OWSG General Meeting

August 21st 2024

Mohamed Elshabrawy

Sub-Committee Chair

Agenda

#	Topic	Speaker	Company	Duration
1	Opening remarks	Mohamed	Shell	10 min
2	Update on API RP78	Jonathan	Oxy	5 min
3	Survey Correction Trial in Canada asset	Matt Weber	Shell	15 min + Q&A
4	Challenges with anti-collision and PUM's	Dan Wessel	Innova-Drilling	15 min + Q&A
5	A Precise SF calculation proposal	Mike Calkins	Three Sigma Well Design	20 min + Q&A
6	Database Error Model update on historical data	Knut Ness	ADNOC	15 min + Q&A
7	AOB & Closing remarks	Mohamed	Shell	10 min

Our Mission

To promote practices that provide confidence that reported wellbore positions are within their stated uncertainty.

2024 Brand

OWSG: Operational Wellbore Survey Group

Operators, OEMs, Service Partners & Interested Parties.

Focus: Case Studies and Operational Practices – Implementation.

Meetings every other month.

2024 Meetings

1. January 23rd
2. April 11th
3. June 12th
4. August 21st
5. Sep 25th (ISCWSA)
6. October 23rd
7. December 11th

Alisa Zahoruiko/Getty Images/iStockphoto

https://jpt.spe.org/twa/are-your-online-meetings-inclusive

SEP. 25 - SEP. 26, 2024

ISCWSA #60 - New Orleans, Louisiana, USA

Ernest N. Morial Convention Center
900 Convention Center Blvd.
New Orleans, LA 70130
United States of America

Early Bird
$125.00
Seats total 80, Seats available 61
(ends 08/25/2024)

Regular
$150.00
Seats total 35, Seats available 35
(ends 09/18/2024)

Late registration
$200.00
Seats total 10, Seats available 10
(ends 10/31/2024)

MIT
$50.00
Seats total 5, Seats available 4
(ends 10/31/2024)

The 60th Meeting of the ISCWSA is scheduled to take place in New Orleans on 26th September 2024, in conjunction with the SPE Annual Technical Conference and Exhibition.

Subcommittee working group meetings are scheduled for **25th September.** For access to attend the Subcommittee meeting, you **must** pre-register with the appropriate Subcommittee Chair.

Update on API RP78 review and ballot

Jonathan

- Ballot Draft Under and Edit / Revision
- Moving much of the Magnetic & Gyro Inclination & Azimuth Quality Information from Annex C to Section 4.8 (QA/QC)
- Confirm Terms & Definitions
- Omit Terms & References no longer relevant
- Completed one reference table that needed refinement.
- Target to complete Draft by mid-September
- Send back to API RP78 Program Manager for Final Ballot Preparation
- Target Ballot by October.

