Adsorbsia™ GTO
Dow Developmental Arsenic Removal Media

Product Characteristics
Arsenic Removal Efficacy
Anticipated Advantages

Basis of the Technology

Adsorbsia GTO

Based on Titanium Oxide technology patented by Stevens Institute (US 2003/0155302 A1)

In-licensed by Dow

Dow technology applied to develop a formulation that provides
physical strength
to compliment the
adsorptive *capacity of Titanium Oxide*

Designed for single use in Municipal /POE /POU operations

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Physical Properties:

Product form	Dry Granule
Moisture Content	< 5%
Particle Size Range	14-60 US mesh
Bulk Density	50 lbs/ft^3
Surface Area (BET)	200 – 300 m^2/g
Pore Volume	0.20 to 0.25 cc/g

Passes extractive tests for both TCLP and CA WET

Product Attribute Targets

- Leverage the capacity of titanium for arsenic
- Provide a stable granular product form

Internal lab scale performance evaluation has emphasized:

Effect of influent pH
Effect of particle size
Competitive Solute behavior
Bench mark performance

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Dow Internal Dynamic Testing Method

- Standardized on NSF std 53 challenge water
- Arsenic levels at 50 ppb and 300 ppb influent
- pH 6.5 and 8.5
- 0.45” diameter X 4” column
- 30 second EBCT (5 gpm/ft2)

Augmented with Equilibrium Isotherm studies

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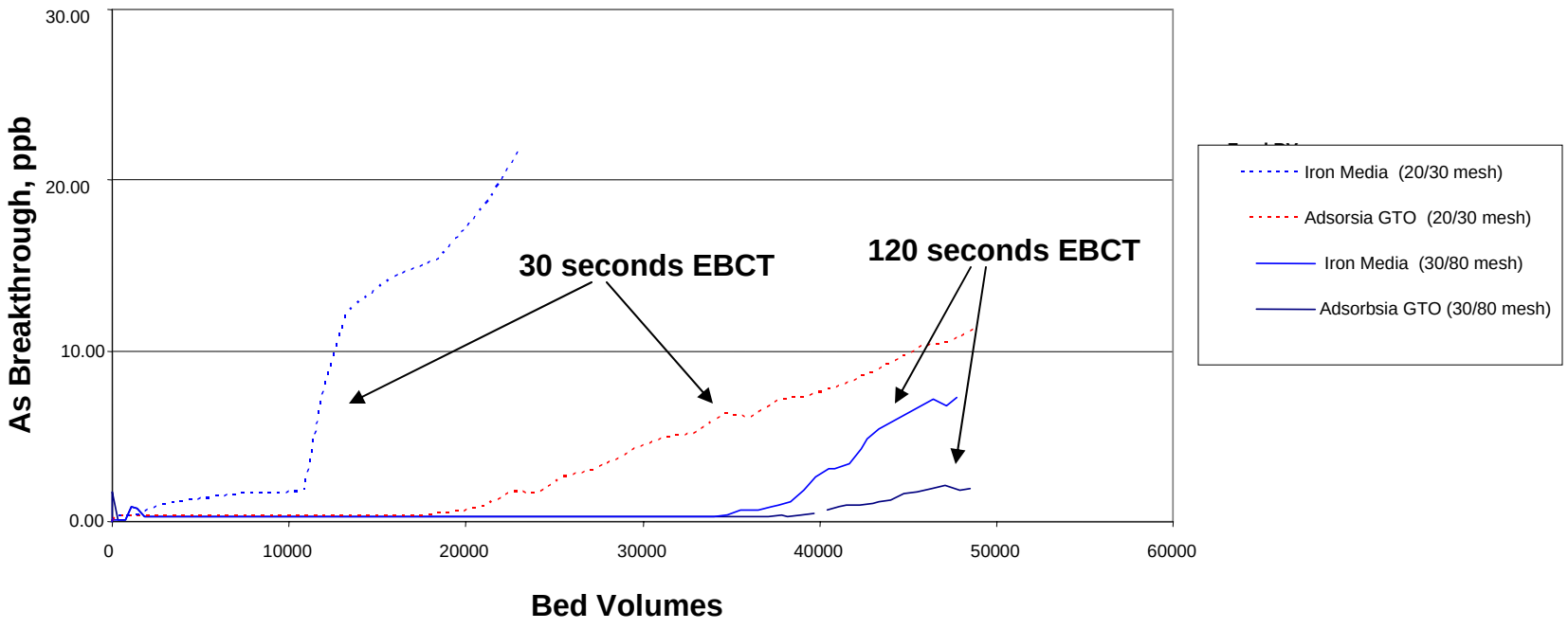
Dynamic column testing at pH 6.5

