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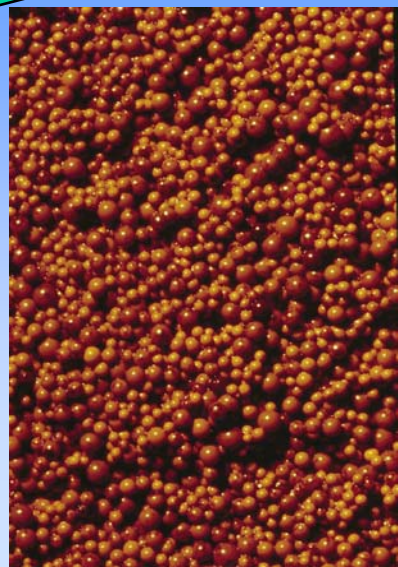
ArsenX np

One Product - Multiple Solutions



Francis Boodoo

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Topics

- Arsenic, Uranium, Nitrate Removal
- **No Dumping** Design (As,NO3,U)
- Removal of Cation & Anion Contaminants in Single Vessel

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Benefits of Combined Removal

BENEFITS:

- Single system – Lower capital cost
- Reduced space requirements
- Lower O&M costs than individual treatment
- Less operator attention
- Less waste disposal.

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ArsenX^{np} Media

- Iron Impregnation of Resin – nanoparticles
- Design for 1 – 5 minutes Contact Time
- Arsenic removed by ligand exchange
- Residual Anion Exchange Properties
- Uranium & Nitrate removed by ion exchange.

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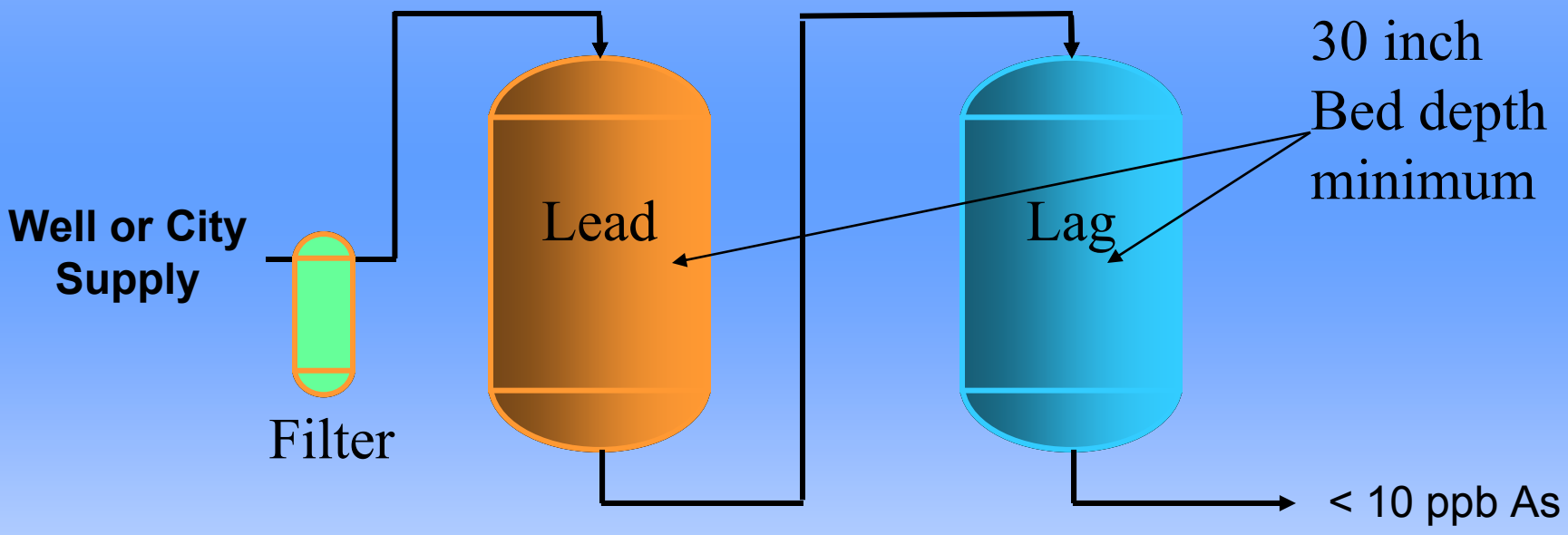
Lead-Lag Design