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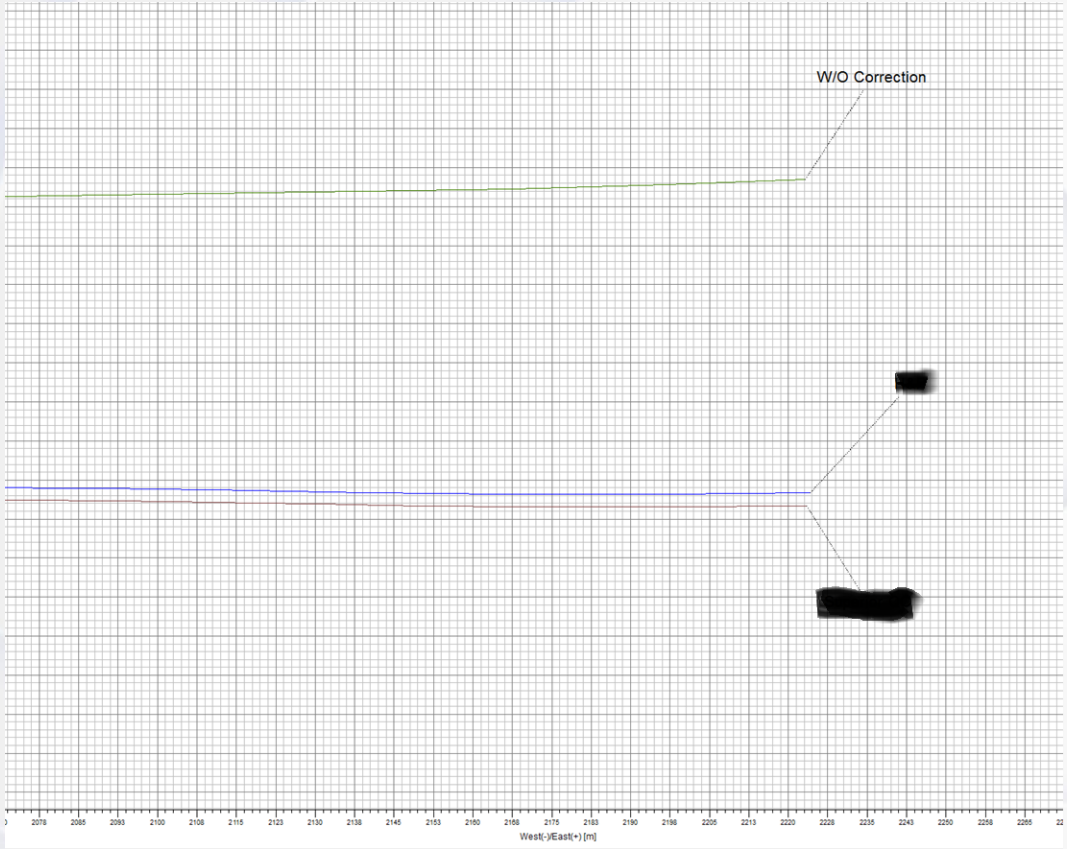
Survey Correction Trial

Matthew Weber
Borehole Surveying SME/Focal

Why? How? Results

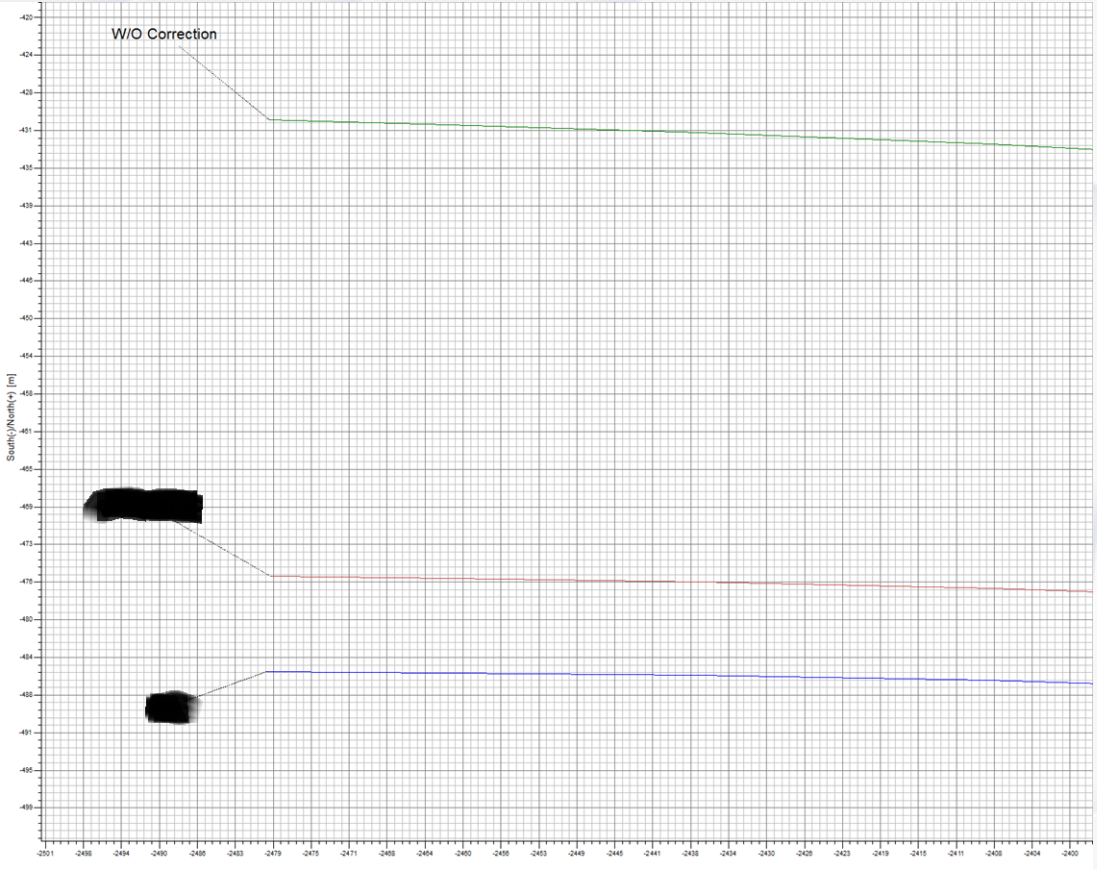
- Without correction a 45-60m shift in position would be detrimental to spacing, target windows as well as reservoir drainage.
- We will compare a regular uncorrected MWD survey along with two survey correction companies that will output a fully corrected “MWD+IFR+MS+SAG” survey
- Healthy to have some competition
- If the correction results are similar, this will give evidence of the need for correction, confidence in the survey correction services we are using and give us the best wellbore placement possible.

