

# 'Slow & Easy' Fracture Injection for Enhanced Production from Unconventional Resources

*Terralog Technologies Inc.™ offers a unique, cost effective & sustainable hydraulic fracturing process for unconventional resources including shale play exploitation.*

Terralog Technologies Inc. (TTI) has developed and pioneered the use of an innovative low-rate/pressure, continuous-cyclic hydraulic fracturing process; the **Slurry Fracture Injection (SFI)™** process. Terralog has been the industry leader in the design, operation and management of SFI deep well disposal for large volumes of a variety of waste streams in the petroleum industry, helping our customers achieve environmentally sustainable (Zero Discharge) exploration and production operations. Terralog has developed and adapted the SFI process for the stimulation of unconventional resources, called the **'Slow & Easy' Hydraulic Fracture** process.

## TTI's Slow & Easy Hydraulic Fracturing (HF) Process

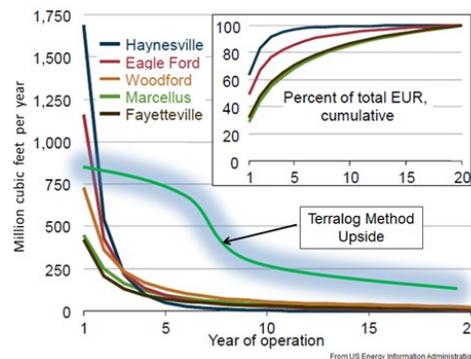
The 'Slow & Easy' HF process is ideal for shale reservoirs and other unconventional plays such as tight gas and conglomeratic reservoirs. It is an innovative, cyclic injection process at lower rates and net pressures to develop complex fracture networks and optimized SRV development in low permeability reservoirs. The premise is that these low-permeability naturally fractured reservoirs (NFRs) can be successfully stimulated at a lower cost; and with significantly improved operational and economic efficiencies for sustainable unconventional resource development.

## Slow & Easy Objectives:

- ✓ Use longer-term, cyclic, lower injection rates for a more effective conductivity enhancement of the natural fracture network through geomechanic mechanisms.
- ✓ Enhancement of the natural fracture network system in shales and NFRs, which is a key element to improved and sustained production.
- ✓ Achieve more stable & sustainable production rates over the life of the well.
- ✓ Increase Stimulated Reservoir Volume (SRV), leading to increased Estimated Ultimate Recovery (EUR).
- ✓ An alternative HF process that mitigates many of the concerns being raised regarding environmental security of large scale multi-stage hydraulic fracturing (MSHF) for shale resource development.

## Slow & Easy Advantages:

- ✓ **Significantly reduced stimulation & completion costs:**
  - Less field equipment/personnel to be mobilized to location (reduced traffic, equipment footprint, and noise);
  - Reduced usage of proppant and chemicals during stimulation.
- ✓ **Optimized field development with increased well spacing.**
- ✓ **Reduced environmental risks (improved wellbore integrity, reduced risk of induced seismicity, etc).**
- ✓ **Ideally suited for re-frac operations:**
  - Nature of treatment makes it less dependent on design of original well completion;
  - Provides a cost effective alternative for conducting re-fracs.
- ✓ **Improved water management:**
  - The process does not require fresh water;
  - Produced water/fracture flowback water can be used as the fracture fluid (with minimal or no pre-treatment);
  - Reduced post-treatment flowback water volumes (vs other fracturing techniques).
- ✓ **Unique opportunity to integrate re-frac stimulation operations with water management.**
- ✓ **Asset protection - reduced risk and intensity of frac hits/well interference.**



## How Is The Terralog 'Slow & Easy' Process Different?

- Slow & Easy HF process utilizes low injection rates, cyclic injection for progressive development of short, complex fracture networks.
- Geomechanic mechanisms improve overall SRV and natural fracture conductivity in tight formations.
- SRV occurs expansively from the well into the reservoir.
- Increased well spacing due to increased SRV.
- Slow & Easy HF process is an innovative HF process for shale resource development. **Benefits include:**
  - ✓ **Reduced stimulation & completion costs**
  - ✓ **Reduced environmental impact from field development operations.**
  - ✓ **Improved water management.**
  - ✓ **Reduced induced seismicity.**
  - ✓ **Reduced risk of 'frac hits'.**

## Slow & Easy Applications:

- Shale resource development.
- Stimulation of low permeability, naturally fractured reservoirs.
- Ideal for re-fracturing of wells.
- **Optimized water management:**
  - ✓ Re-use of flowback wastewater/produced water.
  - ✓ Allows for integrated water disposal-refrac operations.

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