1.25 – 5 minutes EBCT



On exhaustion of lead, replace lead with lag,
put fresh vessel in lag position

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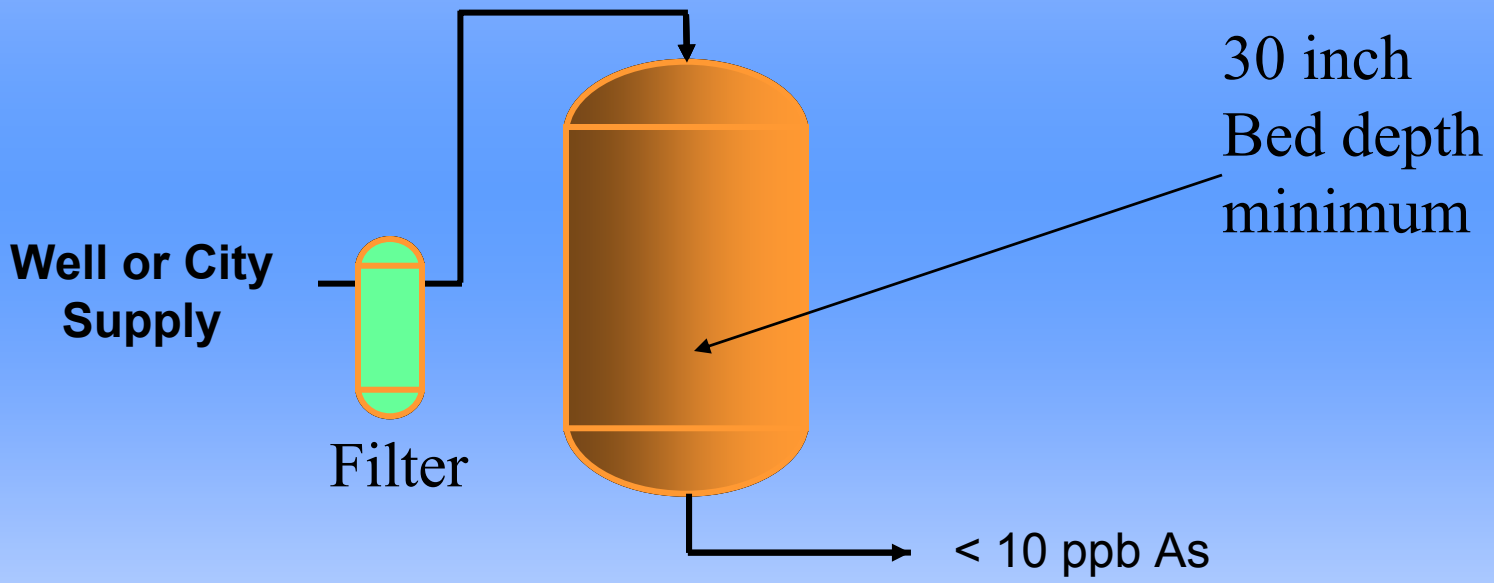
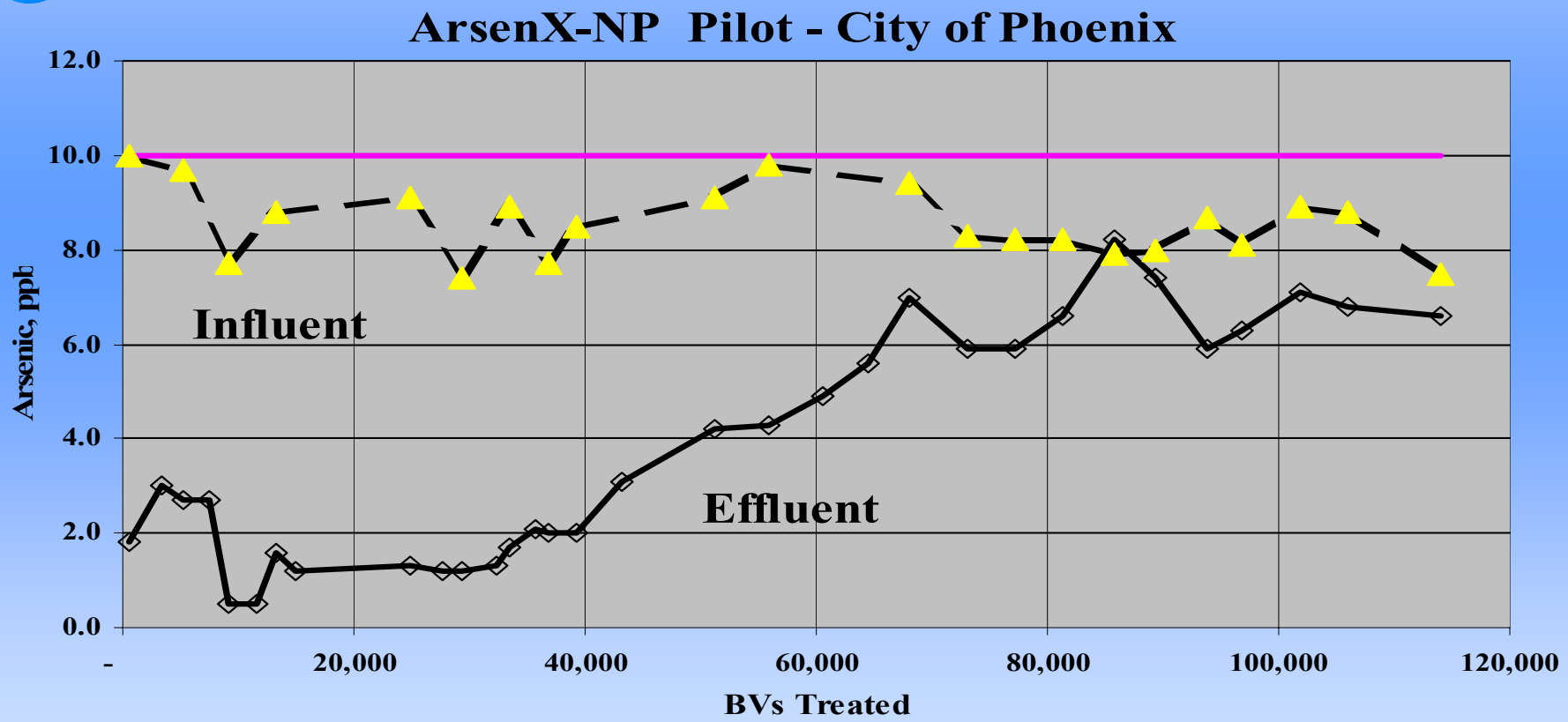
Single Vessel Design

