

Demineralization

How do you Monitor Demineralizers?

- **Monitoring Practices**
- **Typical Measured Values**
- **Correct Measurement Methods**

How do you Monitor Demineralizers?

- **Monitoring**

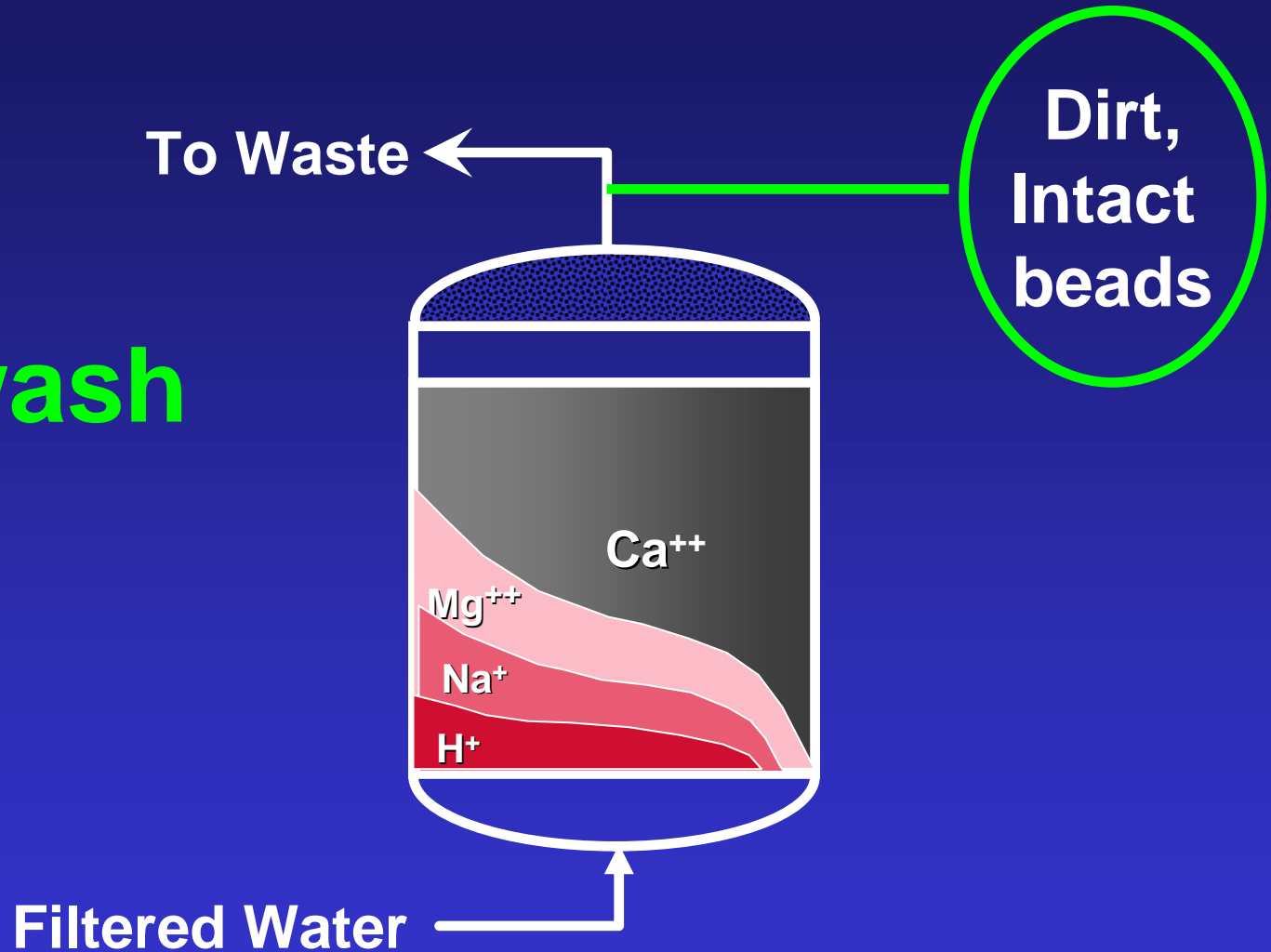
- Backwash

- Service

- Forward Rinse or Fast Rinse

How do you Monitor Demineralizers?

