Benefits of Using an Environmentally Friendly Synthetic Acid in CT Operations

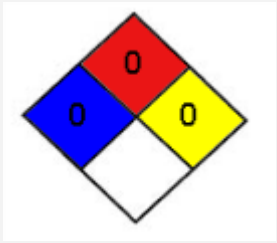
October 18, 2012

Fluid

ENERGY GROUP LTD.

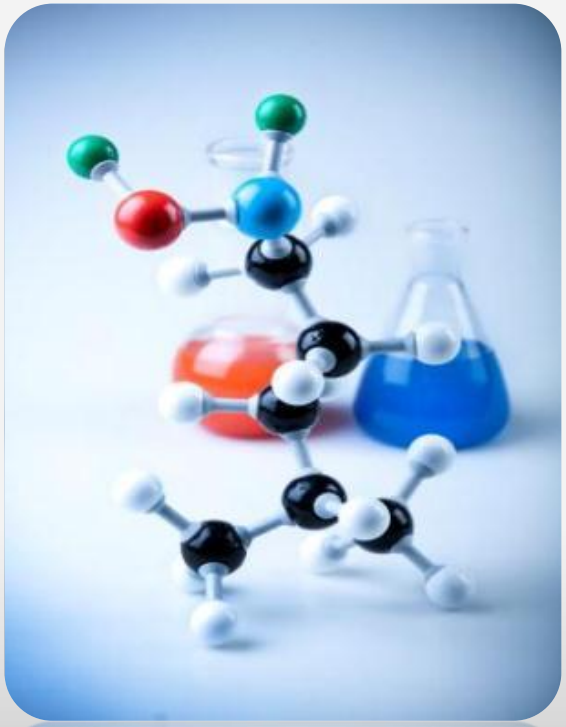
The 'Enviro-Syn' Product Line of Synthetic Replacement Chemistries

- EPA - DfE Approved, FDA - GRAS
- Non-Regulated & Non-Hazardous
  - Non-Toxic
  - Non-Corrosive
  - Non-Fuming
- Environmentally Responsible
  - <10 day Biodegradable



Enviro-Syn – Products Overview

- HCR
  - Hydrochloric Acid Replacement
- HSR
  - Sulphuric Acid Replacement
- CSR
  - Caustic Solution Replacement
- HFR
  - Hydrofluoric Acid Replacement
- ACT
  - Active Microbial Agent



Enviro-Syn – Quality Control

- Synthetically Manufactured
  - Accurate process control measures
  - NO by-products or contaminants
  - Consistent strength
  - Titration qualified
- No Supply Constraints
  - No transportation limitations
  - No volume restrictions

Enviro-Syn HCR – FAQ

Q – What is it?

A – Enviro-Syn HCR is a patented, synthetic (man-made) product that has similar solubilizing properties of Hydrochloric Acid without the extremely high rates of corrosion and reactivity.

Q – Is it an Acid?

A – HCR is a hybrid solution that falls between how a high strength mineral acid and a low strength organic acid would react. It can be referred to as a Synthetic Acid.

Enviro-Syn HCR – FAQ

Q – How does it work?

A – Enviro-Syn HCR is basically a super-concentrated solution of Hydrogen (H^+). It has a stronger bond to the H^+ ion than what a HCl molecule does, and therefore creates a more controlled reaction rate. Not allowing the H^+ ion to easily react in the presence of Carbonates ($CaCO_3$) or Iron (Fe) is what generates the slower spend and extremely low corrosion properties.

Enviro-Syn HCR – FAQ

Q – What precautions (if any) should be taken with pumping the product?

A – HCR is a very low pH chemical that is designed to clean metal surfaces, dissolve carbonate, and will react with certain soft metals such as Aluminum and Magnesium. Caution should be taken to ensure that when loading, unloading, or pumping that only acid approved hose, pumps, and piping are utilized.

Q – What should the HCR be stored in?

A – Enviro-Syn HCR can be stored in approved plastic/fiberglass containers, fiberglass lined acid tanks, lined steel tanks, or even large scale fluid storage systems.

Enviro-Syn HCR – HS&E Properties

- Environmentally Safe
  - 100% Biodegradable
    - COD = 11,000 mg/L
      - » *Citric Acid > 2,000,000 mg/L*
    - BOD 150 mg/L at 5 days
  - Non-Toxic
    - LC50 of >700 mg/L
      - » *HCl acid ±4 mg/L*
    - LD50 of 1973 mg/kg
      - » *HCl acid ±90 mg/kg*
  - Not Mutagenic

Enviro-Syn HCR – HS&E Properties

- Exposure Safe
  - Non-Fuming
  - Non-Destructive on human skin
    - Primary Irritation score of 1.7 (very mild irritant)
      - » *HCl acid - moderate to severe irritant*
  - Non-Destructive on eye tissues
    - Primary Irritation score of 12.3 (practically non-irritating)
      - » *HCl acid - severely irritating/corrosive*

Note on all HCl MSDS - "Hydrochloric acid is corrosive to the eyes, skin, and mucous membranes"