1.25 - 5 minutes EBCT



Single Vessel – Can Derate Capacity by 50% for Safety

Arsenic Capacity



Uranium Capacity

predicted by software

Depends on:

- Water Chemistry (Sulfate, etc.)
- Residual IEX Capacity on ArsenX-NP

Capacity Predicted Using Proprietary Software

e.g. 25 ppm SO4, 50 ppm NO3, 100 ppm HCO3
30 ppm Cl, 40 ppb U

Saturation Capacity for Uranium – 82,000 BVs.

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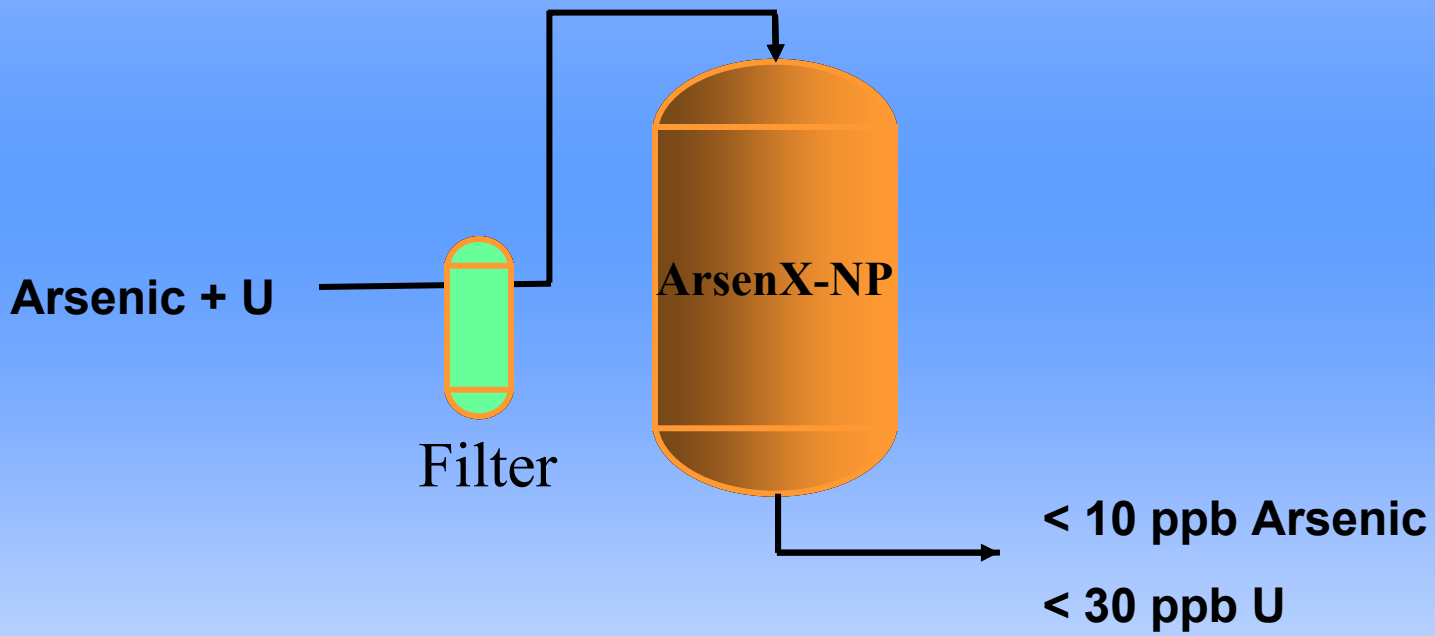
Arsenic +Uranium Removal