Cation Backwash

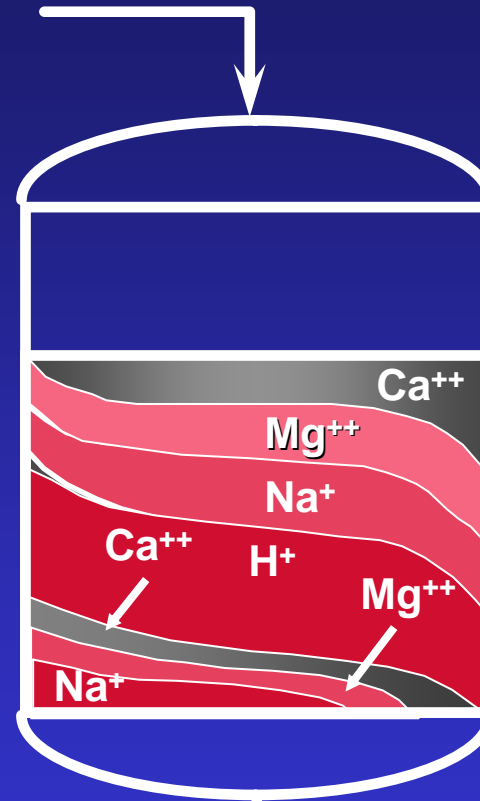


Courtesy of: **ROHM & HAAS**  For all the right resins

How do you Monitor Demineralizers?

Cation
Service

Filtered Water



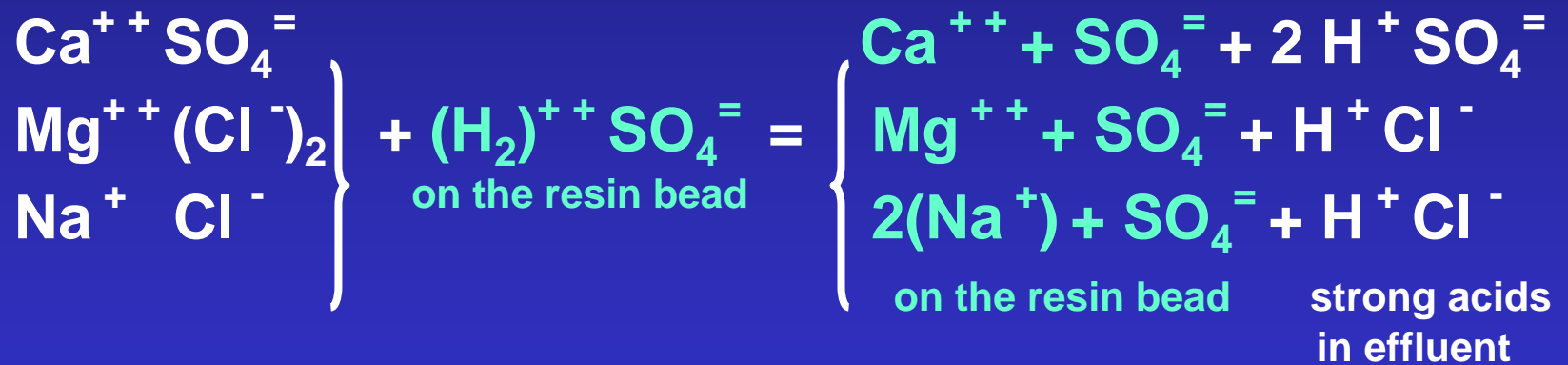
pH
TH
FMA

Courtesy of: **ROHM**
AND
HAAS  For all the right resins

How do you Monitor Demineralizers?