Particle Size distribution and contact time effect



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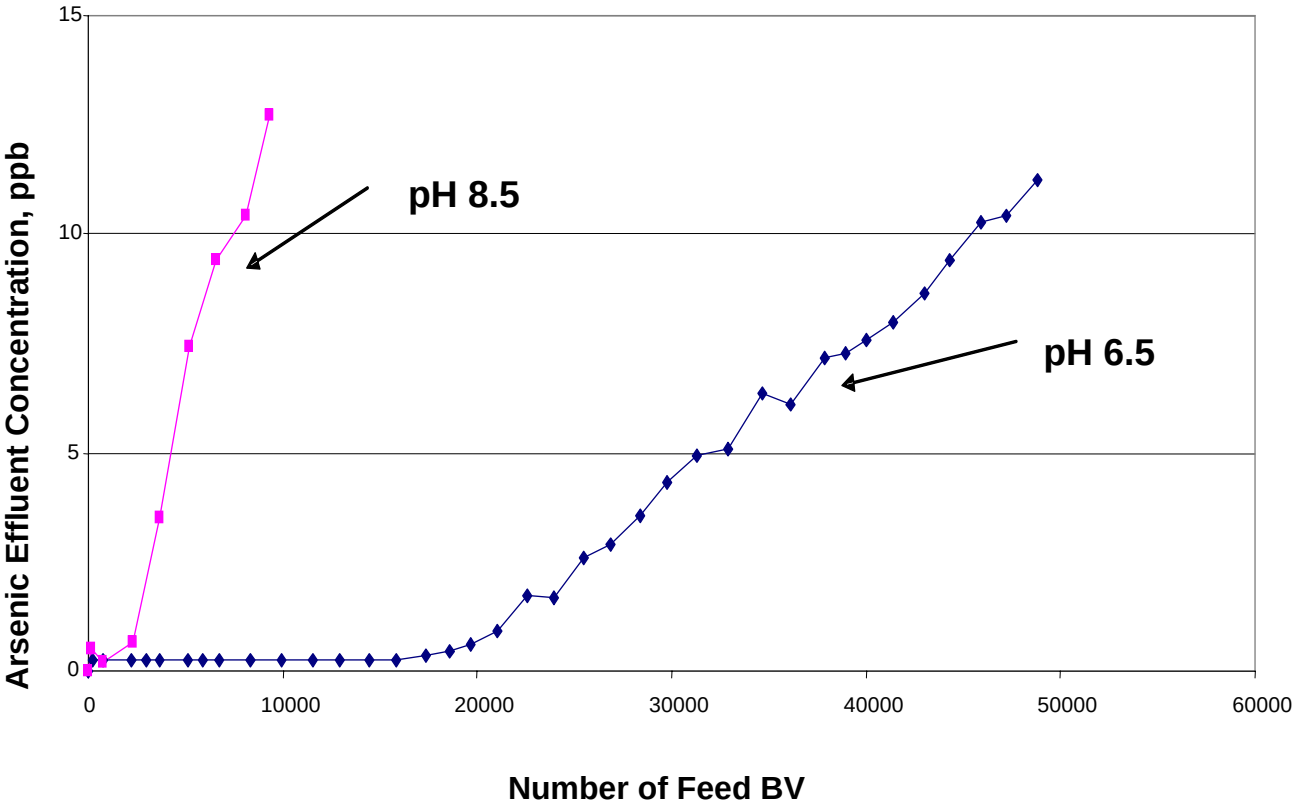
Effect of pH on Dynamic Response

