CoilFlat CT Liner

The High Collapse MonoBore Liner on Road Size Reel
**CoilFlat CT Liner**

Conventional Subsea Well using 18-3/4" BOP Stack with 21" Marine Riser

MonoBore Well using 7-1/16" Subsea BOP Stack with 9-5/8" Marine Riser

**Concept of MonoBore Well**

Comparison of a subsea well cased conventionally with the same well cased with a 7" MonoDiameter Casing System

- Substantial reduction in volume drilled up to 70 %

- Substantial reduction in Steel used up to 70 %

**CoilFlat High Collapse Monobore CT Liner**
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- Expandible Casing
  reopen with a expanding mandrel
  (Shell Technology)

- Collapsible Casing
  rounded with pressure
  (Marinovation Technology)
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Collapsed and Reinflated Tubular Technology

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DEA (E) 96 - RapidWell

Reinflation with Pressure

External Drift

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To solve the limitation is collapse…….

The CoilFlat CT Liner is
- a continuous pipe-in-pipe casing,
- transportable on Coiled Tubing (CT) size reels,
- able to deliver a High Collapse MonoDiameter well liner.

The High Collapse capacity, higher than burst, is obtained by
- the steel liner sandwich wall obtained by
- cementing the pipe-in-pipe cavities after deployment,
- the pipe-in-pipe cavities being used as cementing stinger to cement the CoilFlat CT liner in the well-bore.
CoilFlat CT Liner

Deployable Bell Receptacle
Collapsible Shoe
Aluminium/Composite

Downhole Casing Hanger
protected in the Spool Flange

4,000’ of 7-5/8” CoilFlat Casing on
13’OD x 8’OW Truckable Spool

CoilFlat High Collapse Monobore CT Liner
1- The CoilFlat Liner is unreeled,
   - longitudinally folded,
   - through the previously set CoilFlat Liner having the same deployed diameter

2- When the open hole section is covered,
   - fluid is pumped down to open the CoilFlat Liner.
3- Additional pumping further round-up the CoilFlat Liner.
CoilFlat CT Liner

deployed and rounded up with

6,800 psi Internal Pressure

2,500 psi Annulus Pressure
4- Cement is then pumped down

- through the pipe-in-pipe cavities to cement the liner in the wellbore and,

- build the CoilFlat Liner sandwich wall increasing Collapse performances.
Cement flows down from the Running String:

- down the CoilFlat Cells
- then up the Annulus between formation and liner
**CoilFlat CT Liner**

after constructing a sandwich wall
a High Performance Collapse Liner is obtained

FEA under 8,000 psi
Collapse External Pressure
<table>
<thead>
<tr>
<th></th>
<th>4” Std</th>
<th></th>
<th>7” Std</th>
<th></th>
<th>9-5/8” Std</th>
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<th>10” Std</th>
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<tbody>
<tr>
<td>OD in</td>
<td>4.00”</td>
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<td>7.00”</td>
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<td>9.63”</td>
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<td>10.50”</td>
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<tr>
<td>Weight lb/ft</td>
<td>9.50 #</td>
<td></td>
<td>23.00 #</td>
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<td>45.30 #</td>
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<td>Cement Core WT</td>
<td>0.18”</td>
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<td>0.31”</td>
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<td>0.43”</td>
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<td>3.53”</td>
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<tr>
<td>Folded Flat Height</td>
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<td>2.56”</td>
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<td>6.05”</td>
<td></td>
<td>8.33”</td>
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<tr>
<td>Folded Flat Width</td>
<td>3.37”</td>
<td></td>
<td>6.05”</td>
<td></td>
<td>6.330 psi</td>
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<td>Material</td>
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<tr>
<td>Collapse</td>
<td>6,590 psi</td>
<td>80 ksi</td>
<td>3,830 psi</td>
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<td>3,810 psi</td>
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<td>Burst</td>
<td>7,910 psi</td>
<td>6,340 psi</td>
<td>6,340 psi</td>
<td>6,300 psi</td>
<td>6,330 psi</td>
<td>6,320 psi</td>
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<tr>
<td>Collapse Increase</td>
<td>24 %</td>
<td></td>
<td>114 %</td>
<td></td>
<td>115 %</td>
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</table>
CoilFlat CT Liner