GROUNDBIRCH Well #1



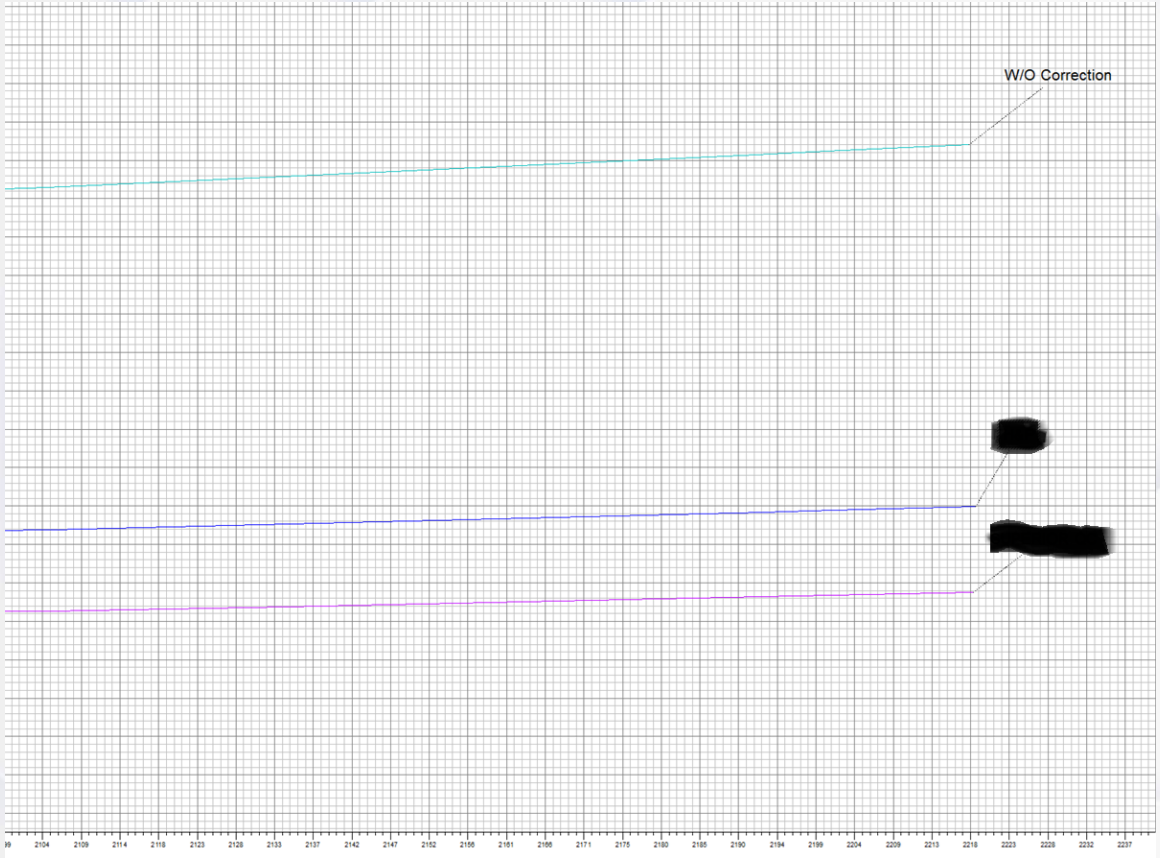
- As you can see, without correction we see a 60+m shift from our corrected positions
- Both are within 2-3m of each others correction at BHL which is quite good.

