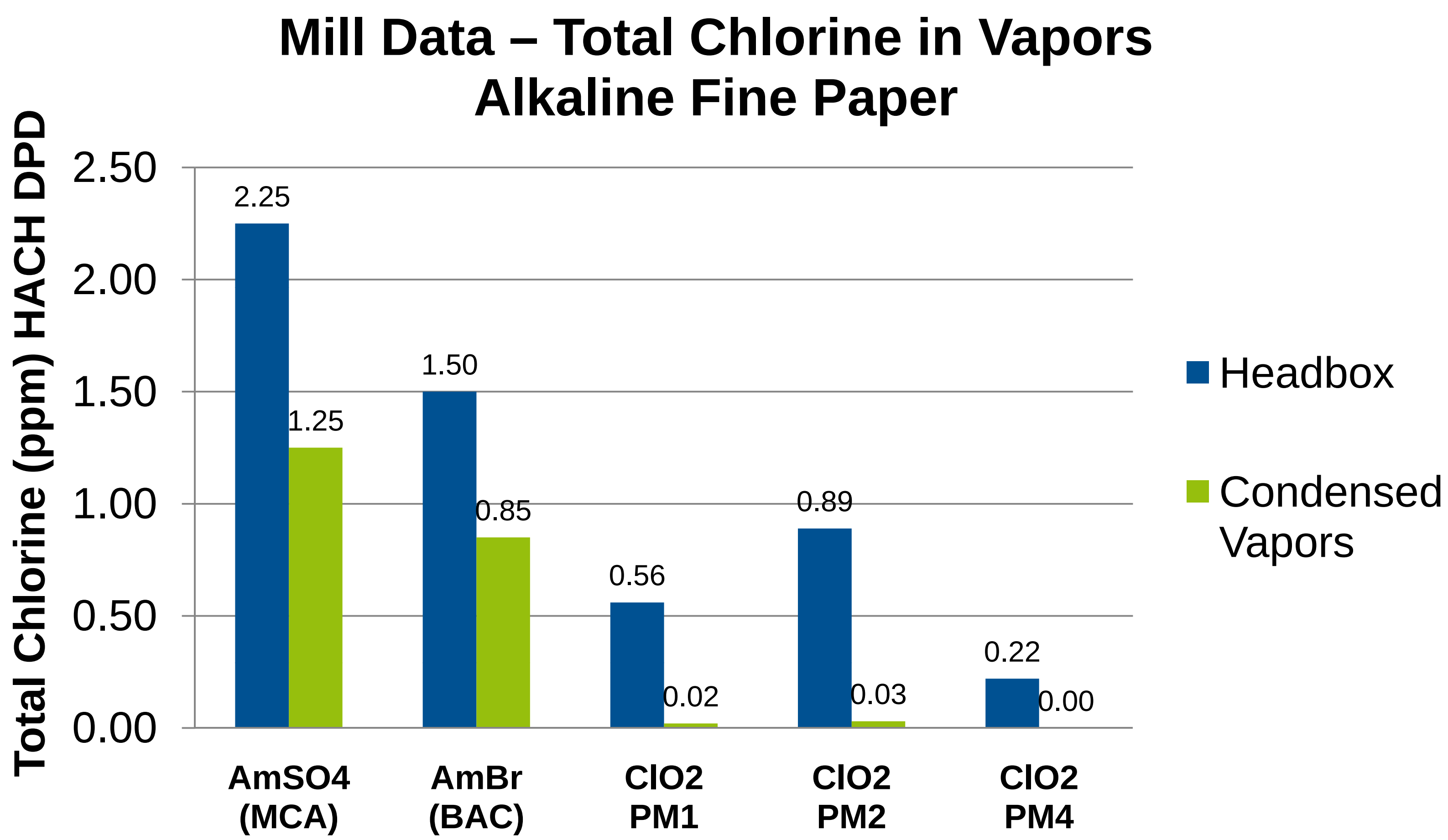
Dryer Section

Hose to collect vapors
from above the paper web