NSF Challenge water / 50 ppb As(V) / 30 second EBCT / 20/30 mesh PSD



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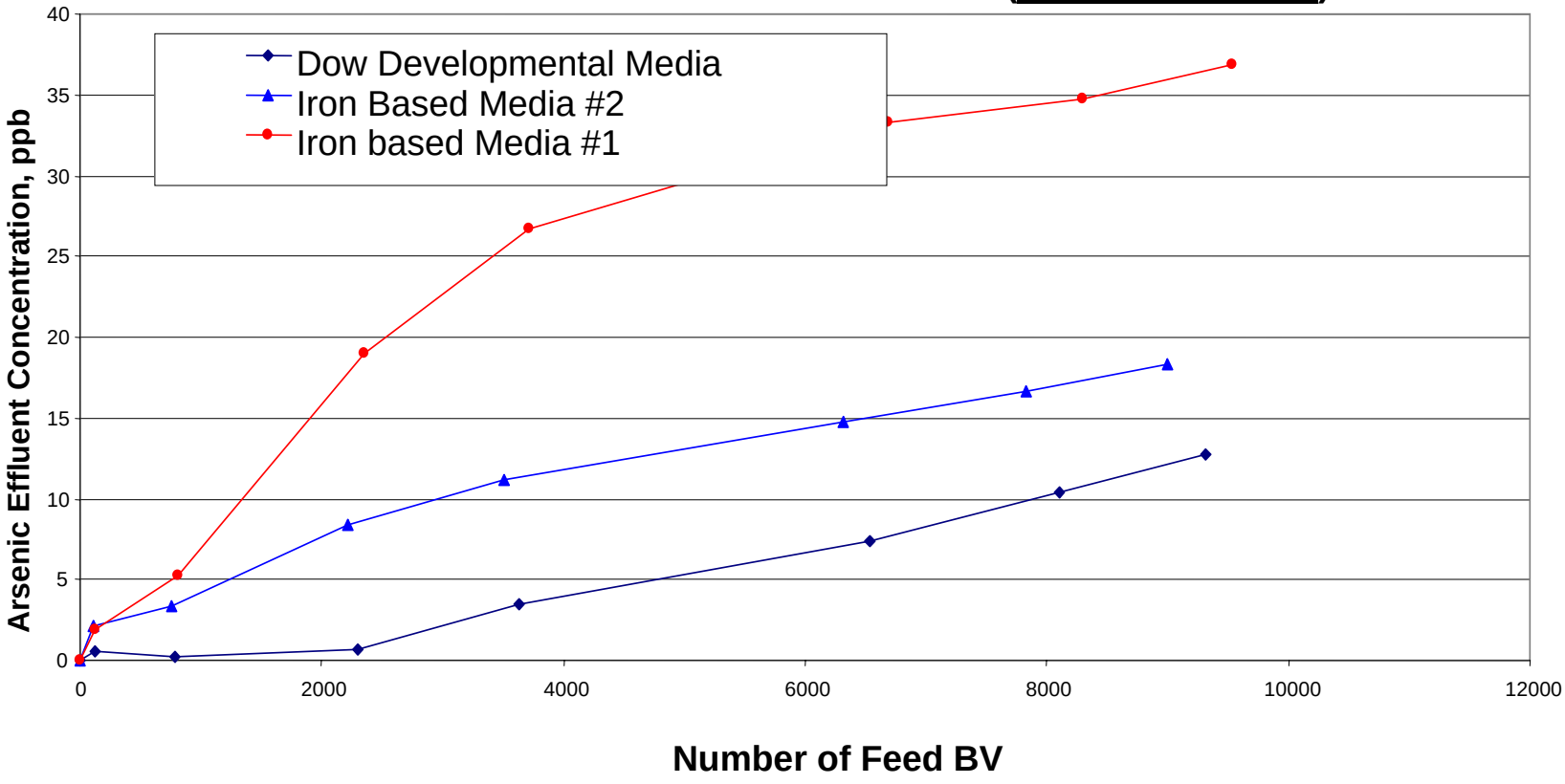
Arsenic Breakthrough Curve

Inlet As(V) concentration: 50 ppb
pH: 8.5
Empty Bed Contact Time: 30 seconds
All media screened 20 to 30 US mesh (595 to 841 micron)



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Impact on Competing Ion Concentrations

Change in NSF Challenge Water Solutes after Media treatment

NSF Challenge water/ 8.5 pH / 300 ppb As(V)/100 sec EBCT

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Summary of Other Findings

Particle size effect on kinetics

- **Minimal effect on breakthrough performance in 25 to 60 mesh range**
- **14 to 60 mesh blend optimizes breakthrough and delta pressure**

Pressure drop

- **Consistent performance at </= 1 PSI/ft at 5 gpm/ft2**
- **Increase +2 PSI/ft at 10 GPM/ft2**

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Summary

New Media Formulation has been characterized through extensive internal testing

- **High operating capacity**
- **Acceptable hydraulics for column operation**
- **Passes landfill leach tests (TCLP & CA WET)**