80,000 BVs for As, 82,000 BVs for U



However, Must Keep within NRC Limit of 0.05% by weight or 0.4 grams U / Liter of Media

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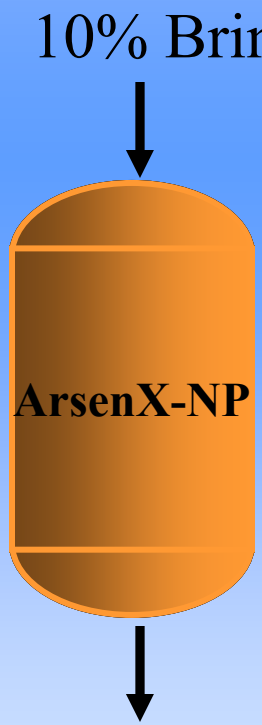
Arsenic + Uranium Removal

Regenerate off Uranium with Brine <u>every 10,000 BVs</u>

Onsite regeneration



<u>Arsenic is Not Removed by Brine</u>

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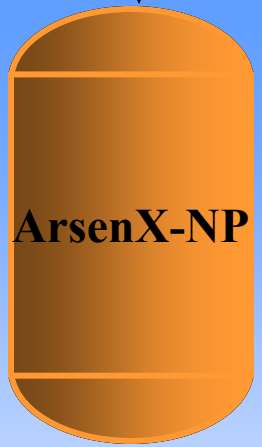
Arsenic + Uranium Removal