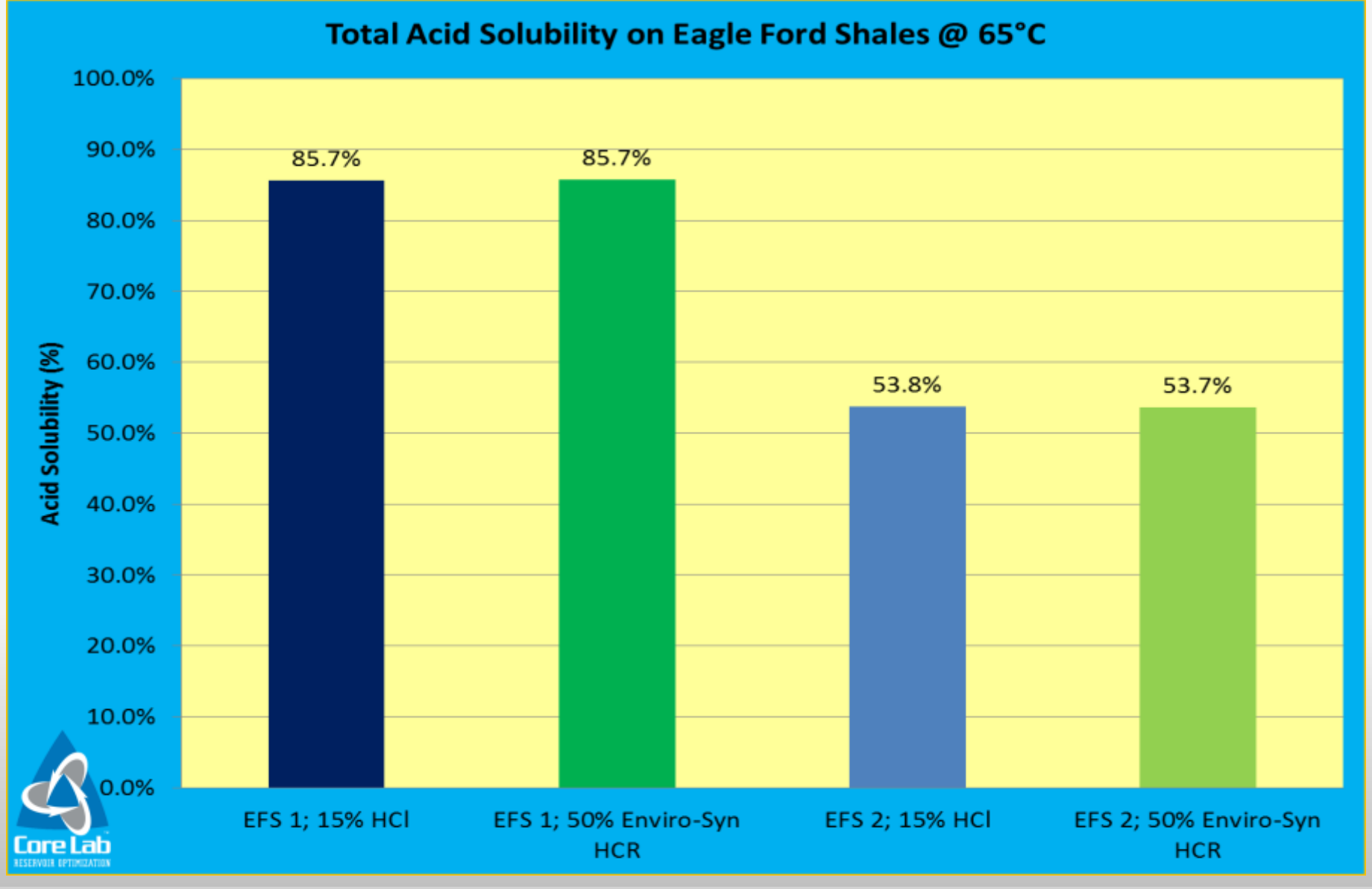
Enviro-Syn HCR – Performance Properties

- Effectively and immediately attacks carbonate based scales, minerals, and formation matrices
- Inherent methodical spending nature
  - Extended placement time through coil
  - Deeper formation penetration
  - Less precipitate/solids formation
- Particularly low corrosion rates

Enviro-Syn HCR – Dissolving Properties

Acid Type	% Dissolved of Conglomerate $CaCO_3$	% Dissolved of Conglomerate $MgCO_3$
Enviro-Syn HCR	100%	21%
50% Enviro-Syn HCR	97%	26%
30% Enviro-Syn HCR	54%	20%
15% HCl Acid Blend	87%	24%
15% Acetic Acid	63%	7%

Each test above was conducted with 1 cubic inch of material placed in 50 ml of solution and allowed to soak for 8 hours at 40 C (100 F)


Total Acid Solubility on Eagle Ford Shales @ 65°C
Acid Solubility (%)
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
85.7%
85.7%
53.8%
53.7%
EFS 1; 15% HCl
EFS 1; 50% Enviro-Syn HCR
EFS 2; 15% HCl
EFS 2; 50% Enviro-Syn HCR
Core Lab
RESERVOIR OPTIMIZATION

Filter Cake Removal – polymer deposited for 2 hours

Enzyme product after 16 hrs

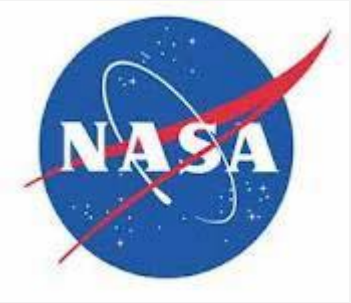
15% HCR after 16 hrs

20% HCR after 16 hrs

Enviro-Syn HCR – Corrosion Properties

- Excellent high temperature corrosion resistance
  - Less required corrosion inhibition
- Superior long term corrosion control (w/o inhibitor)
- Non-regulated for transportation & handling
  - Well below 6.25 mm/year limit at 55^{o}C (130^{o}F)

Enviro-Syn HCR – NACE Corrosion Testing



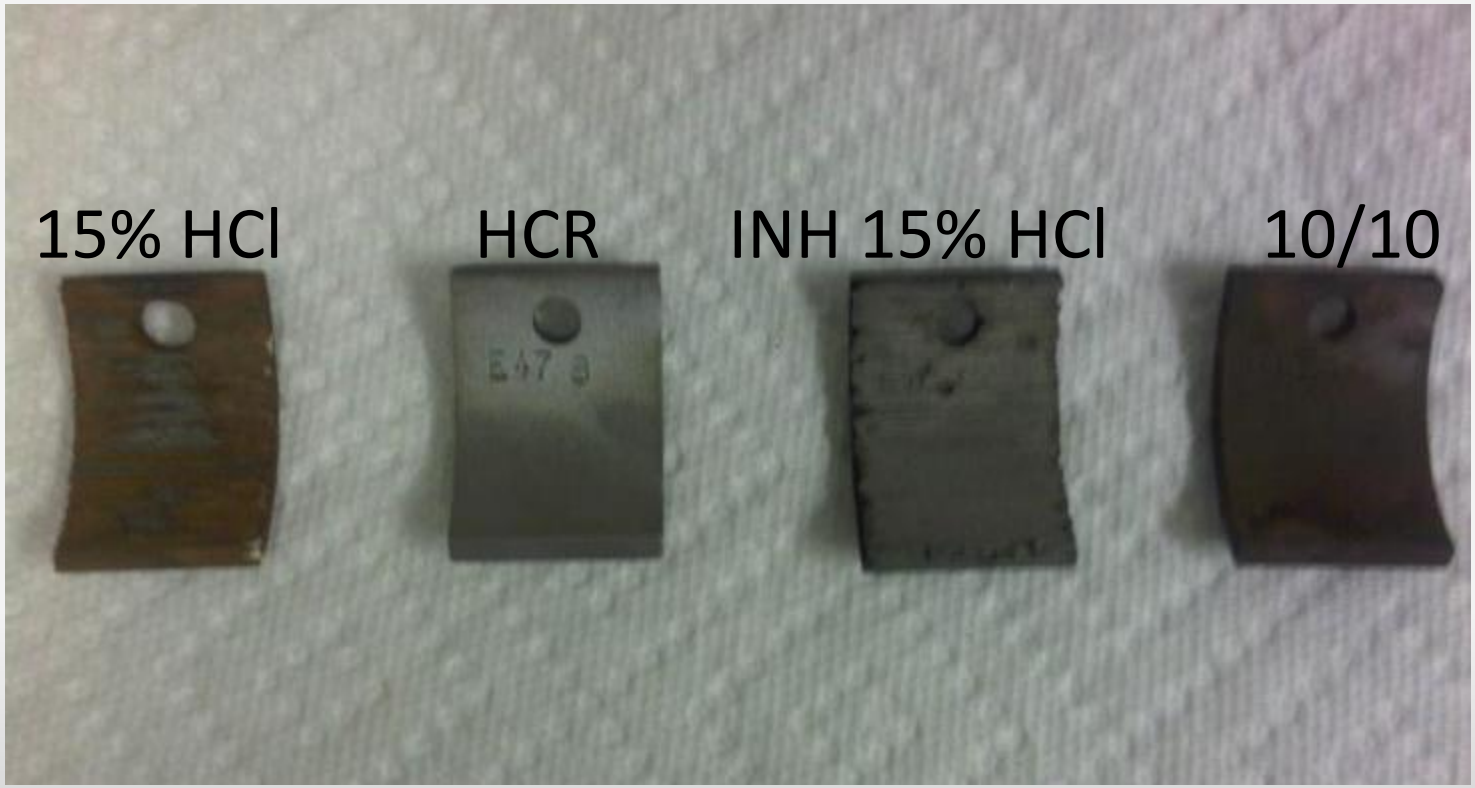
Test: Immersion Corrosion Testing of Metal