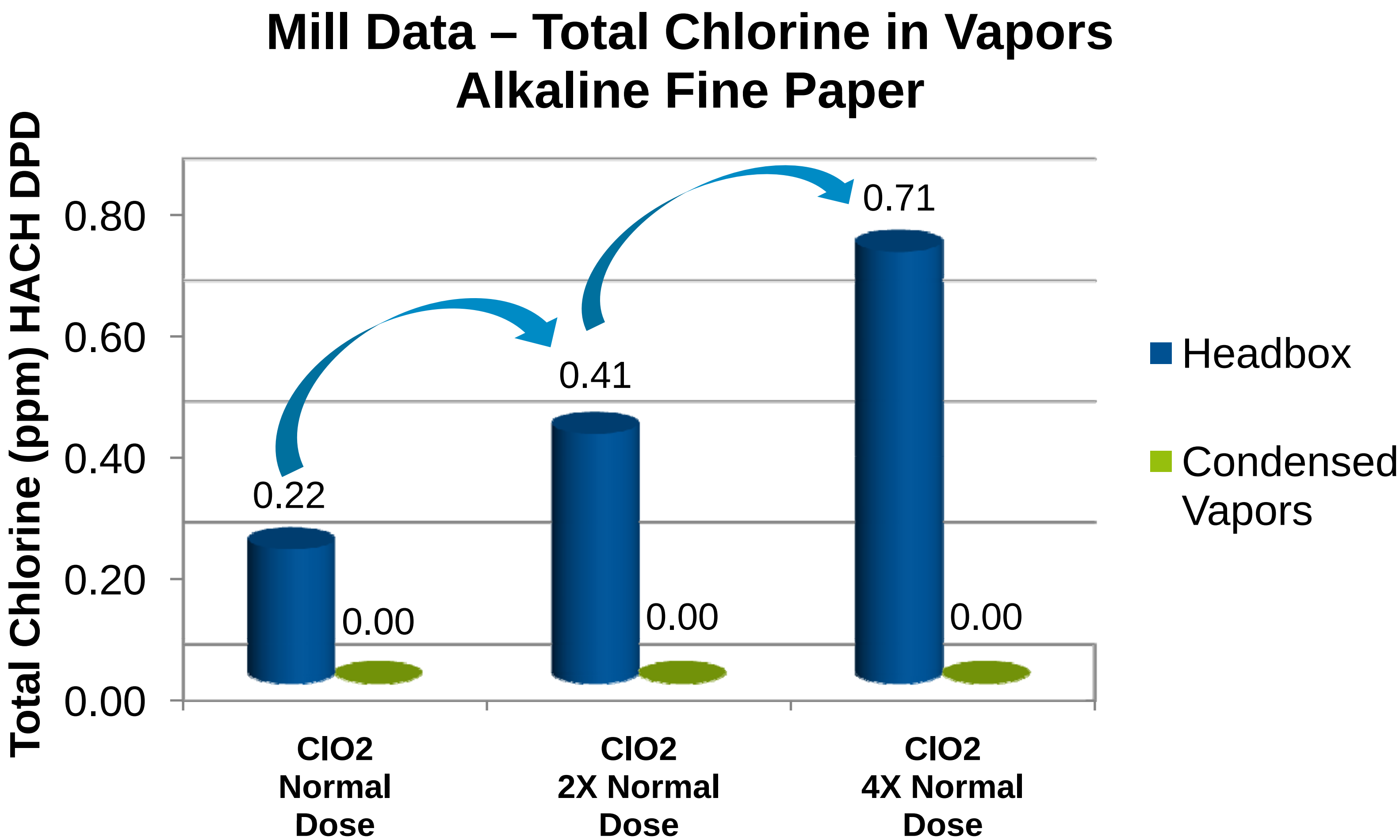
Ice Chest

Vacuum Pump

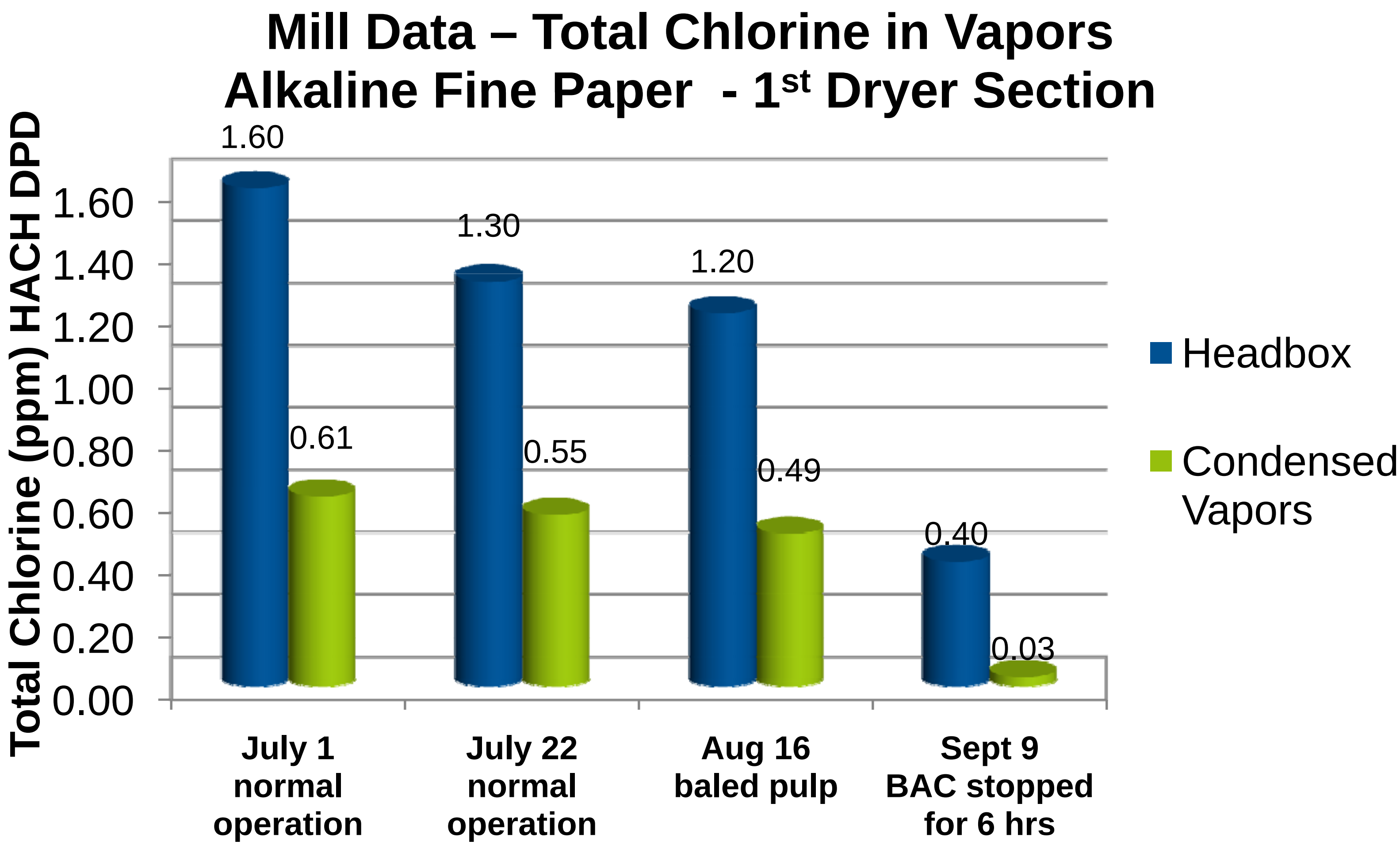