Regenerate off Arsenic <u>every 80,000 BVs</u>

Caustic / Brine



Offsite regeneration via service provider

<u>Arsenic is Removed by Caustic /Brine</u>

<u>Arsenic for precipitation /encapsulation before landfilling</u>

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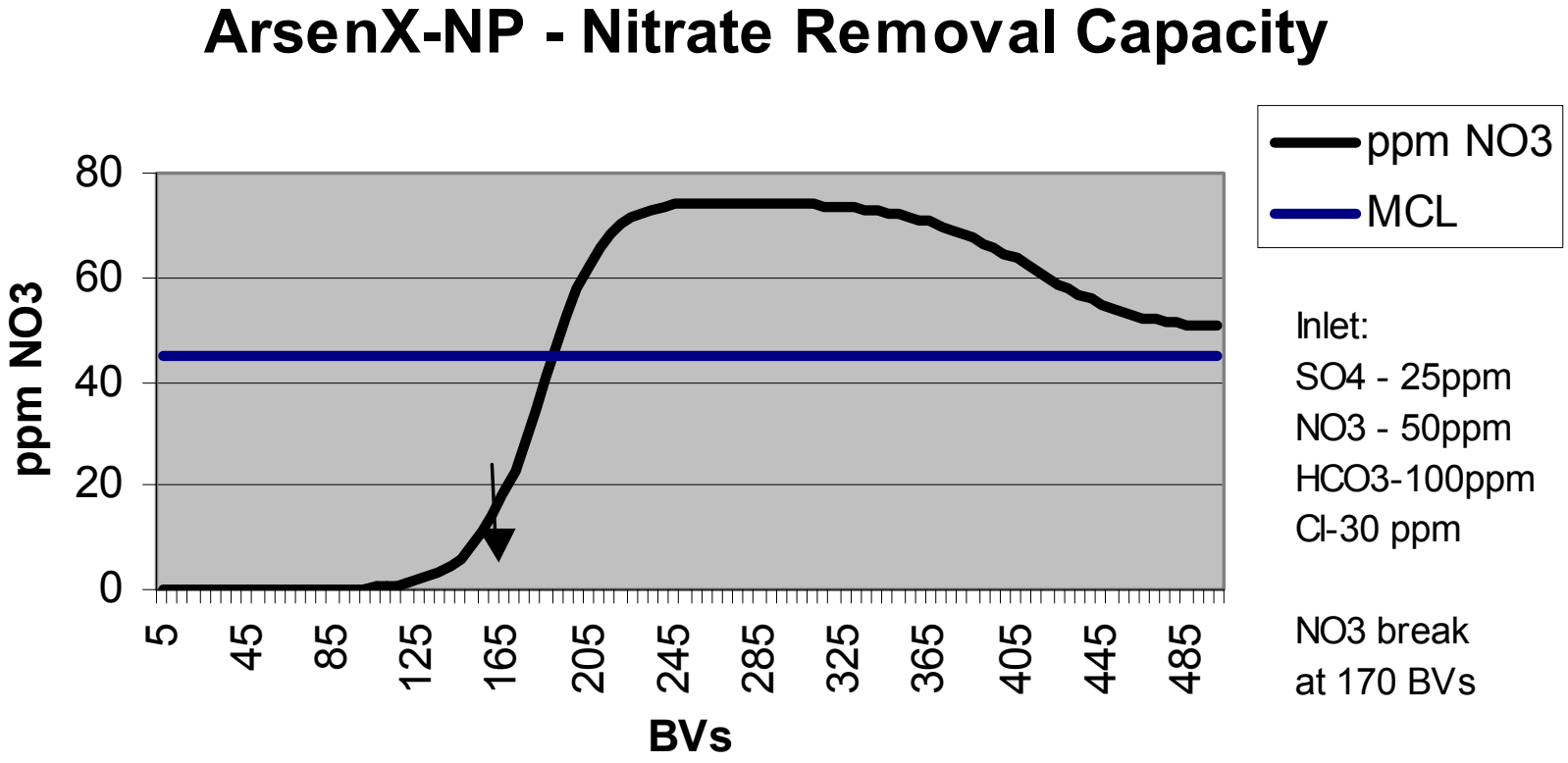
Nitrate Removal



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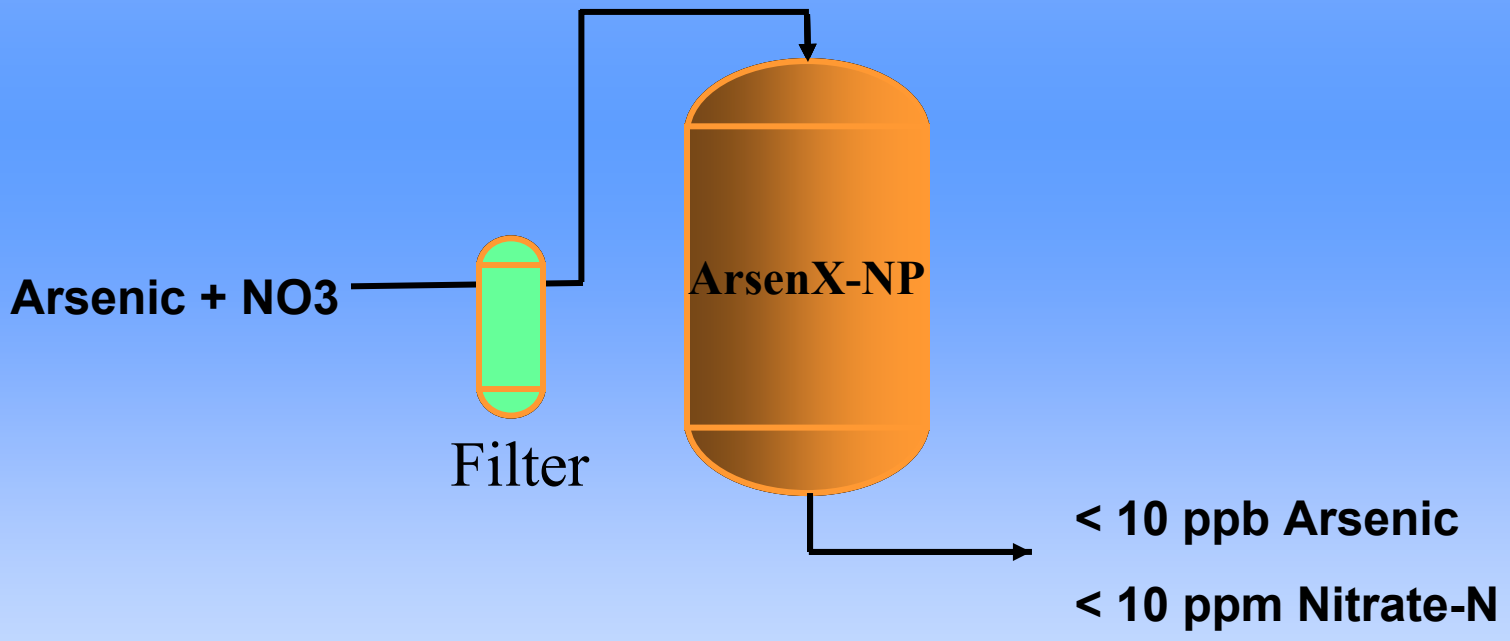
Arsenic &Nitrate Removal

