

MANAGING THE OPERATIONAL COST OF GROUND WATER PRODUCTION TO SUSTAIN PROFITS

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Toward Sustainable Groundwater in Agriculture
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The "Utility of Ground Water"



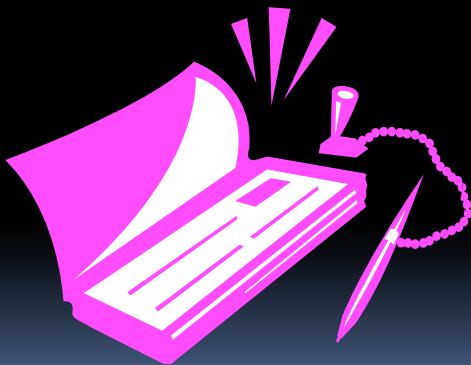
Ground Water and Agriculture



"If you drill it...it will pump"



How much will it cost?



How long until it's finished?



“What will be its operating cost?”



Agricultural Water Wells

- Drilled to a target depth
- Designed for an expected yield
- Constructed with a specific type of steel casing and well screen
- **Strength?**
- **Durability?**
- **Longevity?**
- **Efficiency?**

“A Well is A Well”



“A Plow is a Plow”



Long-Term Objectives for Ag-Wells

- Meet the productivity needs of the owner
- Function efficiently
- Reliable
- Return on the initial capital investment



Proper Design Criteria

- Appropriate Depth
- Diameter Sized for Pump
- Tensile & Collapse Strengths
- Durable
- Long Service Life
- High Efficiency



Types of Steel

Non – Corrosion Resistant

- Mild / Low-Carbon Steel

Corrosion Resistant Steels

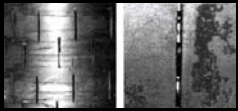
- Copper-Bearing
- High-Strength Low-Alloy (ASTM A606 Type 4)
- Stainless – Types 304 and 316L

Corrosion Resistance

Steel Type	Metal Loss	Corrosion Resistance
Low-Carbon	2.8794 mills/yr	1X
0.2% Copper	0.7438 mills/yr	4X
HSLA	0.3131 mills/yr	9X
SS Type 304	0.0118 mills/yr	244X

Common Design for Ag-Wells

- Non-corrosion resistant steel or PVC
- Mill-slotted casing
- Well efficiency = 60%
- 60% of Ag wells = mill slot

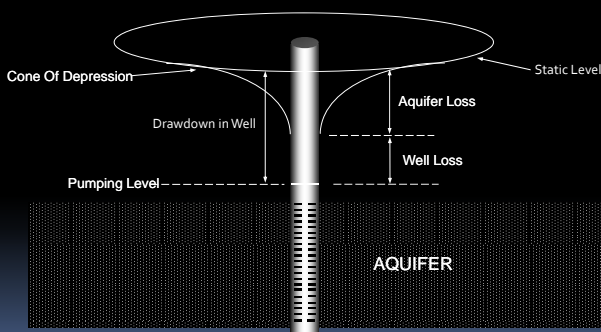


Long-Range Design

- Corrosion-resistant steel
- Highly efficient screen
- Efficiency = 75%
- 40% Ag wells = efficient screen



Efficient Screens and Drawdown



“Why Invest in Well Screen?”

- Efficient screens → Less Drawdown
- Less drawdown → Less lift to delivery
- Less lift → Less power consumption
- Less power → Less cost to operate

Operating Cost Analysis

Case 1: Slotted casing (Steel or PVC)
Efficiency = 60%

Case 2: Efficient screen
Efficiency = 75%

Where:

$$\text{Cost/Hour} = \frac{\text{gpm} \times \text{TDH} \times 0.746 \times \text{Cost/kwh}}{3960 \times \text{Efficiency}}$$

Operating Costs

Parameter	Case 1	Case 2
Pumping Rate	1500 gpm	1500 gpm
Pumping Level	300 ft	250 ft
Discharge Pressure	58 ft	58 ft
TDH	358 ft	308 ft
Power Cost	\$ 0.10/kwh	\$ 0.10/kwh
Well Efficiency	65 %	75%
Annual Operation	4,380 hours	4,380 hours
Annual Cost	\$68,158	\$50,827
Savings = \$17,331		

And...Life-Cycle Costs?

Typical Ag-Wells

- Experience clogging
- Lose capacity quickly
- Experience rising pumping costs
- Rehabilitated on 2 – 3 year intervals
- Replaced prematurely

Efficient, Corrosion-Resistant Ag- Wells

- Minimize loss of capacity
- Increased reliability
- Rehabilitated 5- 7 years
- Replaced 15 to 20 years (or longer)
- Pay dividends that pay for the investment in casing and screen

In Summary....



- Water wells are investments in the future
- Plan for long-term use
- Select corrosion-resistant steel and efficient screens
- Build in reliability
- Realize returns on the investment
- Optimize the operation of the utility

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