3D Representation of Clearance Scans

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The ISCWSA

From the ISCWSA website (www.iscwsa.org):

• “The … ISCWSA … is seeking to dispel the confusion and secrecy currently associated with wellbore surveying…."

• …. “is seeking to dispel the confusion and secrecy currently associated with”…**numbers**…. 

Much of the work we do is centered around numbers and how to make those numbers usable and understandable to a wider audience.
An Example: Do you know what it is?

```plaintext
# Type: property scattered data
# Version: 8
# Description: Exported from tif2pdat.py
# Format: free
# Field: 1 x
# Field: 2 y
# Field: 3 z unknown
# Field: 4 symred integer
# Field: 5 symgreen integer
# Field: 6 symblue integer
# Units: unknown
# End:

1  720   1  190  195  199
2  720   1  189  194  198
3  720   1  187  192  196
4  720   1  186  191  195
5  720   1  185  190  194
6  720   1  185  190  194
7  720   1  186  191  195
8  720   1  187  192  196
9  720   1  186  191  195
10 720   1  187  192  196
11 720   1  188  193  197
12 720   1  188  193  197
13 720   1  189  194  198
14 720   1  188  193  197
15 720   1  188  193  197
16 720   1  187  192  196
17 720   1  182  187  191
```
An Example: Do you know what it is?
An Example: Do you know what it is?
But What Happens When We Look at 3D Data in 3D?
But What Happens When We Look at 3D Data in 3D?

Danger can lurk if we don’t look in 3D!
But What Happens When We Look at 3D Data in 3D?

Danger can lurk if we don’t look in 3D!
Breaking out through the tangle of wells
Breaking out through the tangle of wells
# Traditional Clearance Report – 1D “The Numbers”

## Clearance Report

**Demo - Initial 1000**

**Closest Approach**

**Page 2 of 24**

### Reference Wellpath Identification

<table>
<thead>
<tr>
<th>Operator</th>
<th>Aviemore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>Aviemore</td>
</tr>
<tr>
<td>Field</td>
<td>Aviemore</td>
</tr>
<tr>
<td>Facility</td>
<td>130/60A-D</td>
</tr>
</tbody>
</table>

### Calculation Range & Cutoff

From 0.00m MD to 1000.00m MD

C-C Cutoff (none)

### Offset Well Clearance Summary (11 Offset Wellpaths selected)

<table>
<thead>
<tr>
<th>Offset Facility</th>
<th>Offset Slot</th>
<th>Offset Well</th>
<th>Offset Wellbore</th>
<th>Offset Wellpath</th>
<th>C-C Clearance Distance</th>
<th>ACR Separation Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ref MD [m]</td>
<td>Min C-C Clear Dist [m]</td>
</tr>
<tr>
<td>130/60A-D</td>
<td>D04</td>
<td>130/60A-D04(F11)</td>
<td>130/60A-D04</td>
<td>130/60A-D04</td>
<td>972.72</td>
<td>9.75</td>
</tr>
<tr>
<td>130/60A-D</td>
<td>D06</td>
<td>130/60A-D04Z(F11)</td>
<td>130/60A-D04Z</td>
<td>130/60A-D04Z</td>
<td>972.72</td>
<td>9.75</td>
</tr>
<tr>
<td>130/60A-D</td>
<td>D09</td>
<td>130/60A-D02(F13)</td>
<td>130/60A-D02</td>
<td>130/60A-D02</td>
<td>0.00</td>
<td>23.88</td>
</tr>
<tr>
<td>130/60A-D</td>
<td>D08</td>
<td>130/60A-D03(F14)</td>
<td>130/60A-D08</td>
<td>130/60A-D08</td>
<td>600.00</td>
<td>25.17</td>
</tr>
</tbody>
</table>

**Integrate. Visualize. Analyze.**
2D Representation of Report Numbers: Clearance Distance vs MD
Clearance Data on Traveling Cylinder Plot – 2D
Clearance Data on Traveling Cylinder Plot – 2D
Working with 2D representations with 3D

- Reference is planned path
- Demo - initial 1000
- Highlighted MD range on reference path is 0 to 949 m

- Orientation is Map North
- MD reference is Rig on Demo (RT)
- Selection is offset actual path 130/60A-D04 [130/60A-D04]
Represent the Clearance Data in 3D

- Tube of “minimum allowable separation distance” (MASD)
- ACR Pass / fail coloring on tube
- Add new information: “Available space” symbol based on ACR
- Does not replace reports, TC plots, etc – rather enhances the process
Altering Path Based on Available Space

Altering Path Based on Available Space
Altering Path Based on Available Space
Report and 3D Viewing May Not Be Enough
Viewing in 3D Shows How Relative Ellipsoid Angle Affects MASD – Pronounced Thinning
Viewing in 3D Shows How Relative Ellipsoid Angle Affects MASD – Pronounced Thinning
Adding Tubes with Radius = MASD / Available Space

- Report shows we passed the ACR
- Green = Pass
Adding Tubes with Radius = MASD / Available Space

- But Available Space shows a more informative story
- …which we can then correct quickly
Conclusions

- We have the numbers, but what’s full extent of their meaning?
- 2D tools are excellent at telling us something is wrong
- By finding ways to bring the 2D information into 3D, we can have a better understanding of the full context of the issues
- Plus we quickly evaluate a wider range of options, leading to better, safer wells
Acknowledgements

- Andy Sentance, Dynamic Graphics
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And to the ISCWSA and the audience, thank you....