FMA = Free Mineral Acidity

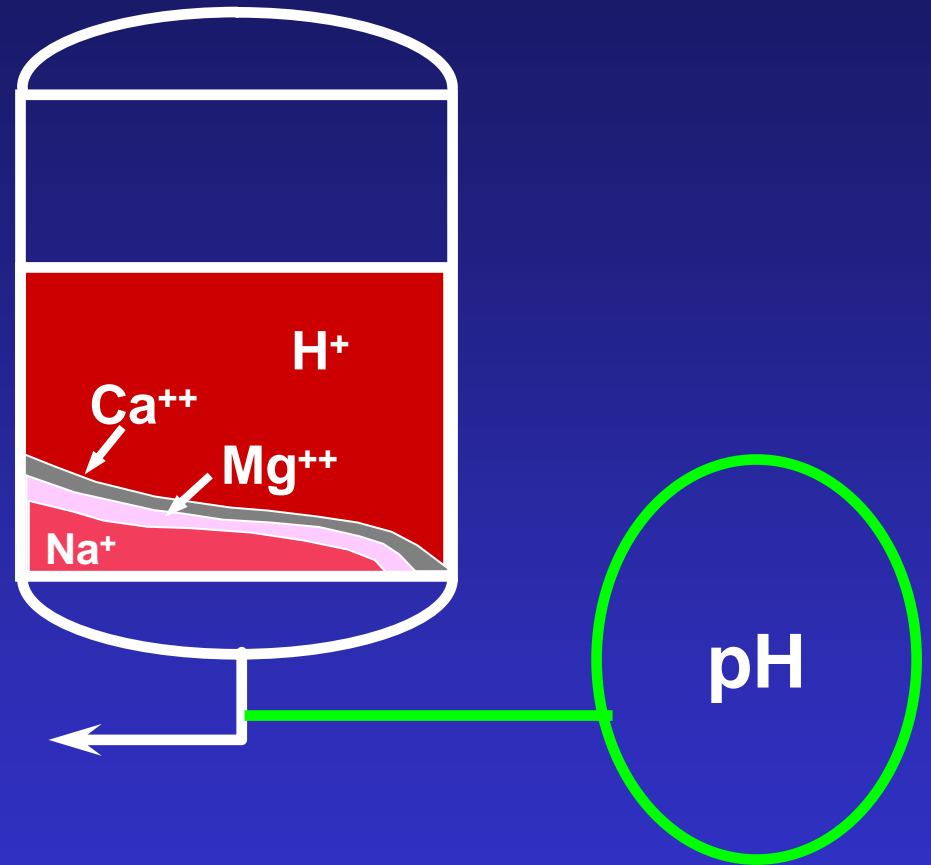
Exchanging a **cation** with H^+ on the bead creates a strong “mineral” acid in the effluent during regeneration



The FMA indicates the chloride (Cl^-) and sulfate ($SO_4^{=}$) concentrations and the run length of the anion

How do you Monitor Demineralizers?