80,000 BVs for As, 170 BVs for NO3



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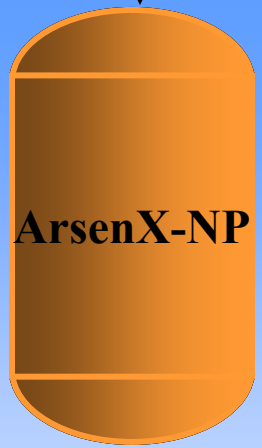
Arsenic &Nitrate Removal

Regenerate off Nitrate with Brine every 170 BVs

10% Brine



170 BVs = every 3 to 4 days

Nitrate Brine to Drain

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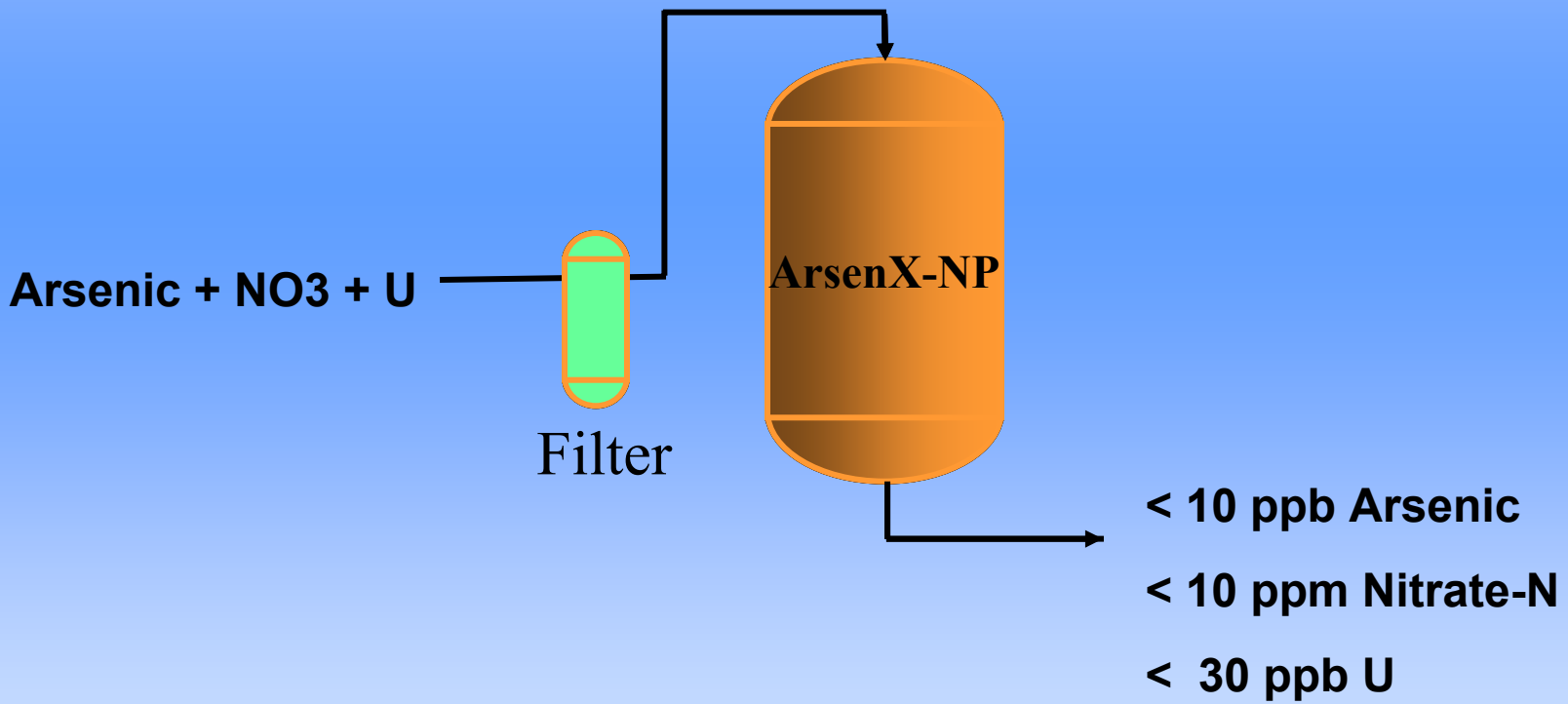
Arsenic +Nitrate +Uranium