GROUNDBIRCH Well #2



- As you can see, without correction we see a 45-55m shift from our corrected positions
- Corrections are within 10m of each others correction at BHL which is still acceptable.

GROUNDBIRCH Well #3



- As you can see, without correction we see a 45-55m shift from our corrected positions
- Corrections are within 10m of each others correction at BHL which is still acceptable.

Summary

- We see the need for correction overall as a 45-60m shift in position would be detrimental considering how often we drill E/W, spacing required and target windows given (20m L/R).
- Both corrections are within acceptable limits at BHL
- Both survey correction companies have shown the necessary knowledge and processes in place to perform the correction adequately when given all data necessary to perform (checkshots, etc..)
- Healthy competition

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INTRODUCING
DAN WESSEL

To present challenges seen in anti-collision and Positional Uncertainty Models, specifically from the perspective of a provider of well planning and directional drilling software.

CEO of Innova Drilling & Intervention

All encompassing software suite for directional drilling, drilling engineering & well planning operations…

Innova's drilling software applications (including Well Seeker Pro) are used on approximately 75% of US land wells by directional drilling service companies as their chosen survey management, anti-collision and reporting software platform.

TOPIC

XCL Terms Effects on Anti-Collision Projections

Impact of XCL terms in the Rev 5 error model

MWD OWSG Rev5.ipm

File Edit View

```
#Tool Name: MWD OWSG Rev5
#Name   Vector  Tie-On  Unit    Value   Formula MinInc  MaxInc
drfr    e       r       m       0.35    1.0     0.0     0.0
drfr    e       r       m       2.2     1.0     0.0     0.0
drfs    e       s       m       1.0     1.0     0.0     0.0
dsfs    e       s       -       5.6E-4  tmd     0.0     0.0
dstg    e       g       im      2.5E-7  tmd*tvd 0.0     0.0
w_12    n       n       -       1.0     sin(inc)        0.0     0.0
w_34    n       n       -       1.0     sqrt(1-(w_12)^2)        0.0     0.0
xym1    i       s       d       0.1     w_12    0.0     0.0
xym2    l       s       d       0.1     w_12    0.0     0.0
xym3    i       r       d       0.3     cos(azi)*w_34   0.0     0.0
xym3    l       r       d       0.3     -sin(azi)*w_34  0.0     0.0
xym4    i       r       d       0.3     sin(azi)*w_34   0.0     0.0
xym4    l       r       d       0.3     cos(azi)*w_34   0.0     0.0
sag     i       s       d       0.2     (sin(inc))^0.25 0.0     0.0
decg    a       g       d       0.36    1.0     0.0     0.0
decr    a       r       d       0.1     1.0     0.0     0.0
dbhg    a       g       dnt     5000.0  1.0/(mtot*cos(dip))     0.0     0.0
dbhr    a       r       dnt     3000.0  1.0/(mtot*cos(dip))     0.0     0.0
amil    a       s       nt      220.0   sin(inc)*sin(azm)/(mtot*cos(dip))       0.0     0.0
abxy_ti1        i       s       -       0.0040  (-cos(inc))/gtot        0.0     0.0
abxy_ti1        a       s       -       0.0040  (tan(dip)*cos(inc)*sin(azm))/gtot       0.0     0.0
abxy_ti2        l       s       -       0.0040  (cos(inc)-tan(dip)*cos(azm)*sin(inc))/gtot      0.0     0.0
abz     i       s       -       0.0040  (-sin(inc))/gtot        0.0     0.0
abz     a       s       -       0.0040  (tan(dip)*sin(inc)*sin(azm))/gtot       0.0     0.0
asxy_ti1        i       s       -       5.0E-4  (sin(inc)*cos(inc))/(2^0.5)     0.0     0.0
asxy_ti1        a       s       -       5.0E-4  (-(tan(dip)*sin(inc)*cos(inc)*sin(azm)))/(2^0.5)       0.0     0.0
asxy_ti2        i       s       -       5.0E-4  (sin(inc)*cos(inc))/2   0.0     0.0
asxy_ti2        a       s       -       5.0E-4  (-(tan(dip)*sin(inc)*cos(inc)*sin(azm)))/2      0.0     0.0
asxy_ti3        a       s       -       5.0E-4  (tan(dip)*sin(inc)*cos(azm)-cos(inc))/2 0.0     0.0
asz     i       s       -       5.0E-4  (-sin(inc)*cos(inc))    0.0     0.0
asz     a       s       -       5.0E-4  (tan(dip)*sin(inc)*cos(inc)*sin(azm))   0.0     0.0
mbxy_ti1        a       s       nt      70.0    (-(cos(inc)*sin(azm)))/(mtot*cos(dip))  0.0     0.0
mbxy_ti2        a       s       nt      70.0    (cos(azm))/(mtot*cos(dip))      0.0     0.0
mbz     a       s       nt      70.0    (-sin(inc)*sin(azm))/(mtot*cos(dip))     0.0     0.0
msxy_ti1        a       s       -       0.0016  (sin(inc)*sin(azm)*(tan(dip)*cos(inc)+sin(inc)*cos(azm)))/(2^0.5)      0.0     0.0
msxy_ti2        a       s       -       0.0016  (sin(azm)*(tan(dip)*sin(inc)*cos(inc)-(cos(inc))^2*cos(azm)-cos(azm)))/2      0.0     0.0
msxy_ti3        a       s       -       0.0016  (cos(inc)*(cos(azm))^2-cos(inc)*(sin(azm))^2-tan(dip)*sin(inc)*cos(azm))/2    0.0     0.0
msz     a       s       -       0.0016  (-(sin(inc)*cos(azm)+tan(dip)*cos(inc))*sin(inc)*sin(azm))      0.0     0.0
mdfac   n       n       -       1.0     1.0+(smd-tho)/(smd+tho) 0.0     0.0
tho     n       n       -       1.0     smd     0.0     0.0
tort    n       n       -       1.8E-4  1.0     0.0     0.0
xcli    i       r       -       0.167   mdfac*swon(abs(din)-tort*smd)*abs(din)+swoff(abs(din)-tort*smd)*tort*smd       0.0     0.0
xcla    l       r       -       0.167   mdfac*swon(abs(daz)*sin(inc)-tort*smd)*abs(daz)*sin(inc)+swoff(abs(daz)*sin(inc)-tort*smd)*tort*smd     0.0     0.0
```