Mill Study– Condensed Vapors



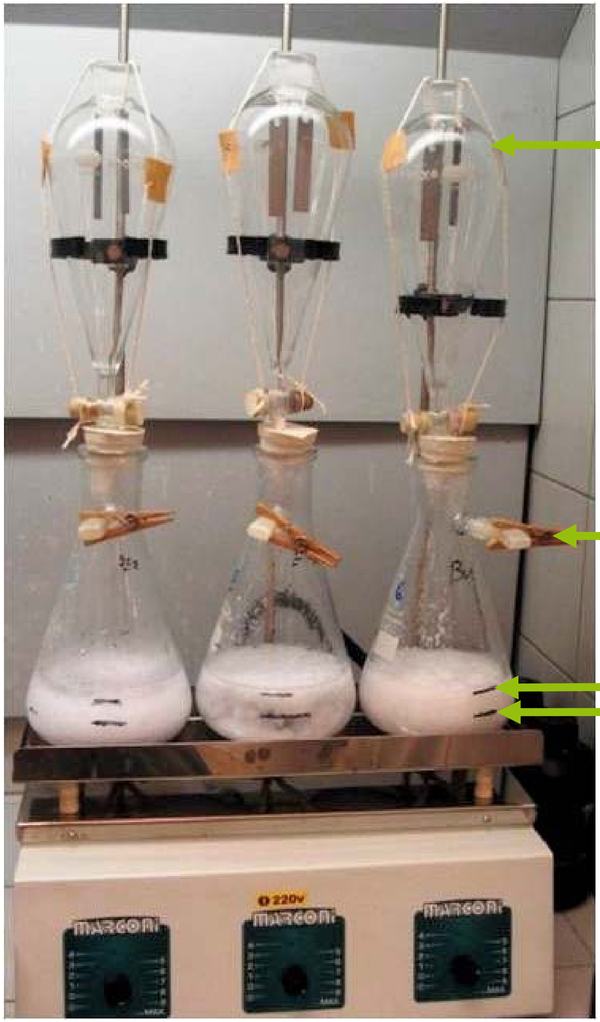
Mill Study– Condensed Vapors Increased ClO_2