80,000 BVs for As, 170 BVs for NO3, 10,000 BVs for U



Brine Regenerate every 170 BVs to Remove Nitrate + Uranium

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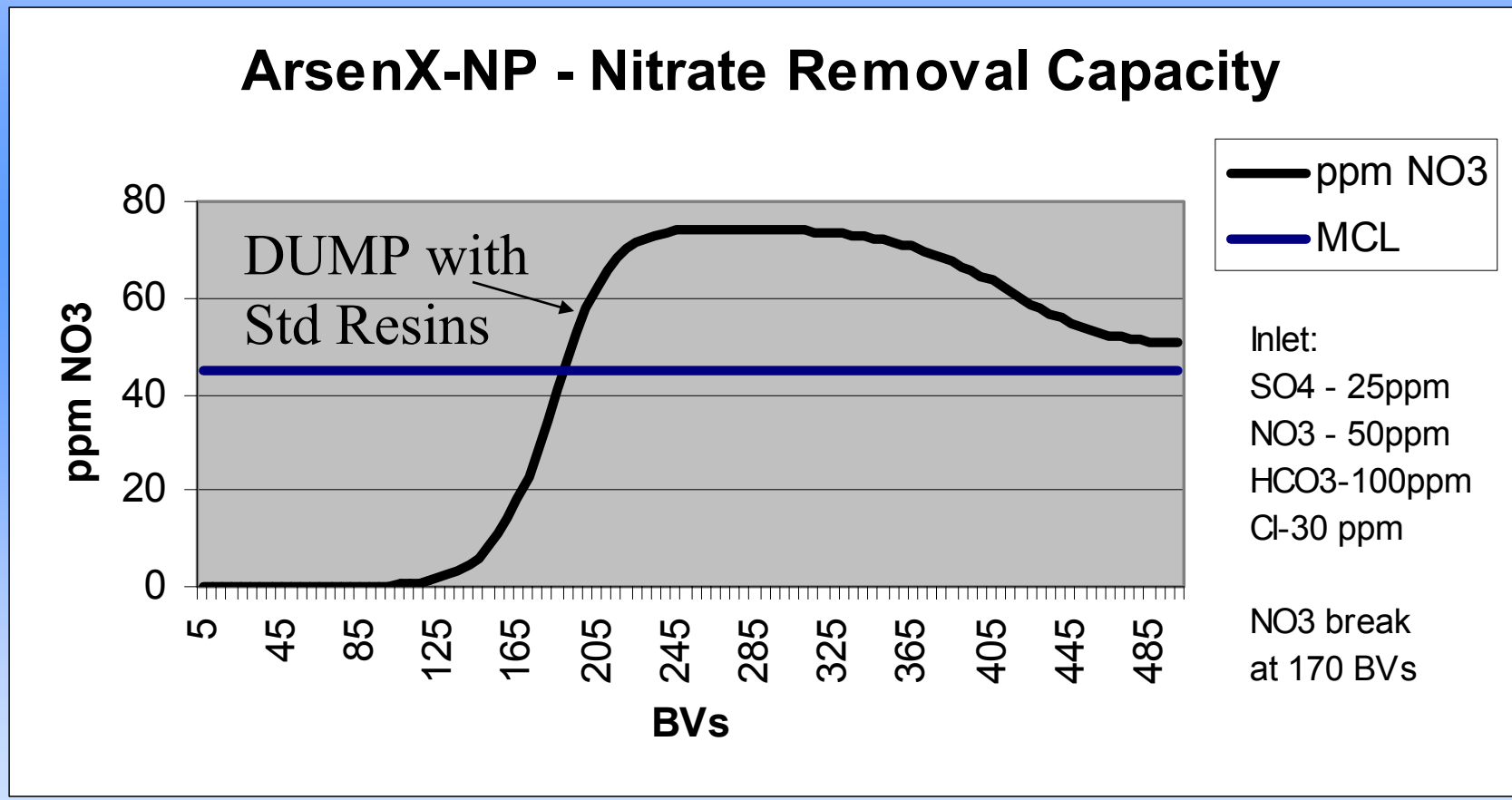
Design to Eliminate NO3 Dumping Potential & Improve Economics