DUMMY SURVEY V. PROJECTION

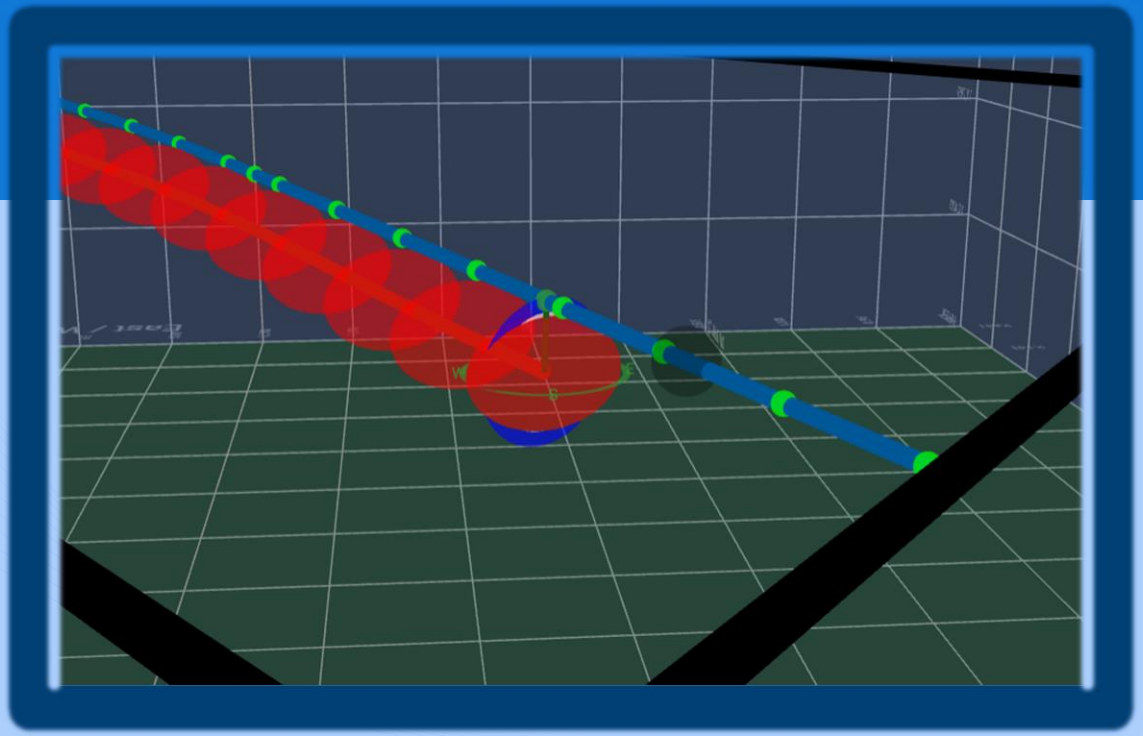
- XCL terms penalize survey intervals with a long course length
- If a DD uses the projection tools then this is not a problem
- DD's rarely use the projection tools….

