



Collision Avoidance Subcommittee Update

Darren Aklestad
6 Oct 2022



Change of Chair

- Darren Aklestad
 - Attending most ISCWSA meetings since 2000
 - Member of Error Model Maintenance and Collision Avoidance subcommittees since inception (2004/2006)
 - Primary contact for error modelling ,anti-collision survey processing related software algorithms within Schlumberger (31yrs)
- THANK YOU!
 - Harry Wilson, Steve Sawaryn, Gary Skinner



CA Subcommittee Agenda 5th Oct 2022 (26 attendees + 2 online)

- Review Past 3 meeting (53-55) action item review – determine status
- Pete Clark: Comparison of SPE ACR implementations between software systems / Relationship between separation rule and dispensation rule
- Jerry Codling: Report on sidetrack CA handling implementation / Lateral Surface Error
- Working Meeting (back to our roots)
 - Pete Clark: Furtherance of anti-collision reporting standardization
 - Jerry Codling: Begin creation of addendum guidance notes on ACR usage



Action Item Review (Keepers)

- Update document bibliography – Bill Allen follow up to finalize
- Standardize nomenclature/lexicons across subcommittees
- Website document Update (always)
- CA Reporting Nomenclature Standardization
- Inferred Wellbore Position – sub-subcommittee
- Full acceptance of Sidetrack WG Recommendations paper (approved in EMM)



Action Item Review (Parked)

- Collision root cause analysis / human factors analysis
- CA Management Presentation Slide Pack
- Modification of Pa (Project Ahead) Anti-Collision rule term → new action
- Modification of Sm (Surface Margin)) Anti-Collision rule term → new action

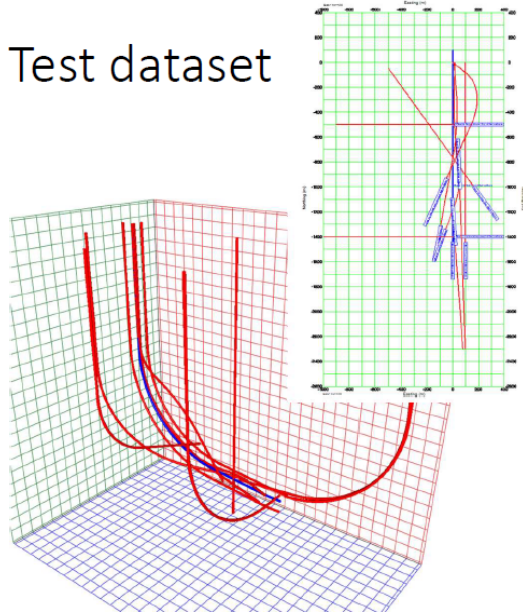


Action Item Review (New)

- Create addendum guidance notes document for ACR
- Document/guidance note on ACR adoption methodology / lessons learned
 - SPE Paper?

Pete Clark - Comparison of SPE ACR implementations between software systems

Test dataset



Wellpath name	Relationship to Reference Wellpath
Reference	Reference wellpath. 2DJ to 85 deg inc, due south, then horizontal
Offset 01: East 100	Parallel to reference, offset 100m to the east
Offset 02: North 100	Parallel to reference, offset 100m to the north
Offset 03: East 10	Close top hole, then crossing reference at shallow incident angle
Offset 04: East 20	Close top hole, approaching then diverging at shallow angle
Offset 05: Angular	Approaching at depth at an acute angle
Offset 06: Overlap opposite	Approaching at 180deg relative azimuth and overlapping
Offset 07: Short opposite	Approaching at 180deg relative azimuth and stopping short
Offset 08: Perpendicular	Approaching at 90deg relative azimuth
Offset 09: Vertical	Vertical well intersecting 85 deg inc. tangent
Offset 10: Sidetrack from MD 900m on reference	Sidetrack that diverges from then approaches the reference well
Offset 11: Horizontal approach	Approaching on horizontal plane at 90deg relative azimuth



Pete Clark - Comparison of SPE ACR implementations between software systems

Summary

- Comparison of calculations for ISCWSA CA dataset with two directional software applications
- Compare center to center distance (C-C) and separation factor (SF)
- Calculate difference between application & ISCWSA CA dataset for C-C & SF
- Plot values & differences along wellpath length



Pete Clark - Comparison of SPE ACR implementations between software systems

Conclusions

- Both fit for use for wellbore proximity calculations with SPE WP TS Separation Rule

however

- Different SF values compared to ISCWSA CA dataset for sidetrack wells
 - Ongoing review at ISCWSA
- Missing acceptance tolerance for minor calculation variation
 - Suggest
 - C-C within 5%
 - SF < 5% over ISCWSA published results