Mill Study– Condensed Vapors Varying Operations and BAC Dose



Vapor Phase Testing – Coupons



2 Coupons suspended in the Heated Vapors (30 hrs)

To refill with HB stock

Max
Min

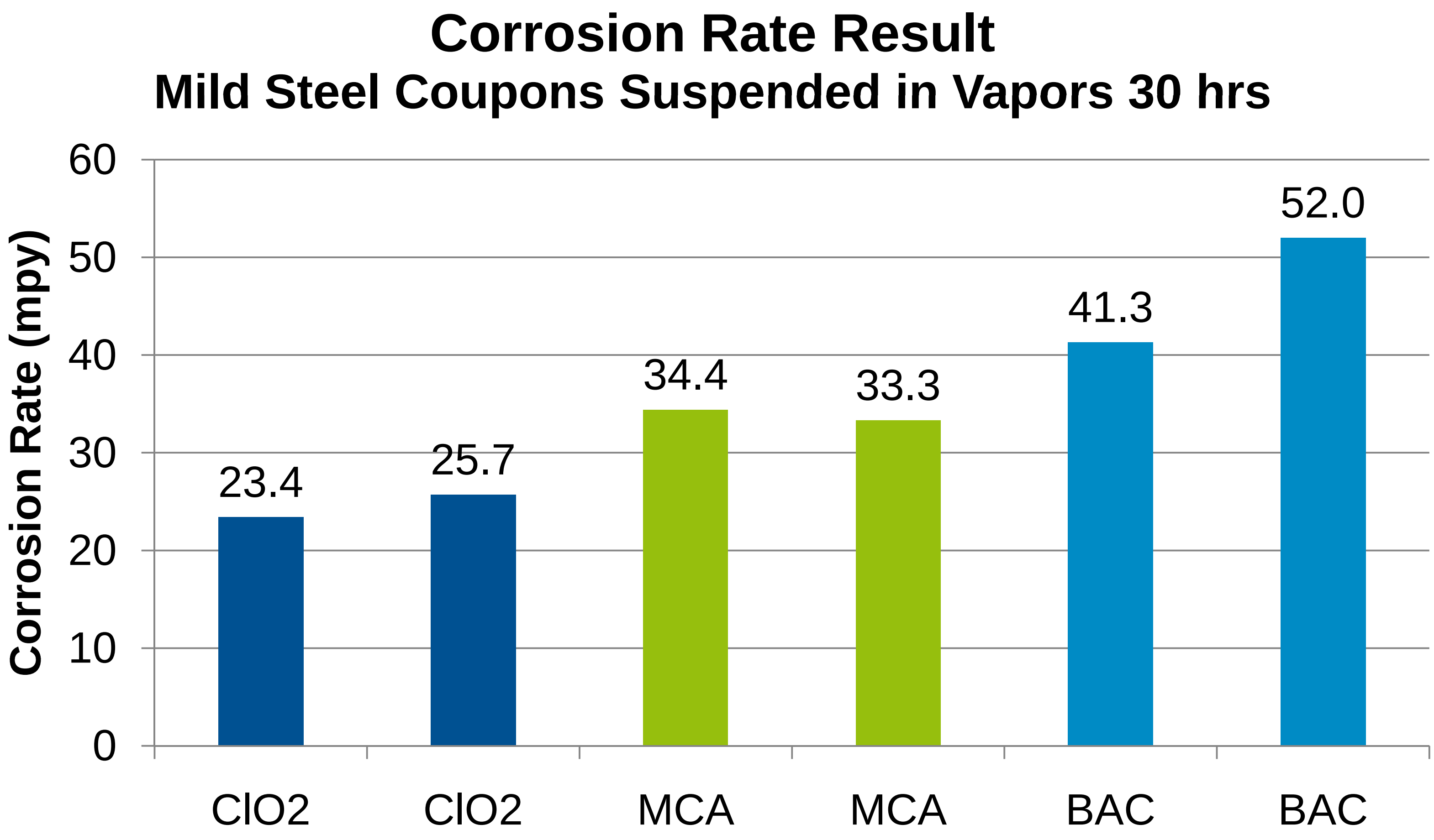
Vapor Phase Testing – Coupons

ClO_2
Front & Back

$AmSO_4$
Front & Back

AmBr
Front & Back

Vapor Phase Testing – Coupons



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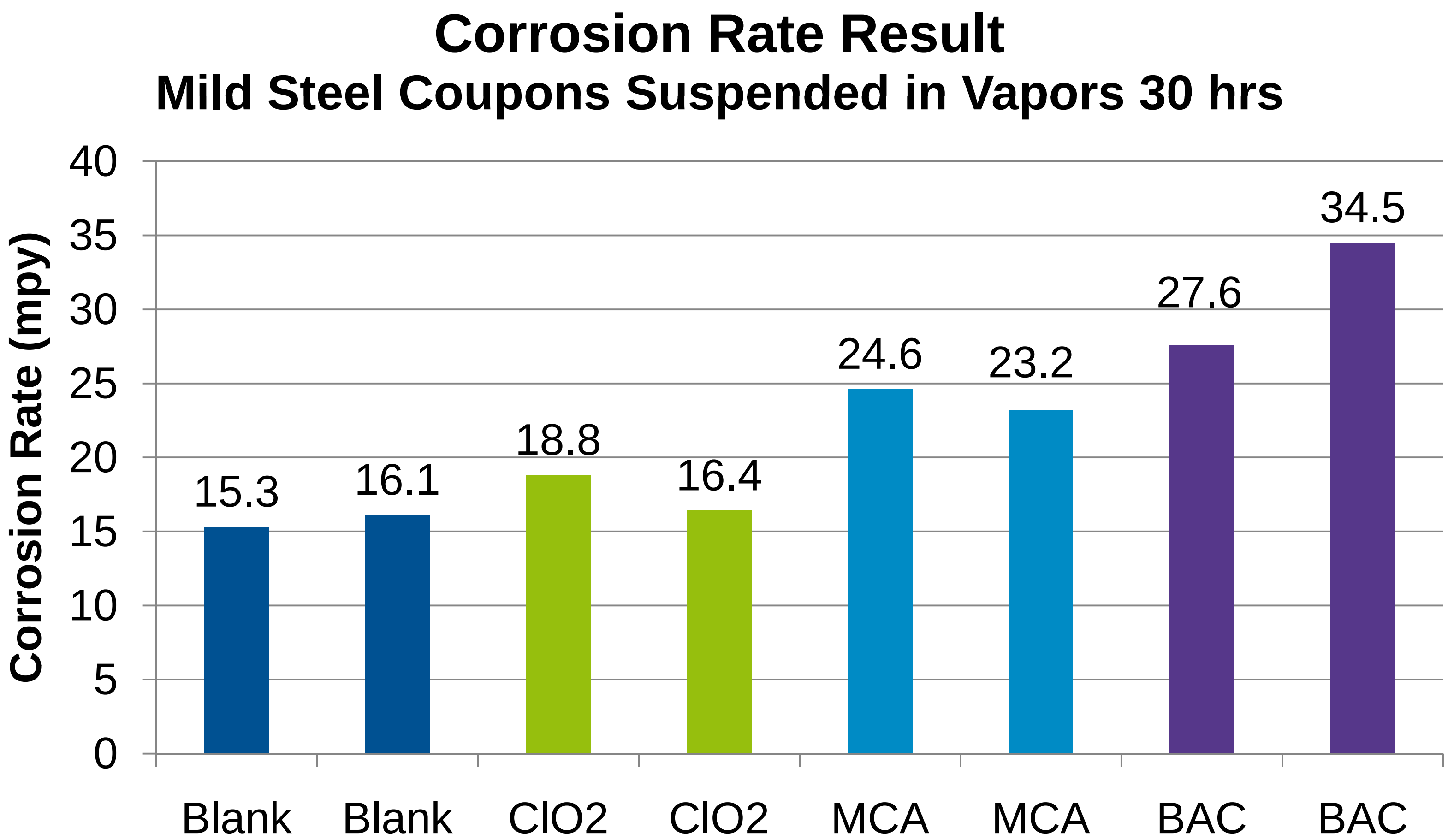

Summary – Condensed Vapor Studies

- Lab Studies – Heating WW and Condensing Vapors
  - AmBr (BAC) – always detected Total Cl_2 in condensed vapors, varying amount & increased with BAC dose
  - $AmSO_4$ (MAC) – always detected Total Cl_2 in condensed vapors, varying amount & increased with MCA dose
  - ClO_2 – zero to trace amounts of Total Cl_2 in vapors, increased to trace amounts with increased dose of ClO_2
- Mill Condensed Vapor Studies – agreed with Lab Studies
- Corrosion Coupons in the Vapor Phase – the trend agreed with condensed vapor studies
- All agreed with what we see in the “real world

Effective Paper Machine Slime Control and No Vapor Phase Corrosion

- **ClO_2**
  - Improved small scale generation of ClO_2
  - Improved control with PLC
  - A **“new”** technology to address
    - The current issues (vapor phase corrosion) and
    - **“Old”** issues (control and application)