CHALLENGE

Directional Drillers in the field commonly input dummy surveys 1,000 ft ahead, which provides misleading anti-collision results as they are penalized for the long course length of the projection

CASE STUDY – Misunderstanding XCL Terms' Effects on Anti-Collision Projections

```
xcli    i       r       -       0.167   mdfac*swon(abs(din)-tort*smd)*abs(din)+swoff(abs(din)-tort*smd)*tort*smd          0.0     0.0
xcla    l       r       -       0.167   mdfac*swon(abs(daz)*sin(inc)-tort*smd)*abs(daz)*sin(inc)+swoff(abs(daz)*sin(inc)-tort*smd)*tort*smd     0.0     0.0
```



Project Overview

A large number of support cases reporting that AC was failing for the DD's in the field but not for the Well planners. Cause was unknown as well planners were projecting ahead using the projection tools – DD's were not.

Singular error terms

dstg	e	g	lm	2.5e-007	tmd-tvd
w_12	n	n	-	1	sin(inc)
w_34	n	n	-	1	sqrt(1-(w_12)^2)
xym1	i	s	d	0.1	w_12
xym2	l	s	d	0.1	w_12
xym3	i	s	d	0.1	cos(azi)*w_34
xym3	l	s	d	0.1	-sin(azi)*w_34
xym4	i	s	d	0.1	sin(azi)*w_34
xym4	l	s	d	0.1	cos(azi)*w_34
sag	i	s	d	0.08	(sin(inc))
decg	a	g	d	0.15	1.0

PROBLEM

- Singular error terms are well defined in the error model
- Identification of the singular terms requires a name lookup
- Encountered a large number of error models from customers with incorrectly named terms e.g. xymer3, mxyr3e, xyr3

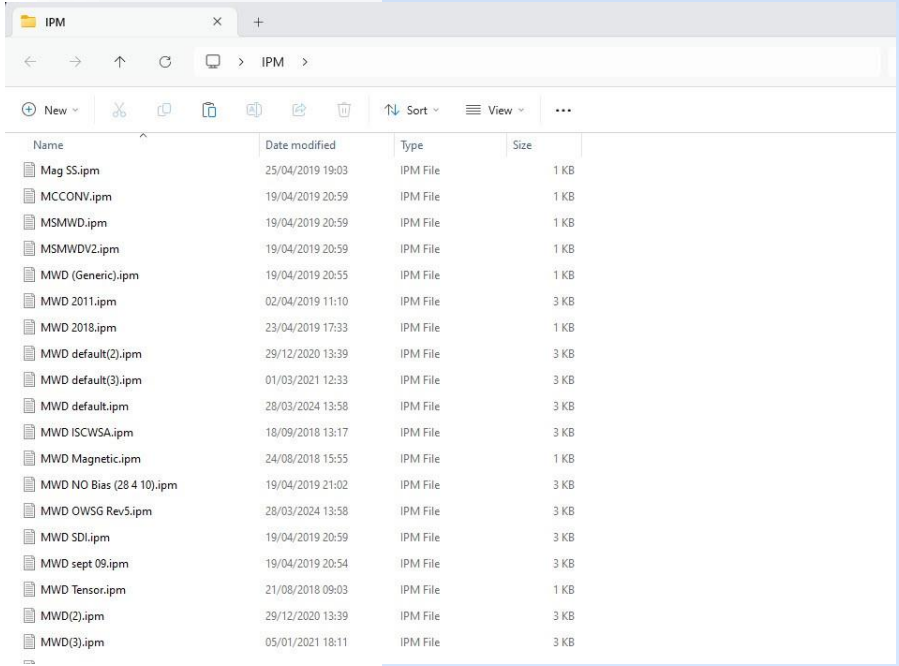
CHALLENGE

Directional service companies treat the PUM as a black box, well planners will import and use without doing any kind of validation of the terms. This causes unrealistic AC results especially for well plans