Reelable Configuration
Height: 2.56"
Width: 6.05"

- .19” Inner Steel Pipe
- .31” Cement Core
- .13” Outer Steel Pipe

Total Steel WT: .32”
Total WT: .63”

Deployment by Internal Pressure
- 6,800 psi
- with Annulus Pressure
  - 2,500 psi
- 80 ksi Material

Deployed Configuration
OD: 7.625"
ID: 6.375"

CoilFlat High Collapse Monobore CT Liner

PCN-070722
CoilFlat CT Liner

Reelable Configuration
Height: 2.56" - Width: 6.05"

.19" Inner Steel Pipe
.31" Spacing Rods
.13" Outer Steel Pipe

Deployed Configuration
OD: 7.625" - ID: 6.37"

CoilFlat High Collapse Monobore CT Liner
**CoilFlat CT Liner**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>CoilFlatHD10</th>
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<tbody>
<tr>
<td>9-7/8”</td>
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<tr>
<td>OD in</td>
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<td>13,840 psi</td>
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<td>Collapse Increase</td>
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**CoilFlat HD 10**
For Deep Geothermal Well

Numbers if the Macondo Well was drilled
Monobore with CoilFlat HD10

- while having from the beginning of the well a 13.5 ksi pressure containing capability and keeping the well in its smaller diameter all the time
- the BOP Stack size: would have been 9” – 15 ksi instead 18-34” – 15 ksi mass would have been 30 tons instead 200 tons
- the Marine riser size: 13-5/8” instead 21”
- the volume drilled is: 8,800 cuft instead 28,850 cuft 70% reduction
- the weight of casing is 1.1 Mlbs instead 3.3 Mlbs 67% reduction

**CoilFlat High Collapse Monobore CT Liner**
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String Installation 1

1- drilled out enlarged double skin bell with grooved profile

when depth is reached…

2- double skin foldable liner hanger lowered on a single trip running tool

3- reeled CoilFlat CT Liner body

4- folded double skin bell receptacle

5- folded aluminum offset cement shoe

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CoilFlat CT Liner

String Installation 2

1- hanger is partially rounded to engage the Bell grooved profile and hang the liner string

2- liner string is inflated with fluid to 6,800 psi with a pressure in CoilFlat cells of 2,500 psi

3- cement is pumped down to fill the annulus between the liner and the formation as well grouting the cells at the same time the 2 remaining folds on the hanger allows fluid returns to the surface
**CoilFlat CT Liner**

Liner String Installation 3

4- from the one trip running tool the hanger is swedge into receptacle and metal to metal sealing is obtained.

after cement is set...

5- drilling can resume by drilling out the aluminum shoe.

With 80 ksi material an 8,200 psi collapse is achieved due to the sandwich construction of the liner wall.
CoilFlat CT Liner

The Benefits:

- solve the collapse limitation of present MonoBore or Monodiameter systems,

- no complex expansion tool, no special step

- deployment transparent to the driller:

- High Collapse is achieved by cement left in the cementing stinger.
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CoilFlat CT Liner JIP Technology Demonstration

Aim:
Confirm by independent laboratory the collapse/burst performances then demonstrate the Casing liner/Shoe connection capability.

JIP Cost: Phase 1: 180 k$, 6 months
Phase 2: 570 k$, 9 months

Participants invited:
Operators, Service Companies, Steel Mill, Pipe Mill… and Universities…
Participation can be either in money or in kind (construction prototype and/or independent testing…)

CoilFlat High Collapse Monobore CT Liner