Applicable Standard: ASTM G31-72 and NACE Standard TM0169-76

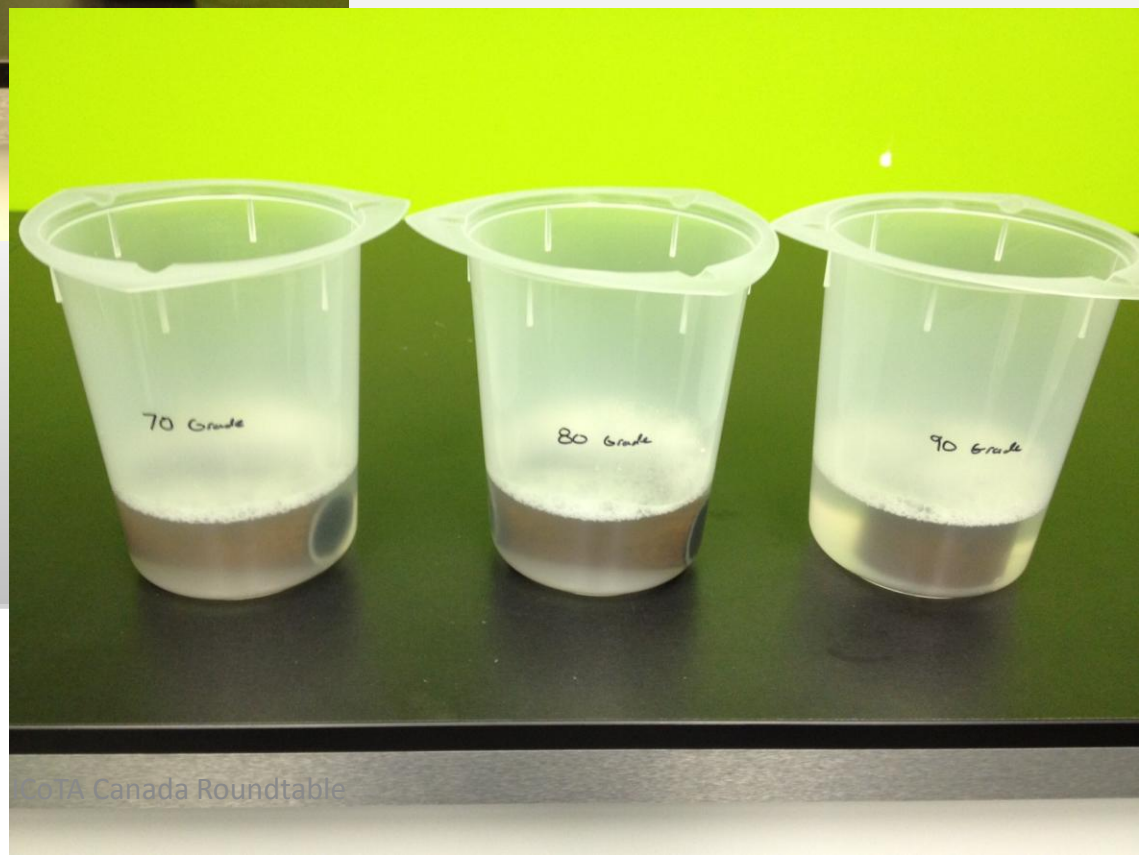
- Each container held a volume of 1170 g of Enviro-Syn HCR
- The temperature of the solution was maintained at 55°C for the duration
- The test was conducted For a period of 72 hours

Results of SAE C1020 Steel & 7075-T6 non-clad Aluminum:

- Neither sample exhibited discoloration, and no pitting was observed
- The corrosion rate based on the 72 hour interval, averaged:
  - 0.27 mm/yr on Steel
  - 1.30 mm/yr on non-clad Aluminum