TOPIC

Naming Conventions of PUM Files

No standardized naming convention for Positional Uncertainty Model (PUM) files.



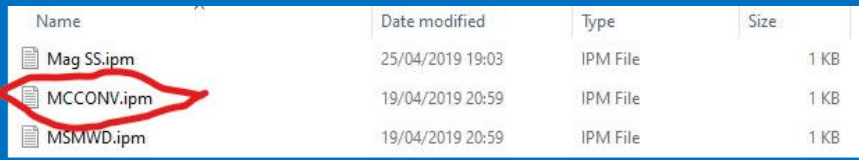
LACK OF STANDARDIZATION

Similarly named files can contain different error terms and weighting functions.

CHALLENGE

This complicates the process of selecting the correct PUM for the application, and even potentially leads to the use incorrect models.

CASE STUDY – Naming Conventions of PUM Files



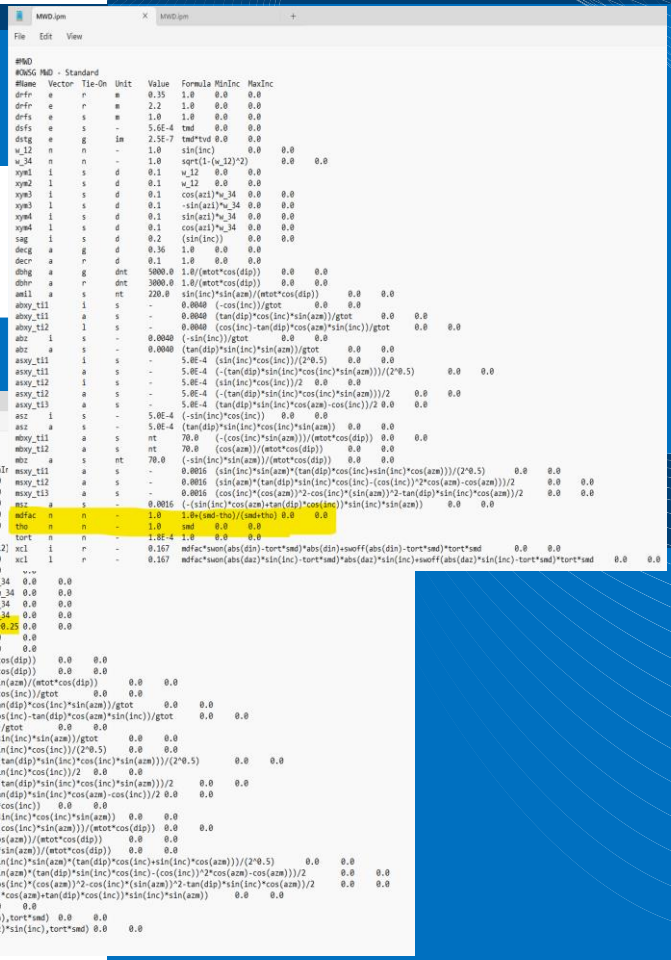
Name	Date modified	Type	Size
Mag SS.ipm	25/04/2019 19:03	IPM File	1 KB
MCCONV.ipm	19/04/2019 20:59	IPM File	1 KB
MSMWD.ipm	19/04/2019 20:59	IPM File	1 KB

PROBLEM

- Often hear DD imported a well from another software and AC results are inconsistent when both software compared.
- On examination PUM file in both Software A & B, has same name but different contents. This is the cause of the inconsistency in AC results.

CHALLENGE

When importing export file from "Software B" to "Software A" duplicate PUM file names are not copied over. Unless a standardized naming convention is used and each different PUM has a unique name this issue will occur.



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Open Discussion

- Observations?
- Ideas?
- Interest to present in the next meeting?

Thank you ☺