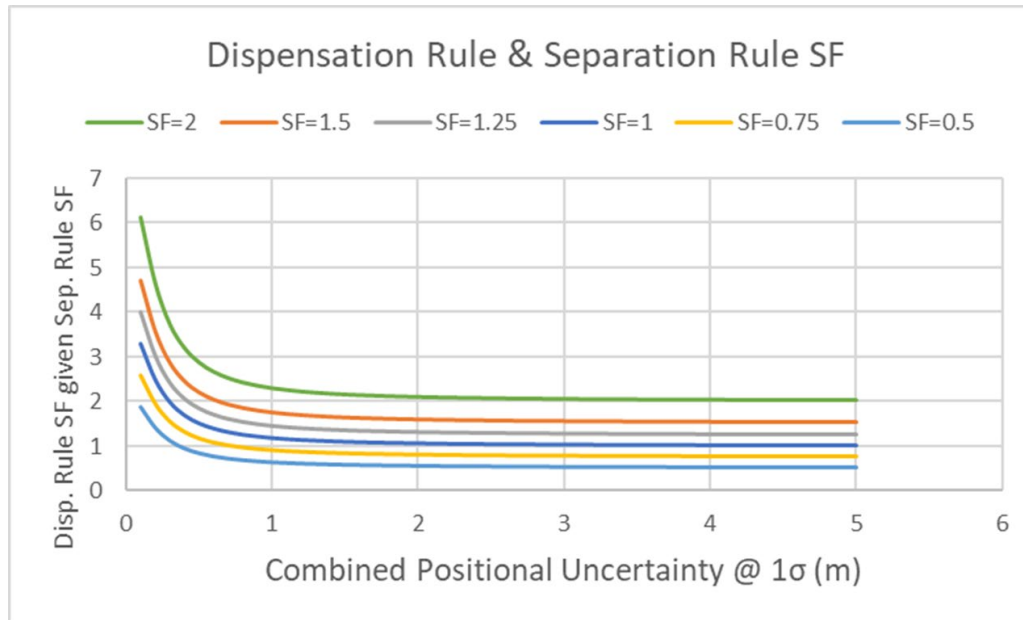


Pete Clark - Comparison of SPE ACR implementations between software systems

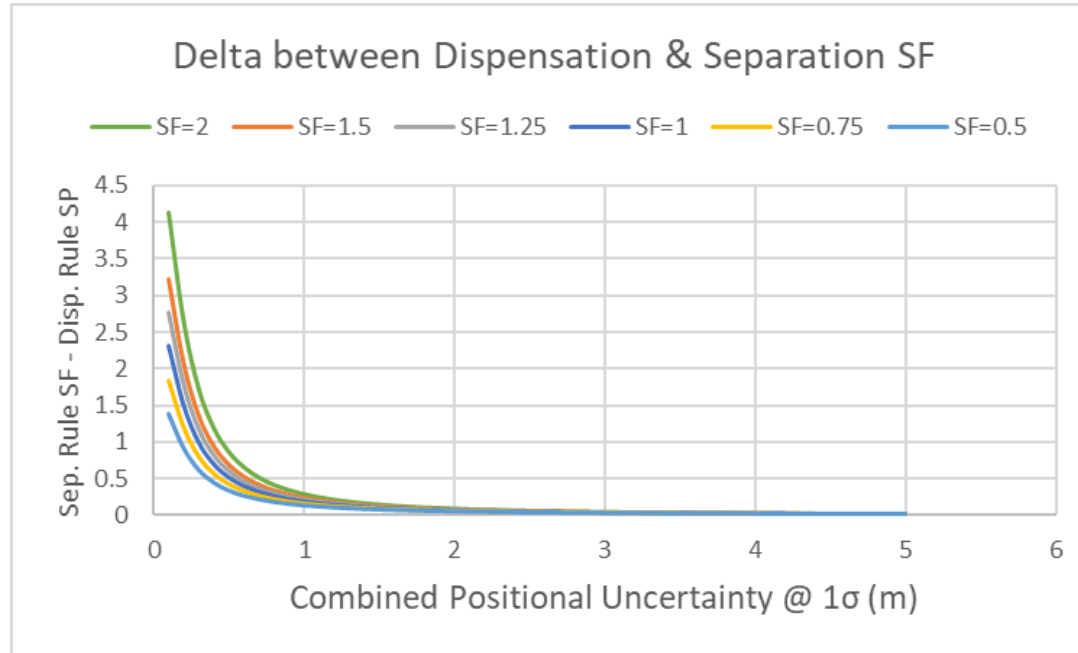
- Good overall agreement 10 profiles
- Divergence on sidetrack profile #10
- Not all software – have implemented Sidetrack handling methodology
- There are specified recommended tolerance limits documented.
- Diagnostic files need some updating



Pete Clark - Relationship Between Separation Rule and Dispensation Rule SF



Pete Clark - Relationship Between Separation Rule and Dispensation Rule SF





Pete Clark - Relationship Between Separation Rule and Dispensation Rule SF

- Conclusion:
Once combined positional uncertainty is $\sim 15\text{ft}$ (3.5σ) or larger difference in Dispensation Rule SF and Separation Rule SF is minimal