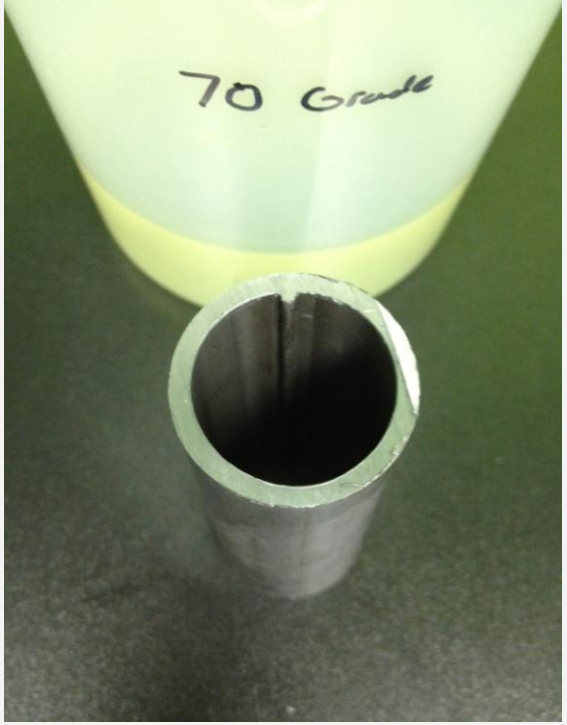

15% HCl
HCR
INH 15% HCl
10/10

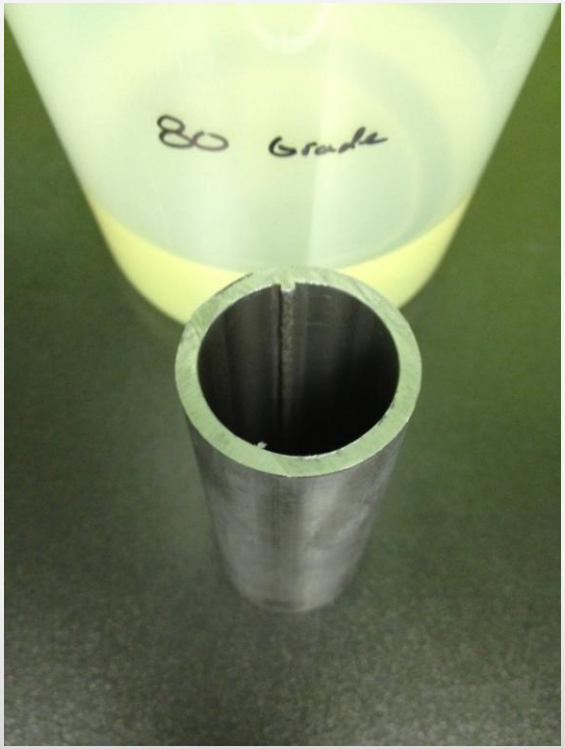
Coiled Tubing Corrosion



3 Days at Room Temperature

21 Days at Room Temperature



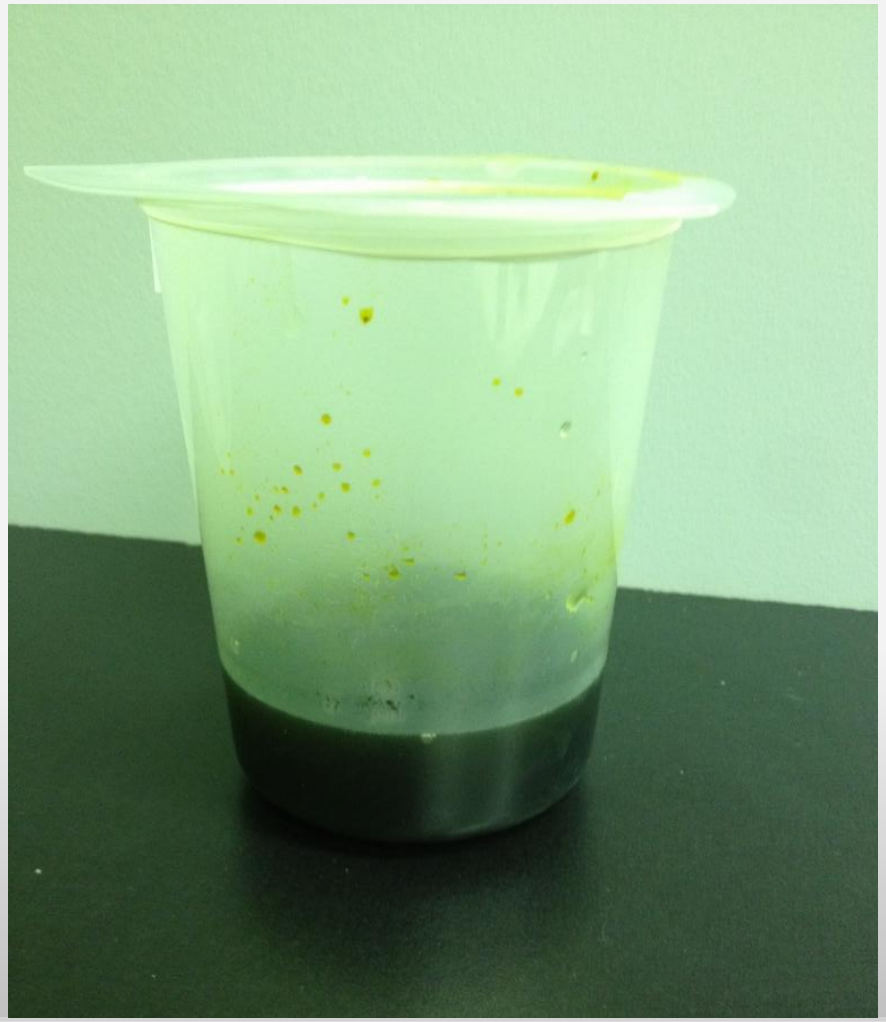


28 Days Total at Room Temperature

Weight (g)	70 Grade	80 Grade	90 Grade
Initial	148.9	157.8	120.2
3 days	148.6	157.5	120.1
% Loss Initial	**0.2%**	**0.2%**	**0.1%**
10 Days	148.3	157.2	120.0
21 Days	148.0	157.1	119.9
28 Days	147.6	156.7	119.6
% Loss Total	**0.9%**	**0.7%**	**0.5%**

3 Days at Room Temperature – 15% HCl Acid

Weight (g)	80 Grade
Initial	149.4
3 days	136.3
% Loss Total	**8.8%**



Coiled Tubing Economics Example

- CT string cost - $150,000
- Average CT string use with acid – 25%
- Average string life reduction from acid use – 33%
- Total life lost to acid - $12,500

- Liability due to CT failure from acid pitting – Pricele$$

Enviro-Syn HCR – Fluid Compatibility

- Enhanced with Non-Hazardous Chemistries
  - Iron Control
  - Corrosion Inhibitor
  - Water Wetting Agent
  - Non-Emulsifier
- Miscible Weighting Agents
  - $CaCl_2$, NaCl, KCl, NaBr
- Gelling Agents
  - HEC, Cationic PA, Low pH Compatible Polymers

Enviro-Syn HCR – Elastomer Compatibility

Elastomer	% Solution Swell	Hardness Change	Tensile % Retention	Elongation % Retention
Sealast HNBR	1	+3	105	107
HSN	1	+1	93	92
Aflas 600-9	1	+2	95	122
Aflas 7182D	1	+1	94	119
CL180 EPDM	1	+1	99	118

Test Parameters:

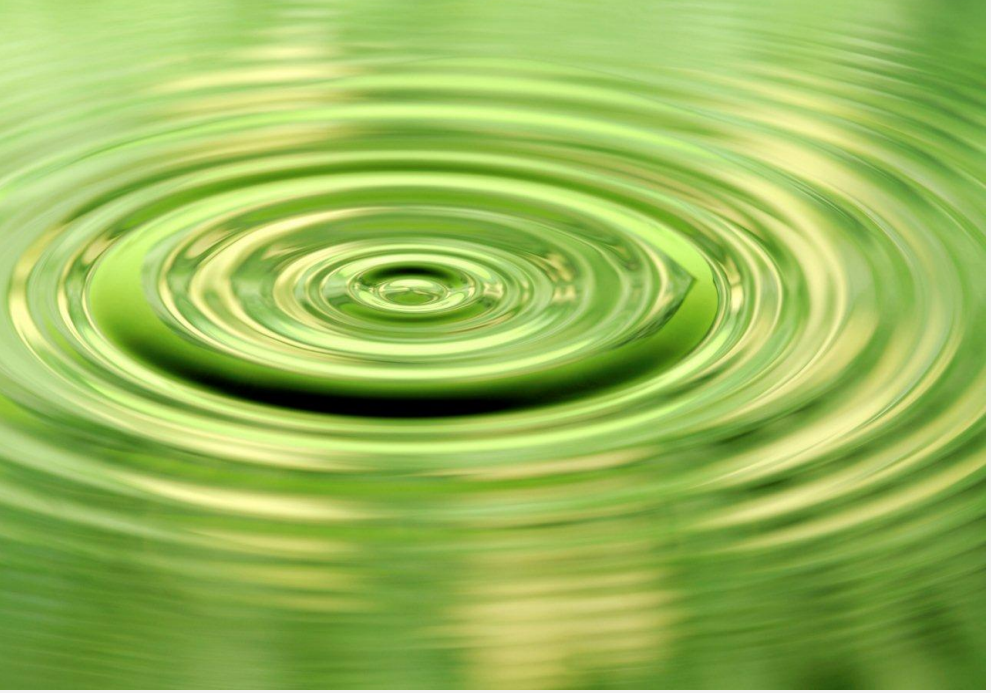
Elastomer samples exposed to the above fluid at 24°C (75°F) for 27 days.

