

¹Linear Flow Systems

For

The RPI Users Group

**BJ Services
Conference Room**

May 21, 1998

Types of Systems:

1. Bar Sand Environments

- **Lake Uintah south shore**

2. Channel Sand Environments

- **Morrow/Springer Channels**
- **Red Fork**
- **D Sand**

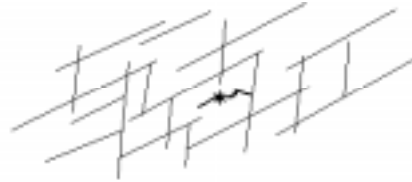
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Naturally Fractured Reservoirs³

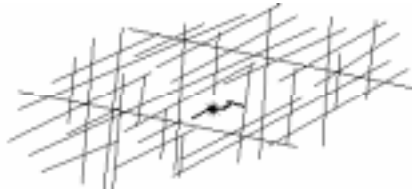
- **Sparsely Fractured**



- **Moderately Fractured (Compartmentalized)**



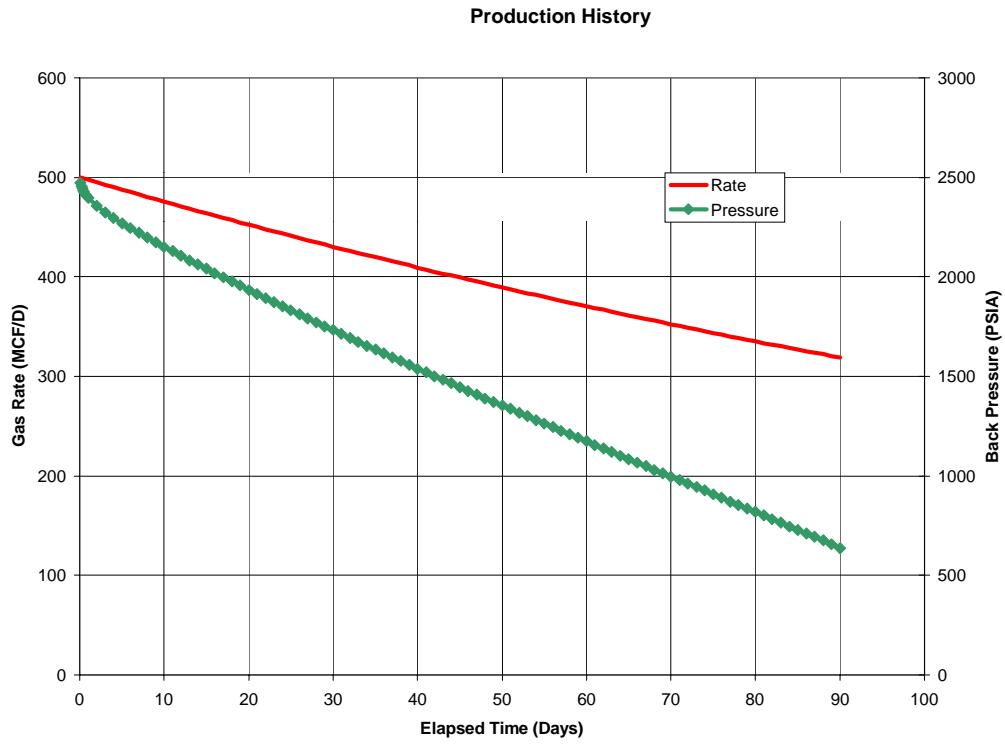
- **Intensely Fractured (approaching Radial Flow)**



Theory:
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$$\frac{\Psi_i - \Psi_w(t)}{q_s} = \frac{\rho_s}{x_f h \sqrt{k}} \sqrt{\frac{t}{\pi \Phi \mu c}}$$