Jerry Codling - Report on sidetrack CA handling implementation

Anticollision Error Handling for Sidetrack Comparisons

Problem

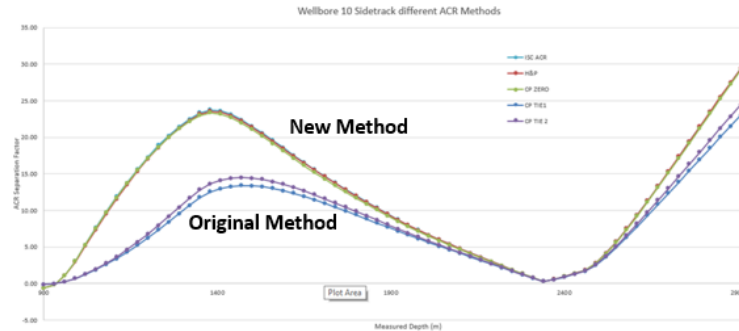
- The methods for calculating relative error for anti-collision with sidetrack legs are not standard.

Solution:

- Change in calculation of relative error from sidetrack depth
- ISCWSA recommended practice

Reason

- Standardization



ISCWSA Test Wellbore 10

- Method, starts error computation from sidetrack depth
- In many reported cases the SF & MSD is smaller (worse) after change.



Jerry Codling - Report on sidetrack CA handling implementation

Sidetrack Handling – current status

- As yet – unfinished or not approved, no implementation yet
- Goal is to have different software generating the same results
- Harry Wilson document from 28th Sept 2021
 - Handling relative errors (Well and global)
 - ACR Rule close to sidetrack depth
- Problems (for me)
 - Handling relative error when one leg has continuous gyro, work in progress
 - Need to have more than one test case and also include the gyro example



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CA Reporting Nomenclature Standardization – WORK

(robust discussion)

- Finalized adoption of 12 mandatory anti-collision reporting columns
- Finalized “exact” preferred naming of columns with a short version
- “Reference” & “Offset” are de facto standards (NOT in agreement with intercept subcommittee)



CA Reporting Nomenclature Standardization – WORK

(robust discussion)

#	Column	Name	Short Name
1	Reference Well Measured Depth	Reference MD	Ref MD
2	Reference Well True Vertical Depth	Reference TVD	Ref TVD
3	Offset Well Measured Depth	Offset MD	Off MD
4	Offset Well True Vertical Depth	Offset TVD	Off TVD
5	Centerline to Centerline Wellbore Proximity	Ct-to-Ct Distance	C-C
6	Minimum Acceptable Separation Distance required to satisfy Collision Avoidance Rule	Minimum Allowable Separation Distance	MASD
7	Separation Factor	Separation Factor	SF
8	Travelling Cylinder North Azimuth	Travelling Cylinder North Azimuth	TC Azi
9	Normal Plane Distance	Normal Plane Distance	TC Dist
10	Distance allowed off of reference to remain in compliance with rule	Allowable Deviation From Reference	ADR
11	Angle between direction of Reference to Offset - indicated in front or behind	Incidence Angle	Ang
12	Rule Status (Pass / Fail)		Status
13	Collision Avoidance Action Criteria	Collision Avoidance Action	Action



Create addendum guidance notes document for ACR

- Jerry Codling gathered information individually from people on current surface margin and project ahead usages within organizations



SPE ACR Adoption Status

- 25 Attendees – 8 Yes (6 orgs)
 - Chevron
 - Baker-Hughes
 - Schlumberger (DrillPlan)
 - Dynamic Graphics (WellArchitect)
 - Halliburton/Landmark (Compass)
 - H&P (DrillScan)



Collision-Avoidance Rev5 correlations usage

- Not fully implemented by all software vendors yet
 - Have not seen usage where it has been implemented
 - Wariness of users.....black box.... don't understand what it is
- Need full update of calculation diagnostics from subcommittee
 - Working with Error Model Maintenance subcommittee



Actions for Keepers / New

- Update document bibliography – Bill Allen to follow up with Ty
- Standardize nomenclature/lexicons across subcommittees – subcommittee chairs or designees
- Website document Update – Darren Aklestad help from Andy McGregor & Phil Harbidge
- CA Reporting Nomenclature Standardization - Pete Clark lead
- Inferred Wellbore Position sub-subcommittee - Pete Clark lead
- Create addendum guidance notes document for ACR – Jerry Codling lead



On-going Actions

- Updating benchmark diagnostic files (Darren Aklestad / Andy McGregor / Jerry Codling)
- Cleanup/Add reference documents on website (Darren Aklestad)
- Work with EMM on memo for handling of structure/slot surface uncertainty (Jerry Codling / Darren Aklestad)



Thank You – Questions?