Results:

All of the compounds revealed excellent compatibility with low swell, and high physical property retention observed with all of the elastomers evaluated.

Enviro-Syn HCR – Comparison to HCl Acid

	HCl Acid	Enviro-Syn HCR
Immediately Active	YES	YES
pH	0	0
Reaction Rate	Very Quick	Moderate
Exothermic	Highly	Mildly
Biodegradable	NO	YES
Health Rating	3 – Severe (poison)	0
Reactivity Rating	2 – Moderate (corrosive)	0
Transportation/Handling Rating	Corrosive	NONE



Current Applications & Case Histories of Enviro-Syn HCR

Acid Fracturing

- Turner Valley (Rundle) Formation (medium crystalline dolomite)
  - 10 completed treatments to date at 300 m^3 average volume (±2000 bbl)

  "The first Rundle horizontal light oil well in a multi-well drilling program in the Turner Valley area has been completed with a multi-stage acid fracture stimulation. Its current production rate is in excess of 225 boe per day. The well has been on production for over three weeks and while still recovering load fluid, has demonstrated strong fluid production rates and continually improving water cuts."

- Pekisko Formation (coarse limestone)
  - 2 completed treatments to date at 550 m^3 (3500bbl)
    - Flowed +45 m^3 (285 bbl) fluid back initially
    - Swab rate of +100 m^3/day (630 bbl) @ +50% oil cut

Coiled Tubing Treatments

- Turner Valley (Rundle) Formation
  - 11 completed treatments to date at 150 m^3 average volume

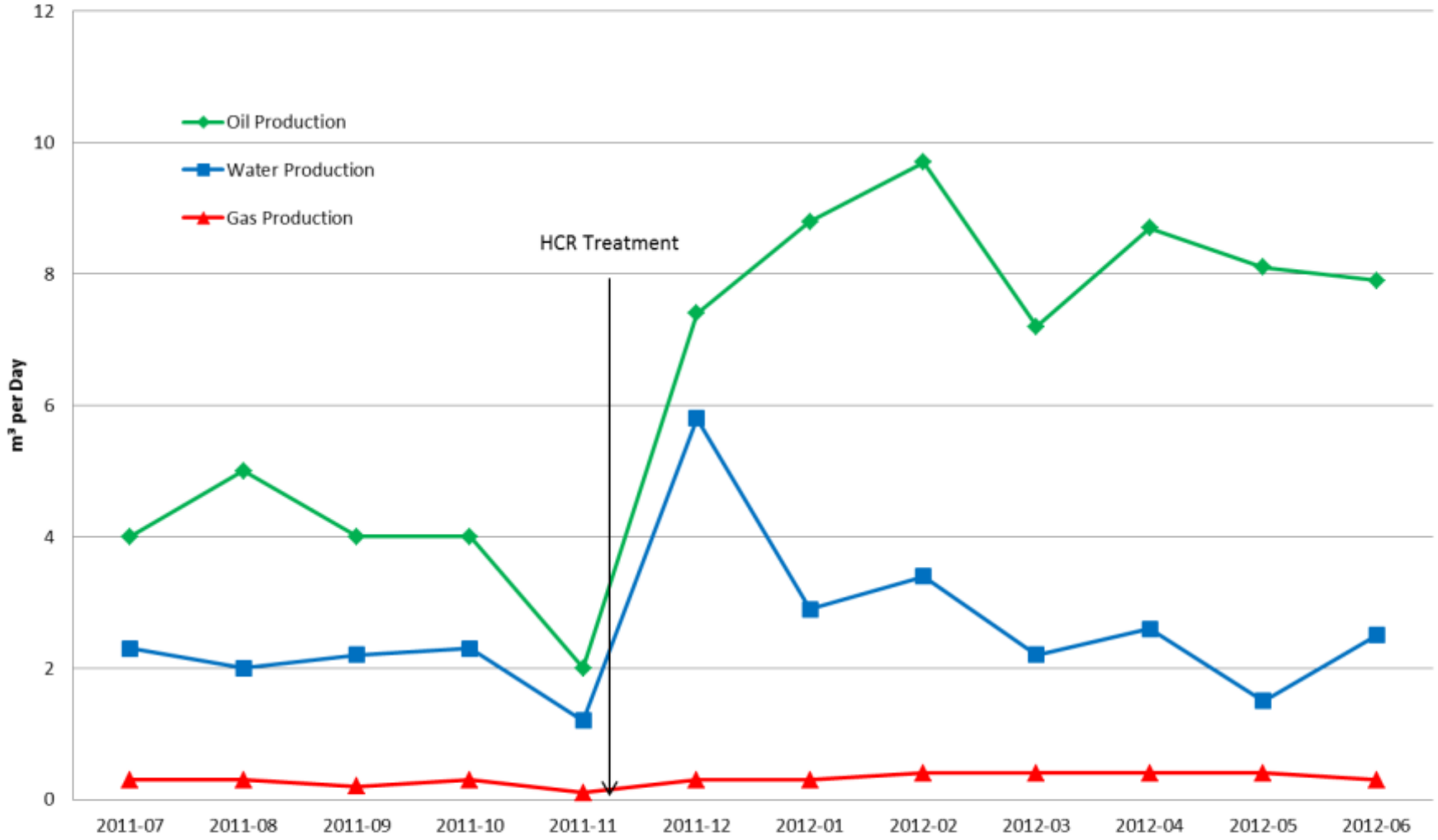
  "At Turner Valley, the first five Rundle light oil horizontal wells had 90 day average production rates of 120 boe per day per well, and a number of the wells continue to demonstrate decreasing water cuts and increasing oil rates, as expected. In particular, one wells production rate continues to increase after being on production for more than four months. Current production from this well is approximately 270 boe per day, a dramatic increase from the well's 30 day initial rate of approximately 120 boe per day. This increasing production profile provides encouragement for similar results from other Turner Valley horizontal wells."