Pilot trials

- **Current liter scale field trials underway**

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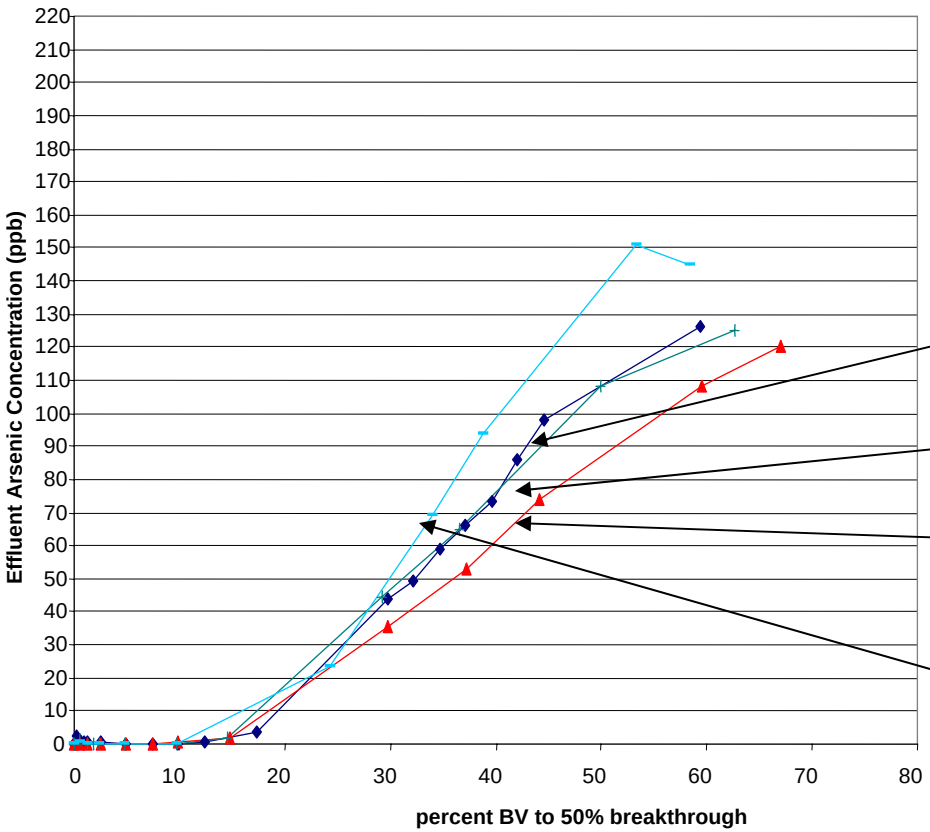
Effect of Particle Size on Dynamic Capacity



Column Conditions:
30 second EBCT
NSF Challenge Water
8.5 pH

500 micron +/- 85

460 micron +/- 40

335 micron +/- 85

1,200 to 200 micron
50% between
400 & 600 micron

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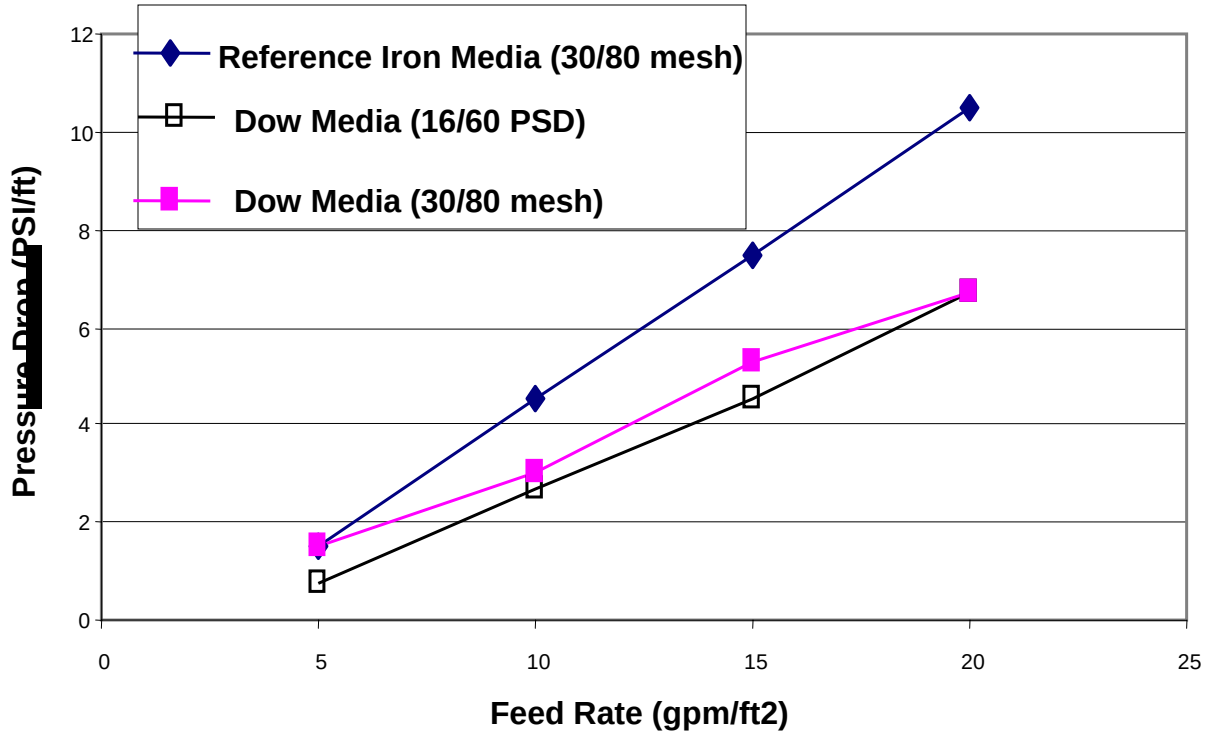
Dow Granular Titanium Oxide

Column Hydraulic Performance

Pressure Drop at different particle size distributions



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