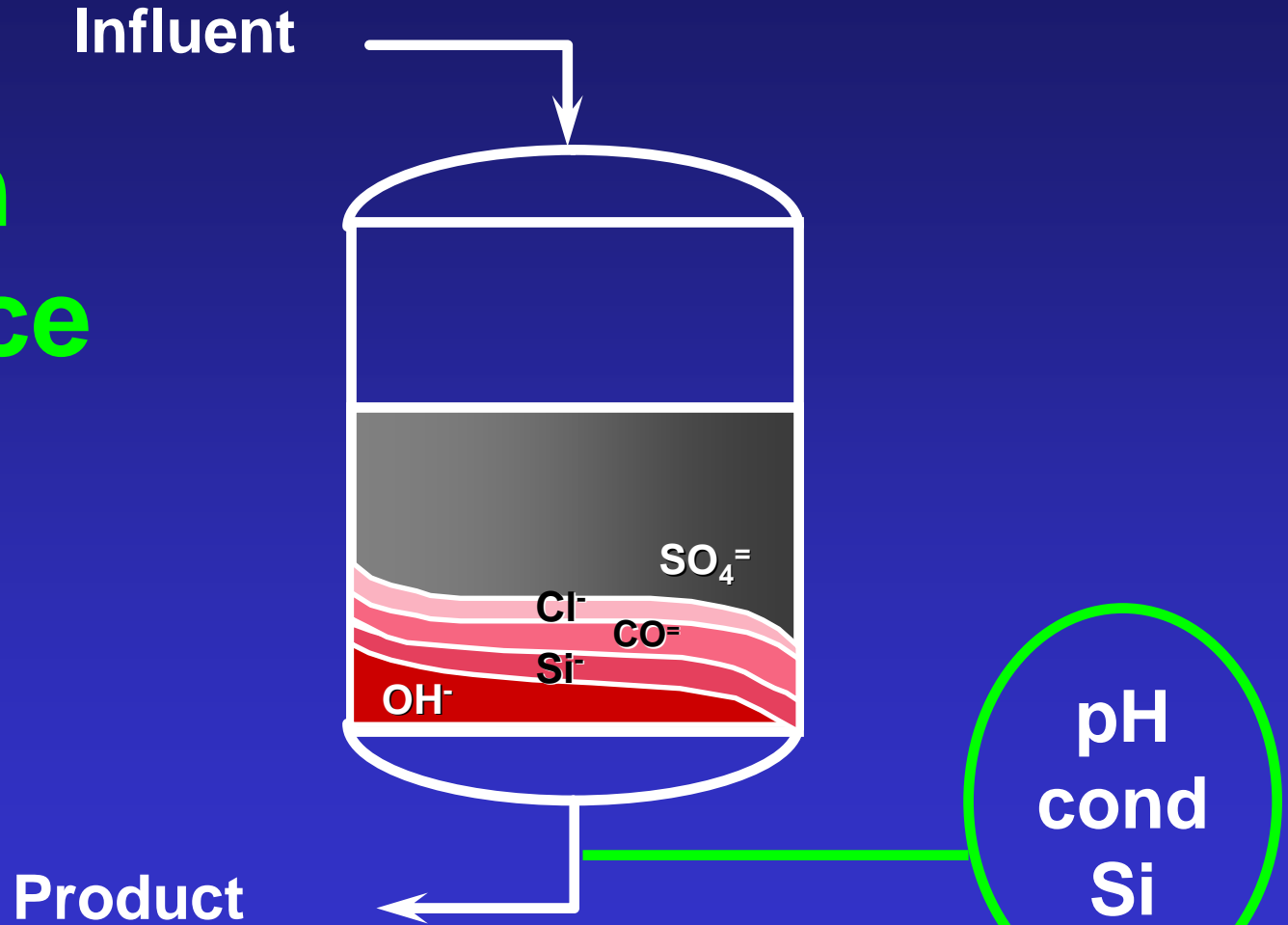
Cation
Forward Rinse
(Fast Rinse)



Courtesy of: **ROHM**
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HAAS  For all the right resins

How do you Monitor Demineralizers?