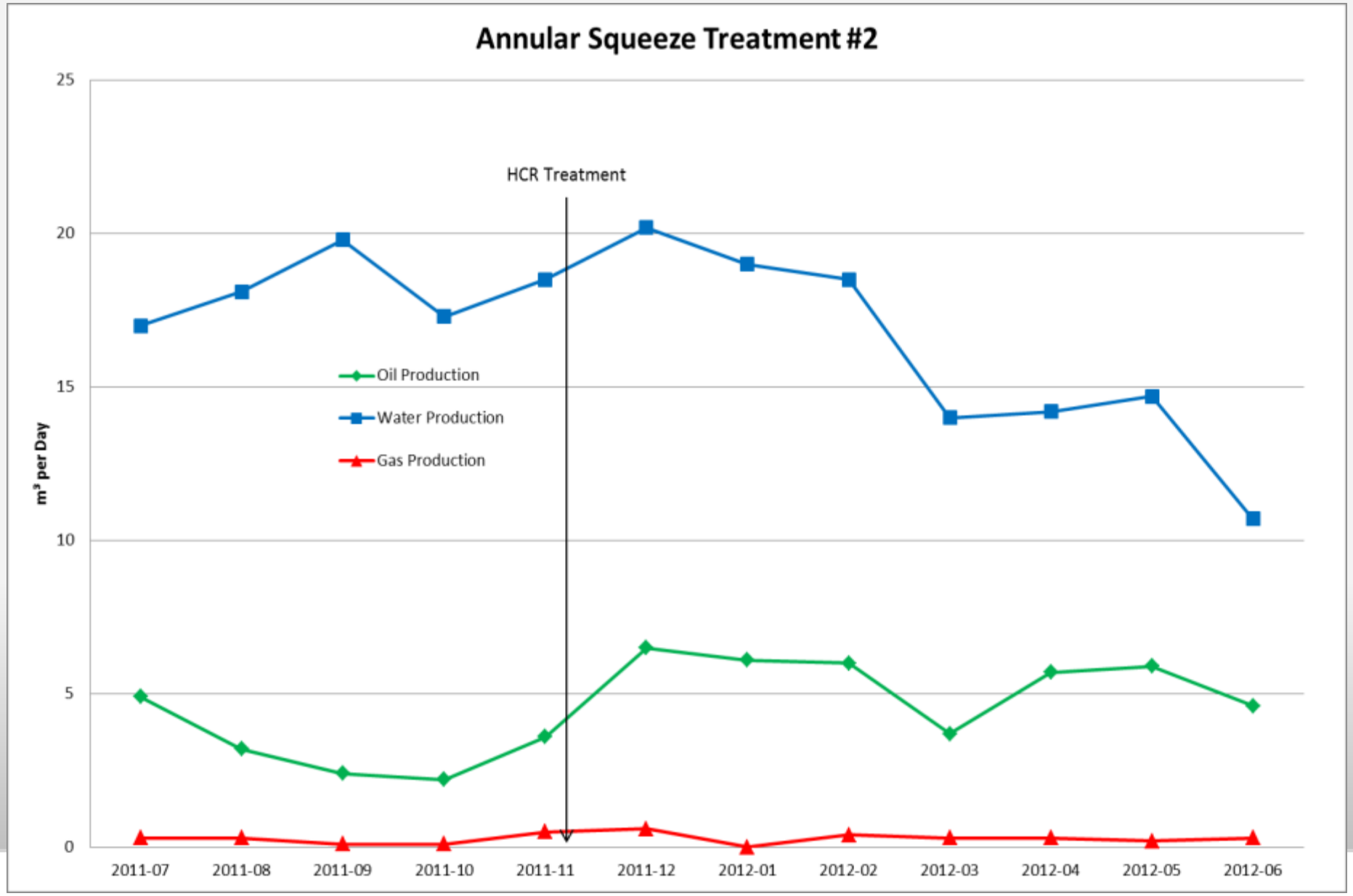
- Estevan, SK - Red River Carbonate

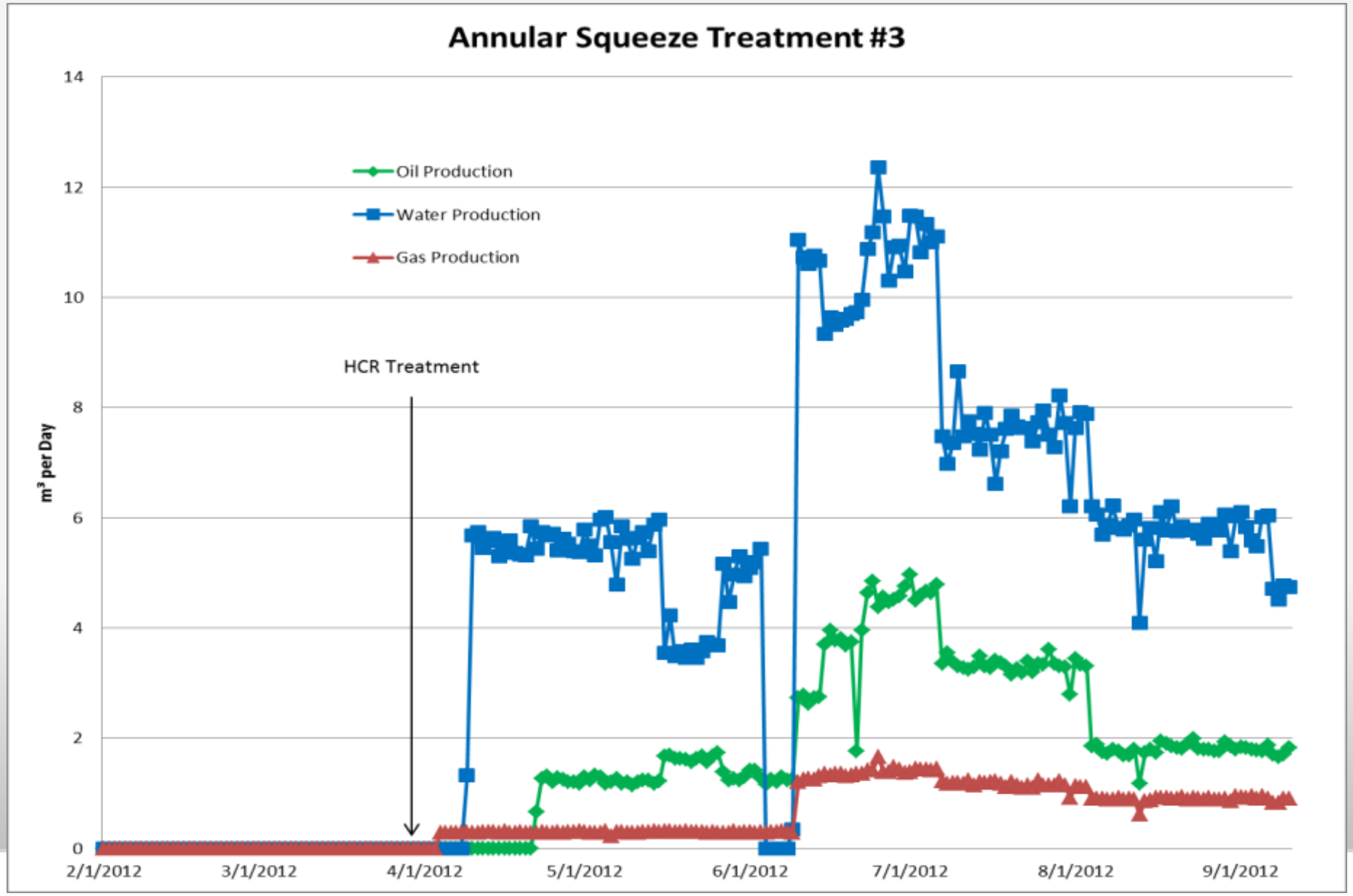
Enviro-Syn HCR – Squeezes, Washes & Spearheads