An Example:⁵

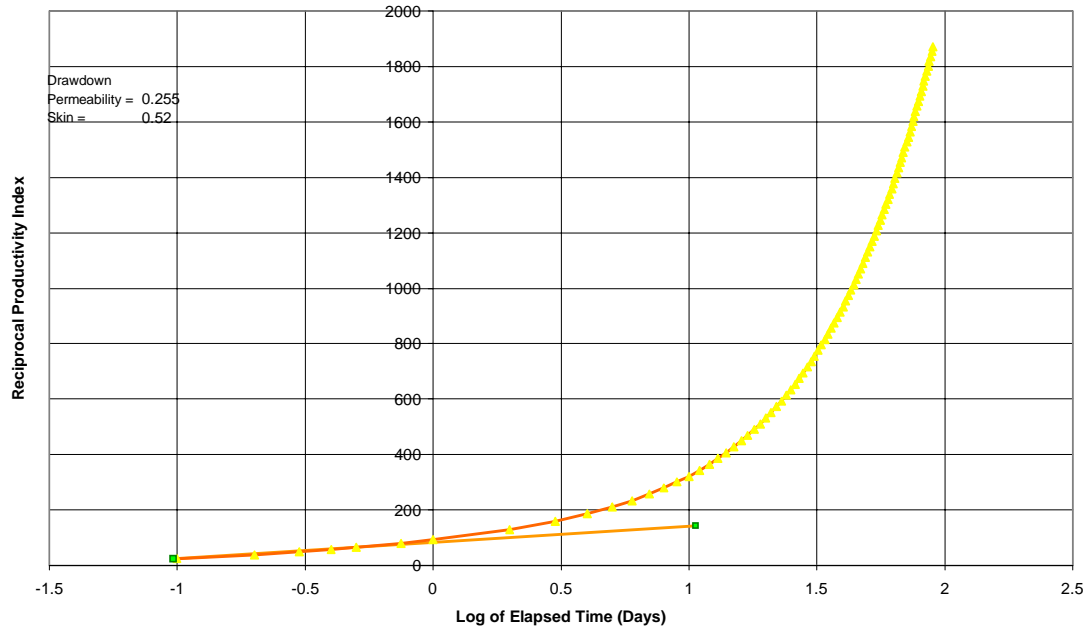


$K = .25 \text{ mDs}$. $X_e = 200 \text{ ft}$. $X_f = 50 \text{ ft}$. $Ad = .9183 \text{ Ac}$.

The MDH Plot:

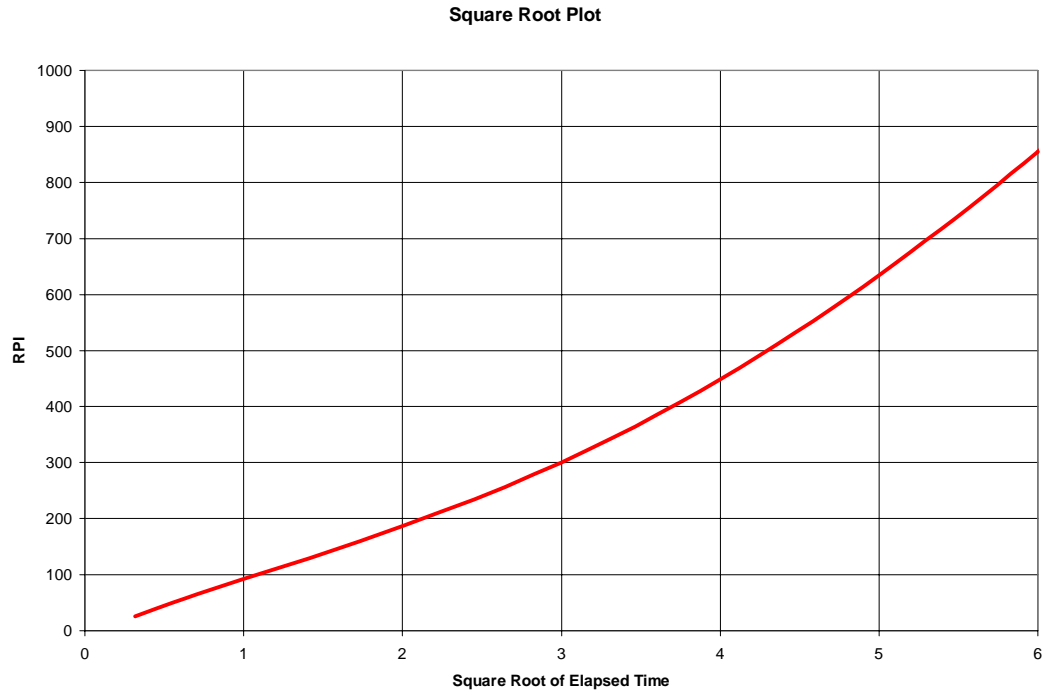
RPI - MDH
BaseCase - Linear Flow

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The Root Plot

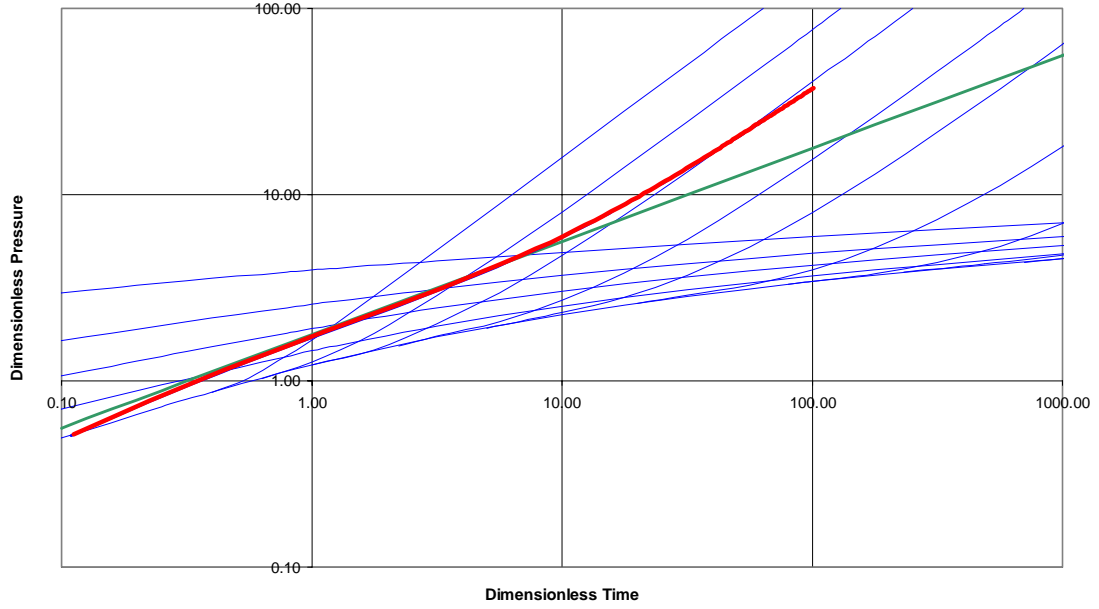
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The Agarwal – Gringarten Type Curve

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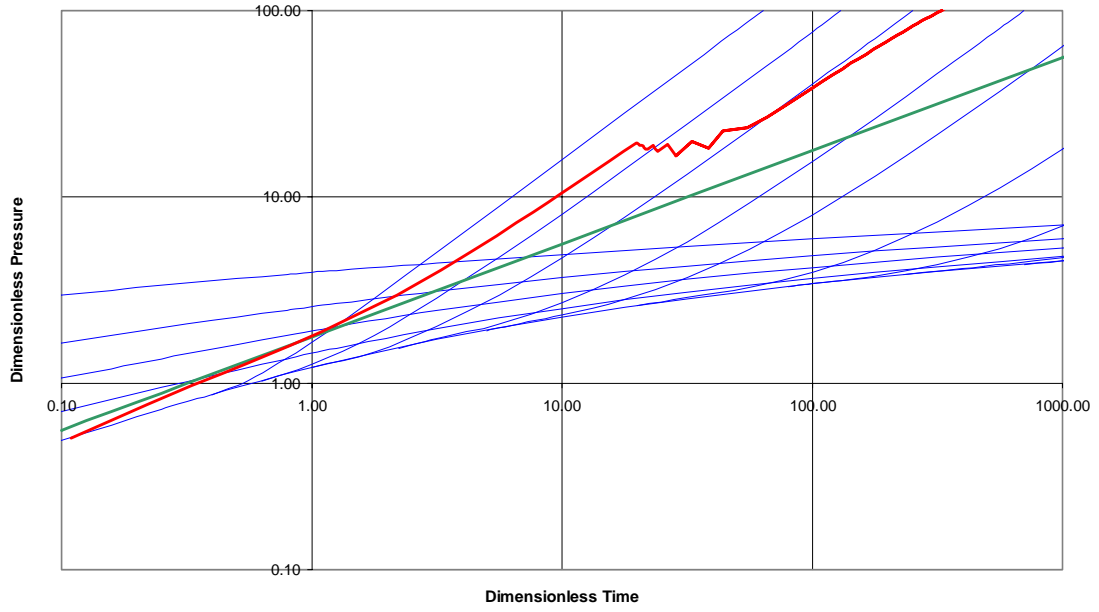
Agarwal - Gringarten Type Curve
BaseCase - Linear Flow