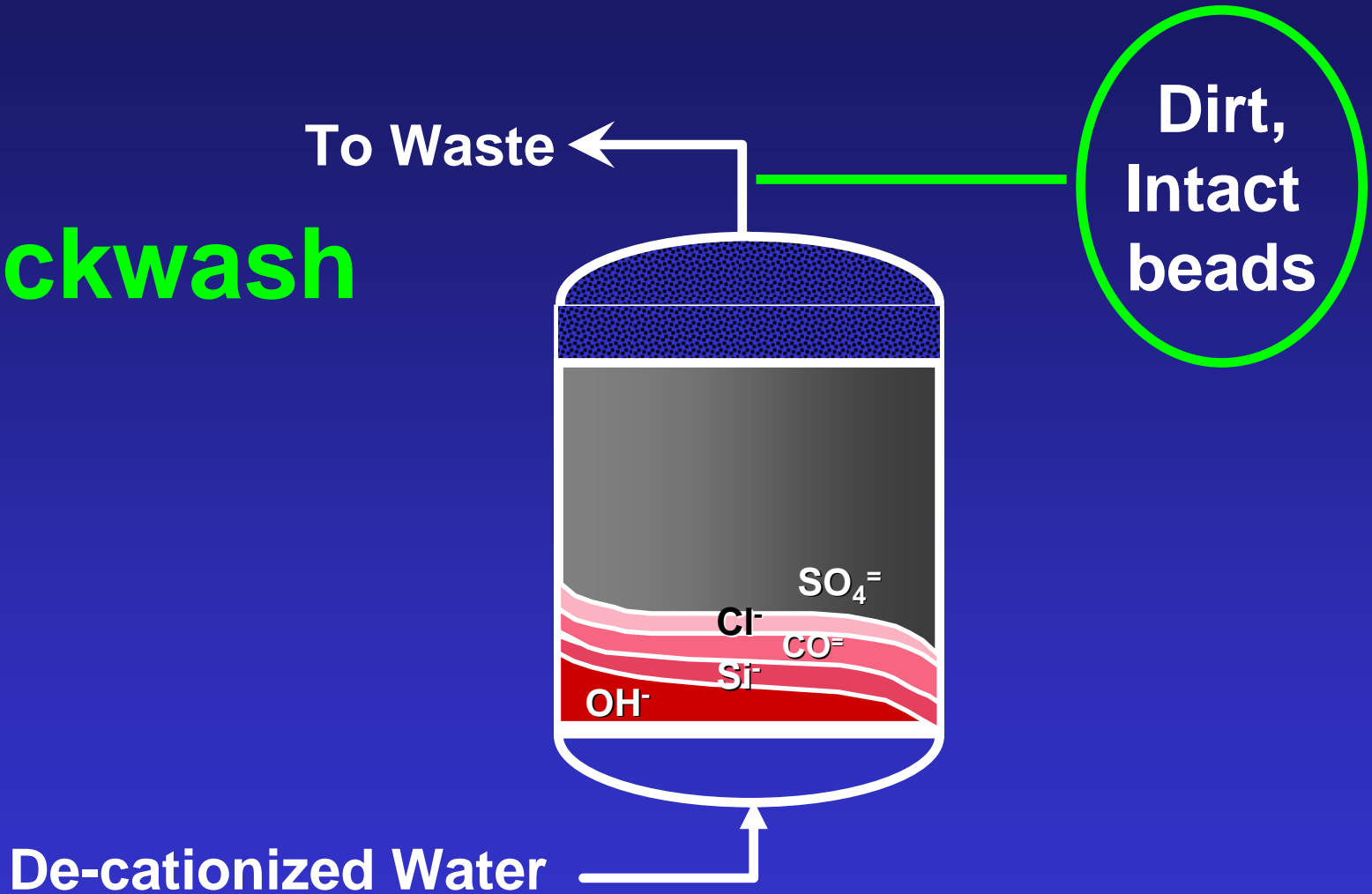
Anion
Service



Courtesy of: **ROHM**
AND
HAAS  For all the right resins

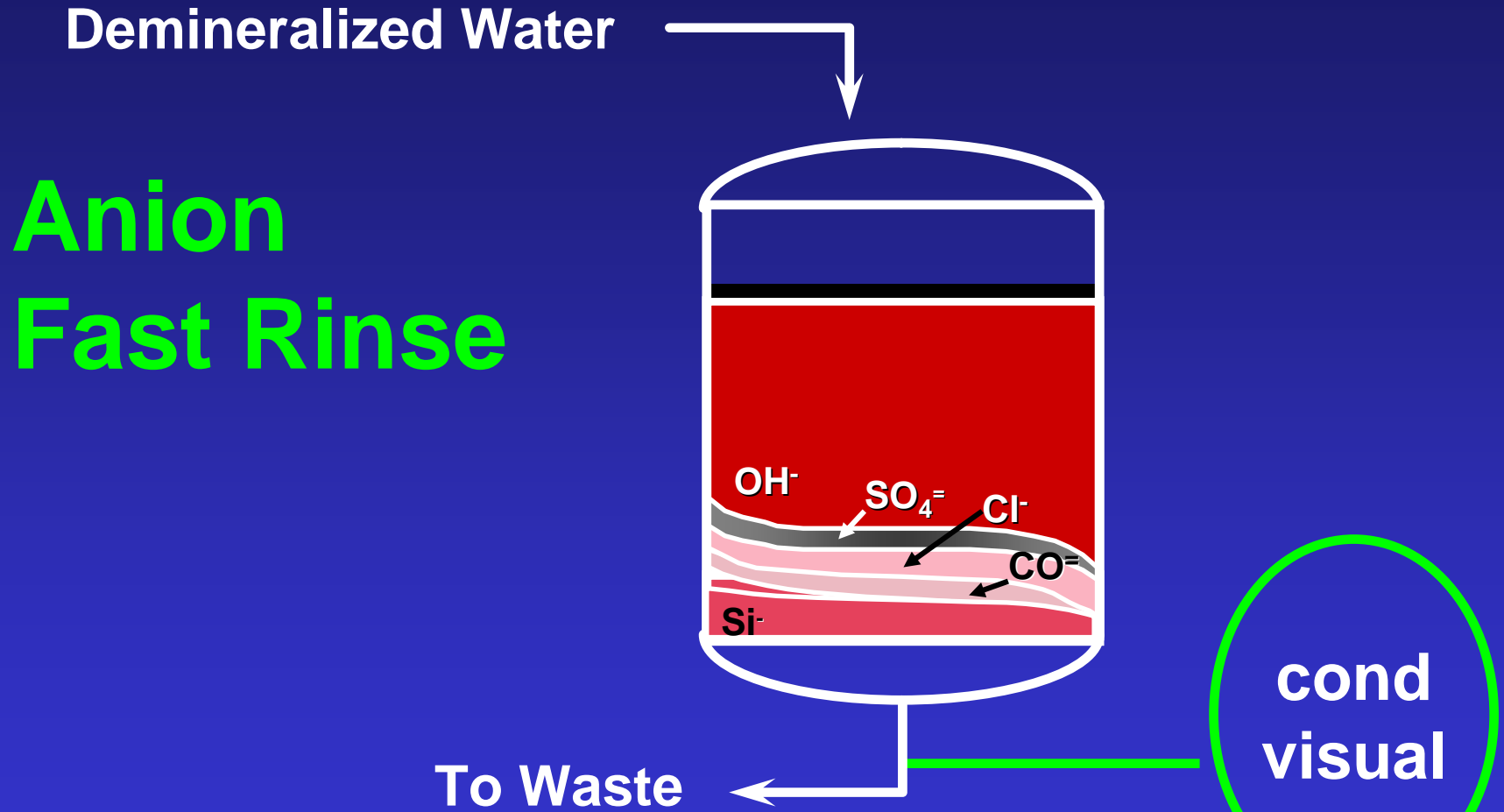
How do you Monitor Demineralizers?

Backwash



Courtesy of: **ROHM**
AND
HAAS  For all the right resins

How do you Monitor Demineralizers?



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How do you Monitor Demineralizers?

- **Typical Measured Values**

- **Filtered Water**

- **Decationized Water**

- **Demineralized Water**

- **End of Service Run**

How do you Monitor Demineralizers?

Typical Value Ideal Value	pH	Conductivity	Total Hardness
Filtered Water	7 – 8	200 – 400 μmhos	40-250 ppm
Decationized Water	2.4 – 3.2 2 - 4	400 μmhos	<0.05 ppm 0 ppm
Demineralized Water	8 - 9.9 7.0	< 10 μmhos	<0.05 ppm 0 ppm
Cation Over-Run	> 4	>1000 μmhos	>0.1 ppm
Anion Over-Run	> 10	> 35 μmhos	-
Mixed Bed Effluent	7 - 9 7	<2 μmhos < 1 μmhos	0 ppm 0 ppm

How do you Monitor Demineralizers?