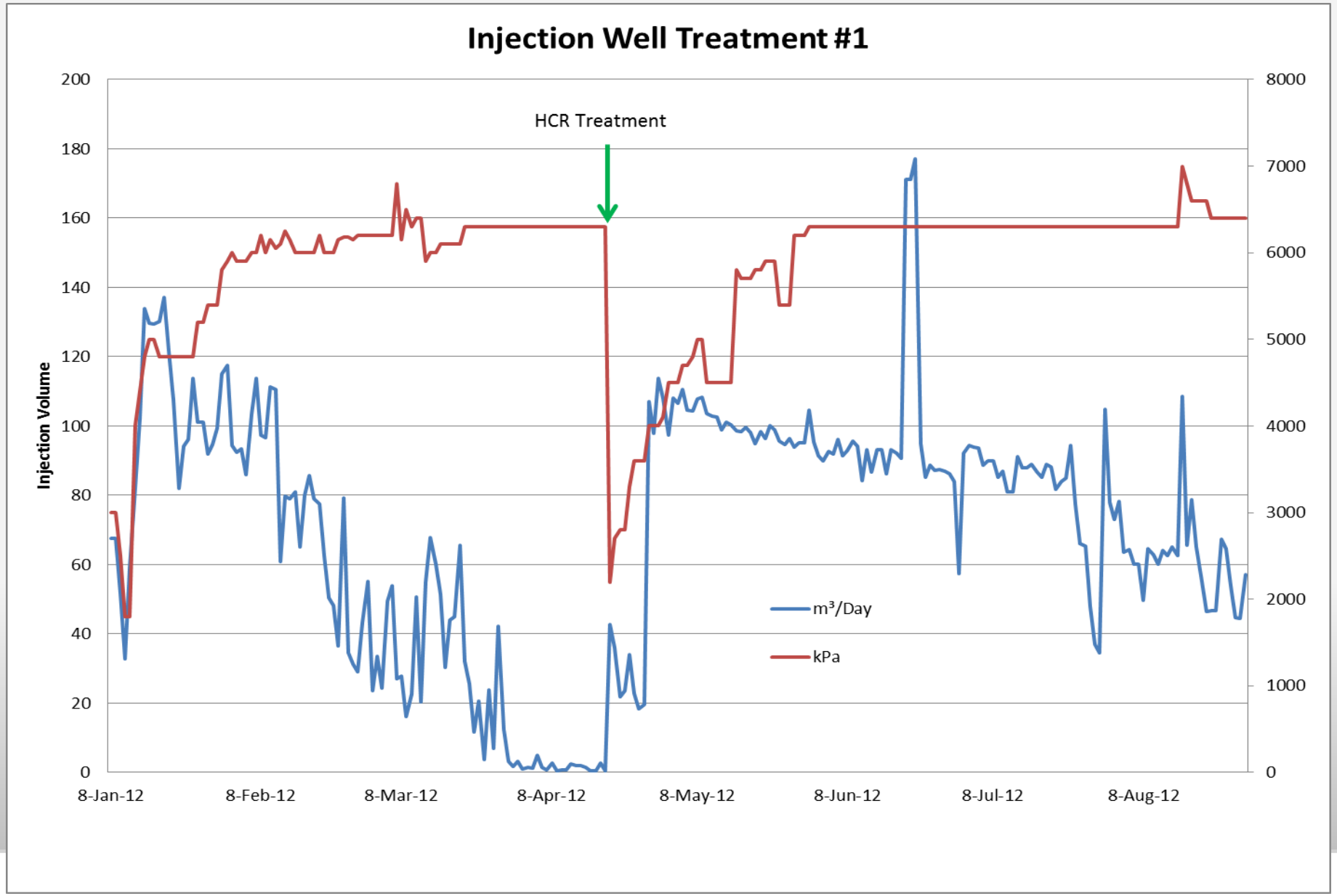
- Injection/Disposal Wells
  - Midale, SK – Midale Carbonate
  - Elkwater, AB – Sunburst Sandstone
  - Enchant, AB – Livingstone Carbonate, Glauconite
- Squeezes & Soaks
  - Bullhead
    - Enchant, AB – Nisku Carbonate
    - Surface Casing Vent Repairs (cement squeezes)
  - Annular
    - Olds, AB – Viking Sandstone
    - Enchant, AB – Glauconite
    - Rocky Mountain House – Cardium
- Frac Spearheads
  - SW Manitoba – Bakken