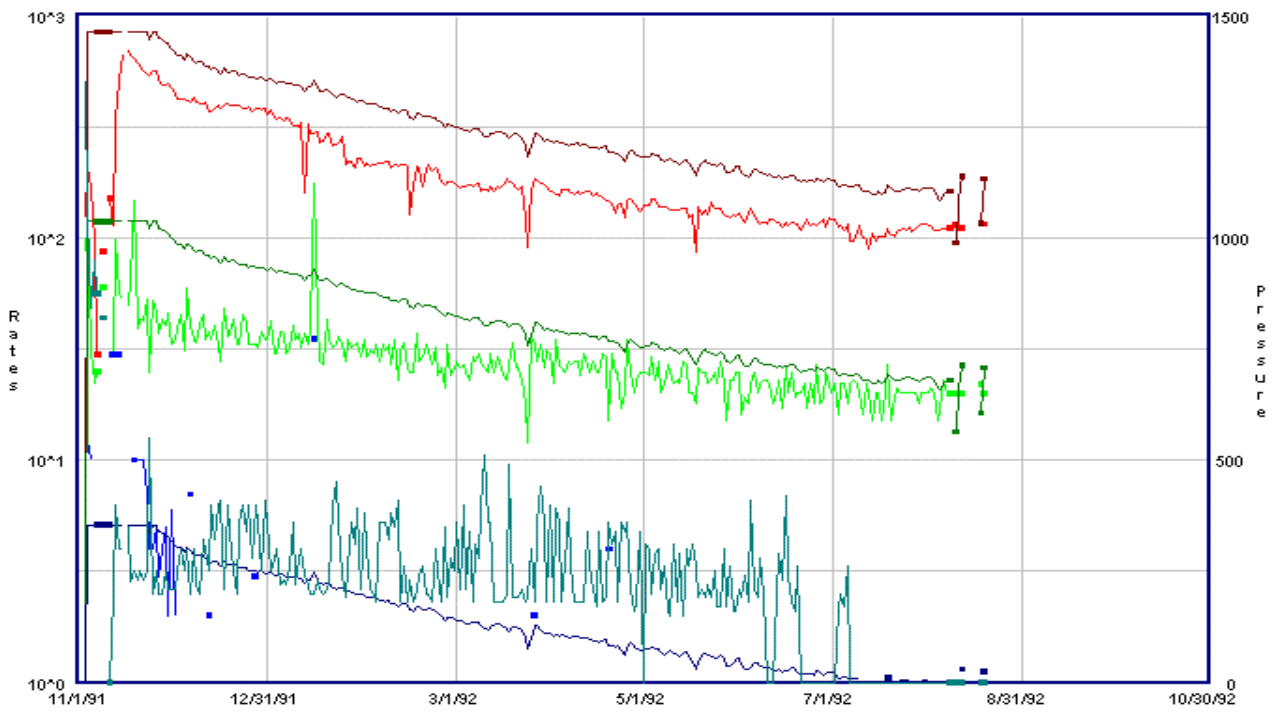
A Compartment Response:

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Agarwal - Gringarten Type Curve
BaseCase - Linear Flow



$K=.25$ mDs. $x_e=200$ ft. $x_f=50$ ft. Blk Bdry=75 ft. Threshold Pressure = 200 psi.