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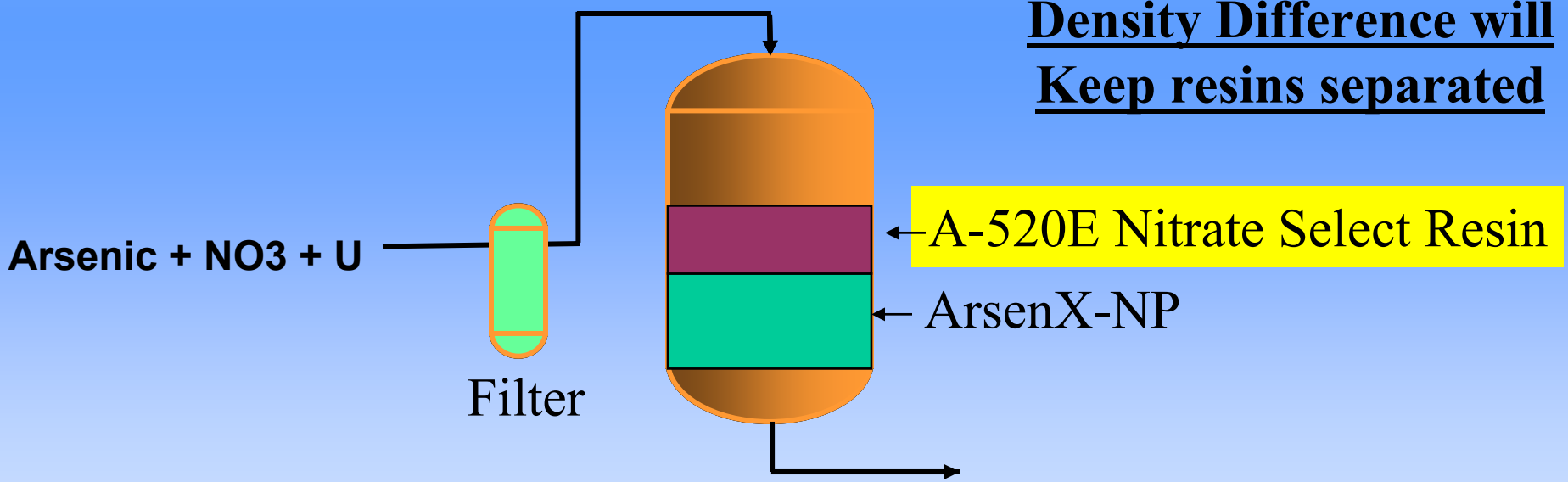
Arsenic +Nitrate +Uranium

80,000 BVs for As, **300 BVs for NO3**, *10,000 BVs for U*

Add Nitrate-Selective resin for Extra Nitrate Capacity – No Dumping of Nitrate, Arsenic or Uranium

Density Difference will Keep resins separated



Regenerate Less Often – e.g. every 300 BVs

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Multicontaminant Control

Combine removal of Cation

& Anion Contaminants:

- Hardness
- Radium
- NO3
- Arsenic
- Uranium

Brine Regenerate for TH, Radium, NO3, U

Summary

- Joint Removal of Arsenic, Uranium, Nitrate is Possible
- Combination of On-Site & Off-Site regeneration possible
- Eliminate As & NO3 Dumping – ArsenX-NP /A-520E
- Remove TH, Ra, As, U, NO3 in one Ion Exchange Vessel
- Improve Economics for Municipal WTP and POE systems

Questions ?

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