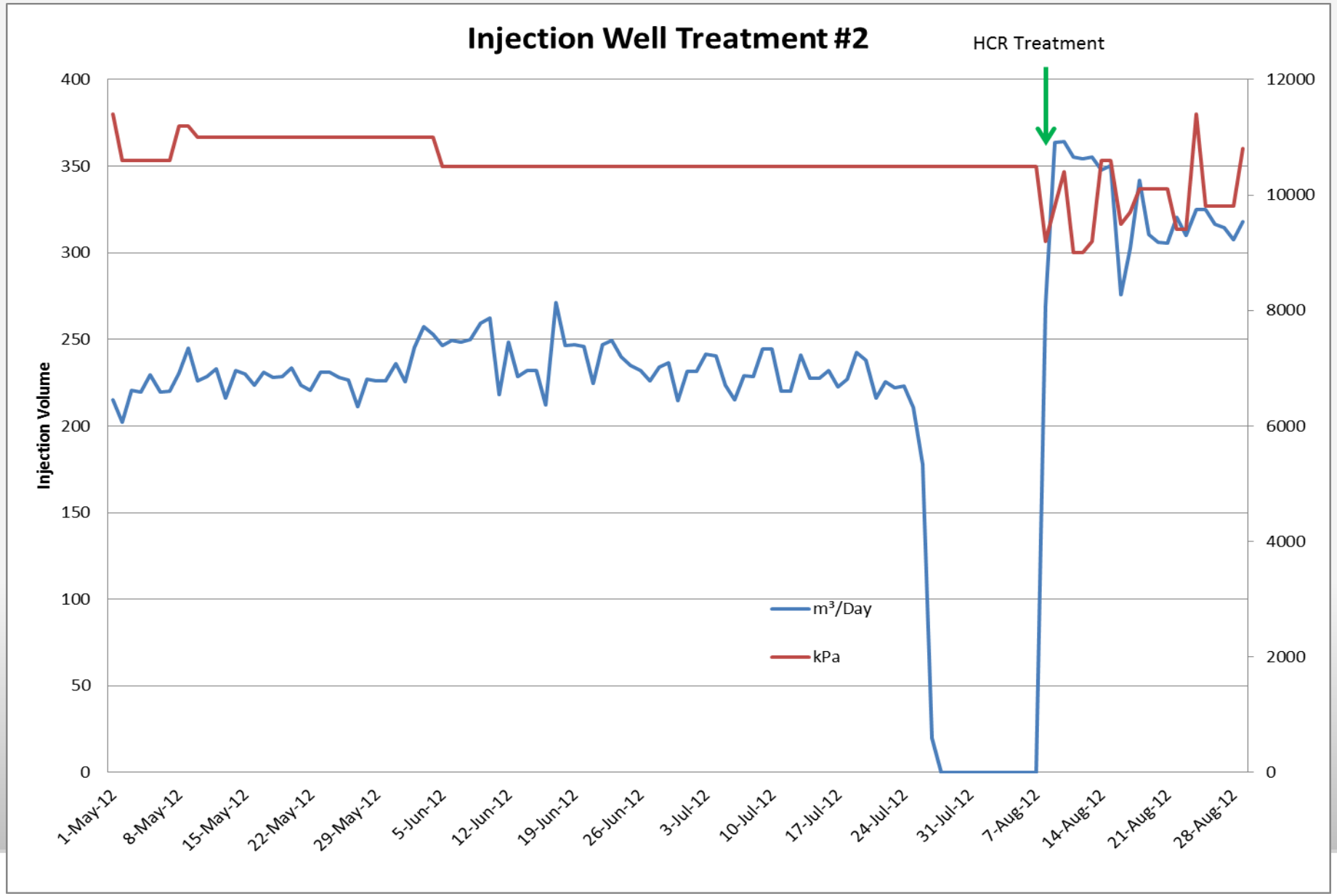
Annular Squeeze Treatment #1



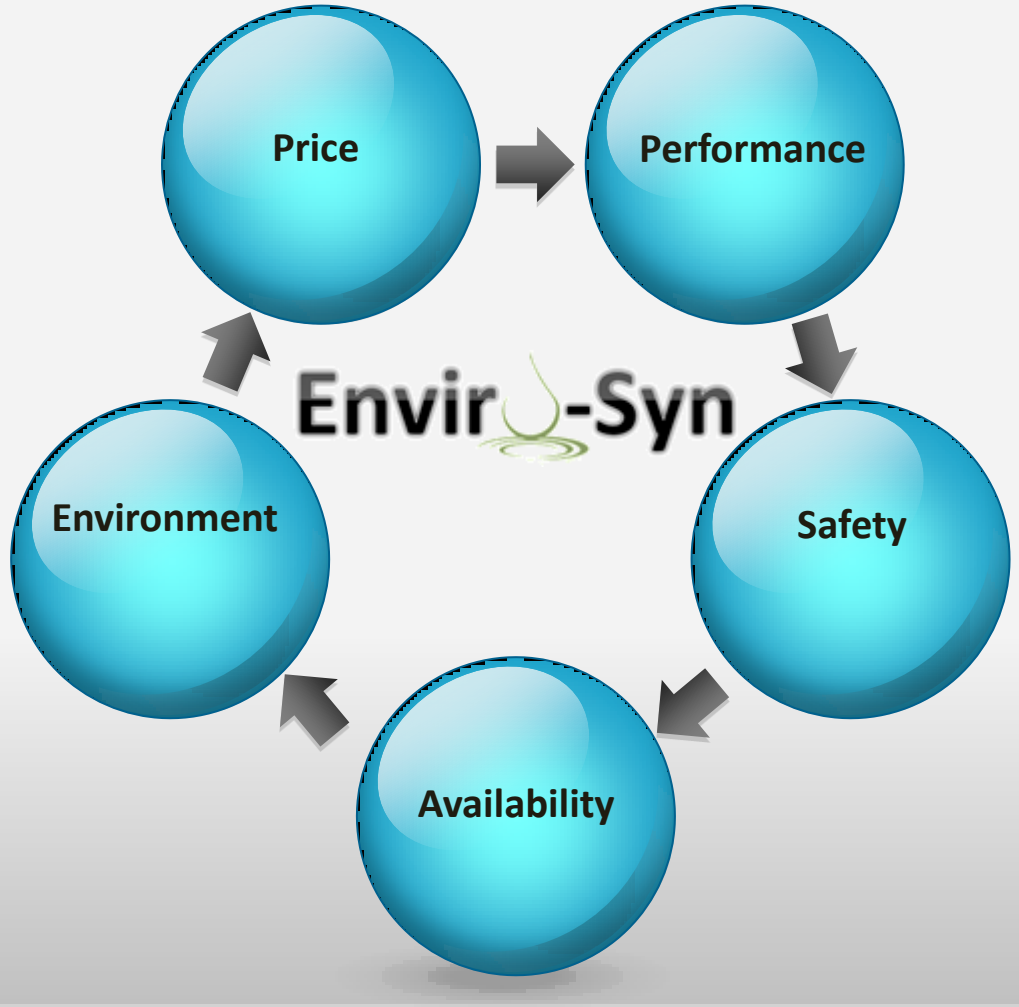

Annular Squeeze Treatment #2
HCR Treatment
Oil Production
Water Production
Gas Production
m³ per Day
25
20
15
10
5
0
2011-07
2011-08
2011-09
2011-10
2011-11
2011-12
2012-01
2012-02
2012-03
2012-04
2012-05
2012-06


Annular Squeeze Treatment #3
Oil Production
Water Production
Gas Production
HCR Treatment
m³ per Day
14
12
10
8
6
4
2
0
2/1/2012
3/1/2012
4/1/2012
5/1/2012
6/1/2012
7/1/2012
8/1/2012
9/1/2012


Injection Well Treatment #1
HCR Treatment
Injection Volume
200
180
160
140
120
100
80
60
40
20
0
8000
7000
6000
5000
4000
3000
2000
1000
0
8-Jan-12
8-Feb-12
8-Mar-12
8-Apr-12
8-May-12
8-Jun-12
8-Jul-12
8-Aug-12
m³/Day
kPa


Injection Well Treatment #2
HCR Treatment
Injection Volume
400
350
300
250
200
150
100
50
0
12000
10000
8000
6000
4000
2000
0
m³/Day
kPa
1-May-12
8-May-12
15-May-12
22-May-12
29-May-12
5-Jun-12
12-Jun-12
19-Jun-12
26-Jun-12
3-Jul-12
10-Jul-12
17-Jul-12
24-Jul-12
31-Jul-12
7-Aug-12
14-Aug-12
21-Aug-12
28-Aug-12

Enviro-Syn – Value Add Products



Thank You ICoTA Canada

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Darren Thatcher, President & COO