- **Correct Measurement Methods**
 - pH
 - conductivity

How do you Monitor Demineralizers?

- **Correct pH Measurement Method**

- **Bench-top**

- calibration procedure
 - use of pH standards
 - calibration frequency
 - care of probe
 - life of probe

How do you Monitor Demineralizers?

- **Bench-top Calibration Procedure**

- two standards (buffer solutions):
pH = 4 and pH = 7

- follow instructions:

- LOW buffer first, adjust reading =
buffer pH

- Higher buffer second, adjust slope =
buffer pH

- minimum calibration frequency:
once per week

How do you Monitor Demineralizers?

- **Bench Top pH Probe Care**

- **Care of probe:**

- in pH 7 buffer

- use with high purity water only (never regenerant), always keep wet

- *Never scratch or touch glass bulb!*

- **life of probe: 2 - 4 years**

How do you Monitor Demineralizers?

- **Correct pH Measurement Method**

- **On-line pH Meters**

- comparison to bench-top meters
 - calibration procedures
 - calibration frequency
 - life of probe

How do you Monitor Demineralizers?

- **On-line pH Meters**

- **Compare Bench Top pH with On-line pH: within 0.2 pH units**

- **Calibration**

- **One point calibration: set on-line pH = bench top pH using slope adjustment**

- **Two point calibration: same as for bench-top pH meter**

How do you Monitor Demineralizers?

- **On-line pH Meters**

- Calibration frequency: once every two or three weeks
- Life of probe: 6 ms. - 1 year

How do you Monitor Demineralizers?

- **Correct Conductivity Measurement Method**
 - **Bench-top**
 - calibration procedure
 - use of standards
 - calibration frequency
 - care of probe
 - life of probe

How do you Monitor Demineralizers?

- **Bench Top Conductivity Meter**

- **Calibration Procedure**

- similar to pH meter
 - use standard solutions

- **Calibration Frequency**

- almost never

- **Probe**

- store in demineralized water
 - life of probe: up to 5 years

How do you Monitor Demineralizers?

- **Correct Conductivity Measurement Method**
 - **On-line Conductivity Meters**
 - calibration procedures
 - calibration frequency
 - use of standards
 - life of probe

How do you Monitor Demineralizers?

- **On-line Conductivity Meters**

- **Similar to Bench Top
Conductivity Meters**

Incredibly reliable on-line meter!

Quiz #9

Circle all relevant routine tests

Service - cation out pH cond visual FMA Si color

Service - anion out pH cond visual FMA Si color

Backwash out pH cond visual FMA Si color

Spent Regenerant pH cond visual FMA Si color

Slow Rinse out pH cond visual FMA Si color

Fast Rinse out pH cond visual FMA Si color

Quiz #10

True or False

- 1. De-cationized water has a low pH because it has organic acids.
- 2. Perfectly demineralized water would have a pH of 7.0.
- 3. At the end of the cation run, a small amount of leaking sodium will cause the pH to increase.

Quiz #10 (cont'd)

True or False

- 4. Total hardness is a good measurement to determine the end of the cation run.
- 5. At the end of the anion run, leaking silica will cause pH and conductivity to increase.
- 6. The typical pH of demineralized water is higher than 7.0.

Quiz #10 (cont'd)

True or False

- 7. The end of the cation forward rinse can be determined by measuring the pH of the effluent.
- 8. The endpoint of the anion run can be time, conductivity, or pH.
- 9. The color of the anion forward rinse will show the amount of organics being removed.

Quiz #11

1. How often should a bench top pH meter be calibrated?
2. What is one indication of a poorly operating on-line pH meter?
3. What happens to a demineralized sample when there is a long time between sampling and measurement of pH and conductivity?
4. How should a bench top pH probe be stored?

Quiz #11 (cont'd)

5. What are pH buffer or standard solutions?
6. How should a conductivity probe be stored?
7. What should be done to the probe after measuring the cation effluent pH but before measuring the anion effluent pH?
8. Should you use the same procedure for the conductivity meter?