¹⁰ Fig. 3 Production Decline Curve for Expl. #3 – Boundary

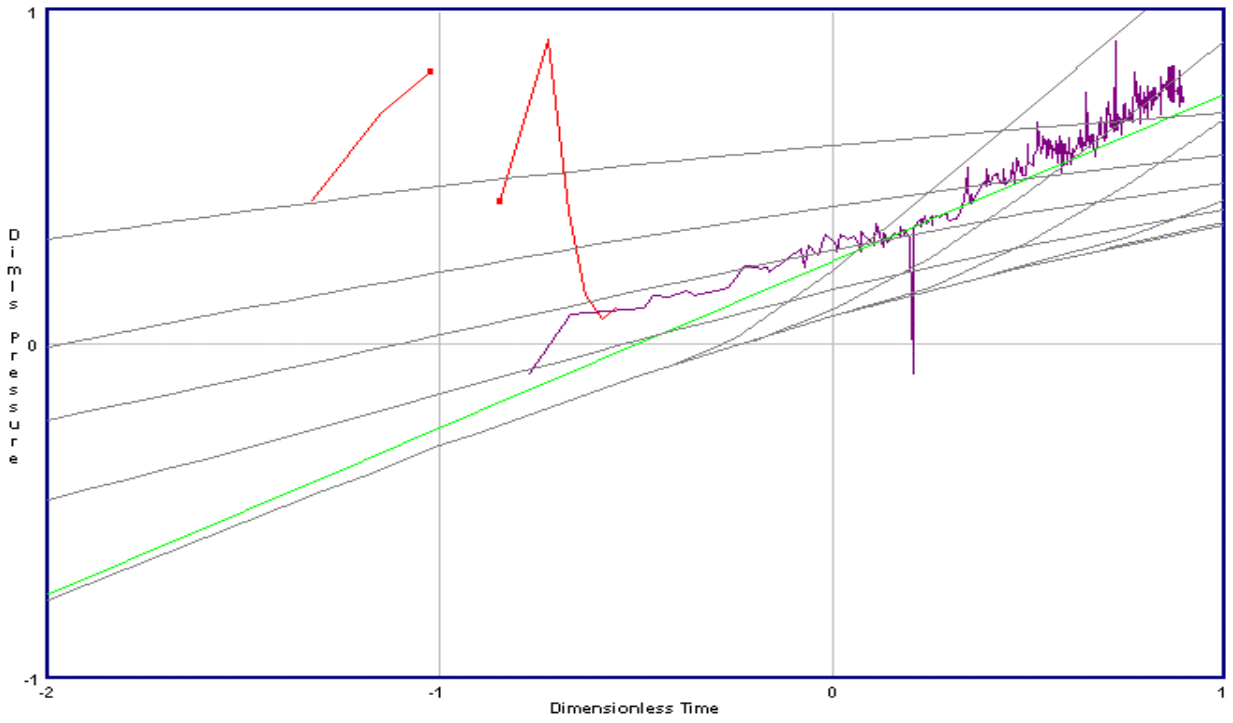
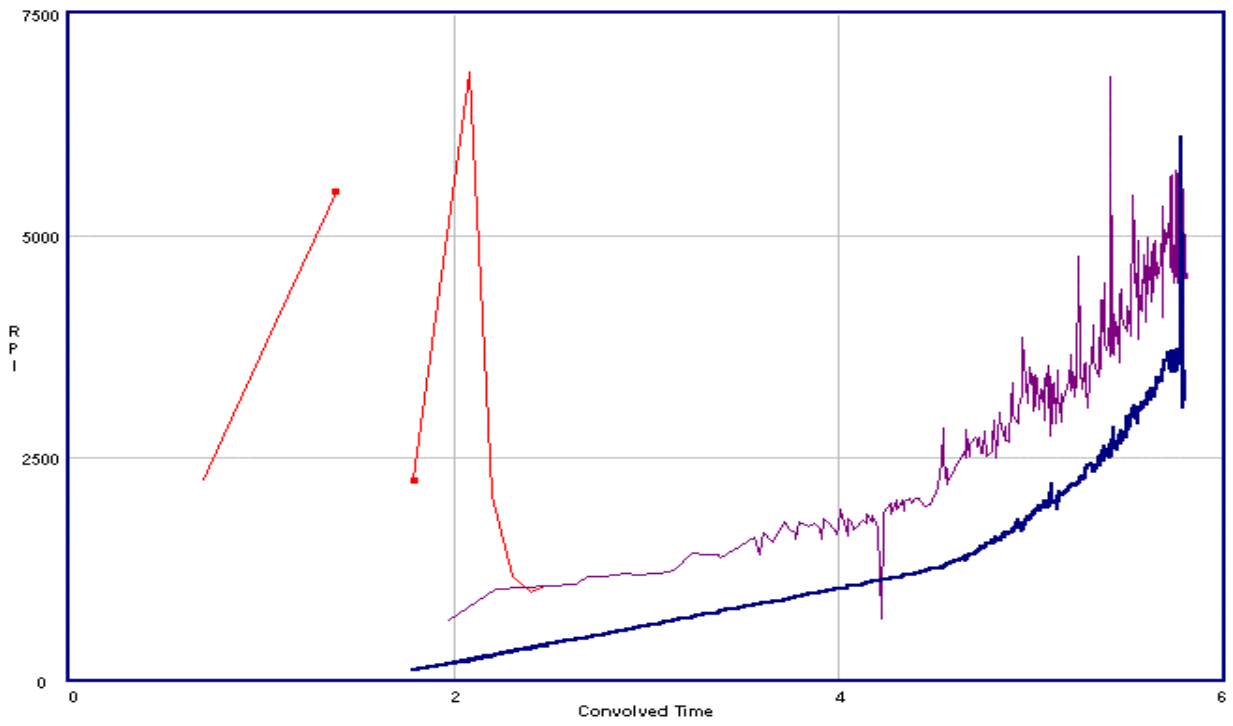


Fig. 1 Agarwal-Gringarten Type Curve for Expl. #3 – Boundary

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¹² Fig. 2 RPI-MDH Plot for Expl. #3 – Boundary

Conclusions:

- **Geologically controlled linear flow regimes can be evaluated**
- **Use the MDH plot at “early” time to estimate permeability**
- **Use Root Plot and AGTC to evaluate “length” of fracture face**
- **Expectations created by “assumed” radial flow cause frequent “disappointing completions”**

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