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MENAPS 2016

Middle East and North Africa Perforating Symposium

MUSCAT, OMAN

RAPID RESPONSE PERFORATING TESTING PROVIDES SOLUTIONS FOR CHALLENGING MULTI STRING APPLICATIONS

MENAPS 2016-02

GEODynamics®
Engineered Perforating Solutions

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INTRODUCTION

Powerful Problems require Powerful Solutions:

Perforating Technology Providers and
Technical Service Providers
combine for Success in Challenging Applications

- The Problem
- The Options
- The Work
- The Result

THE PROBLEM: MULTI STRING P&A APPLICATION

2-7/8” Guns Preferred
3-3/8” Guns if Necessary

String	Size	Weight	Grade
Tubing	4-1/2	12.75	K55
Casing 1	9-5/8	40	K55
Casing 2	13-3/8	54.5	NT55
Casing 3	20	133	J55

THE PROBLEM: MULTI STRING P&A APPLICATION

18 hours !!

2-7/8” Guns Preferred
3-3/8” Guns if Necessary
In Country Tools

String	Size	Weight	Grade
Tubing	4-1/2	12.75	K55
Casing 1	9-5/8	40	K55
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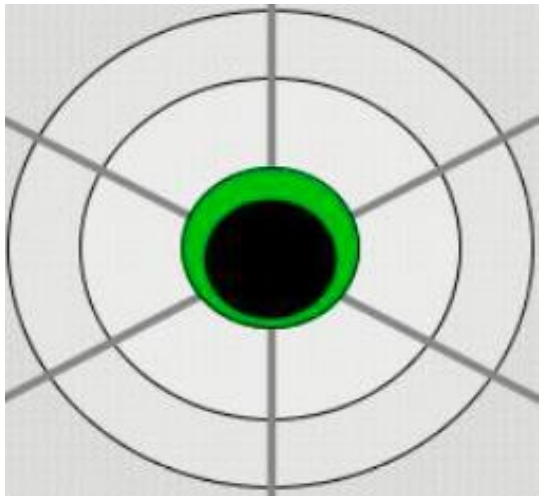
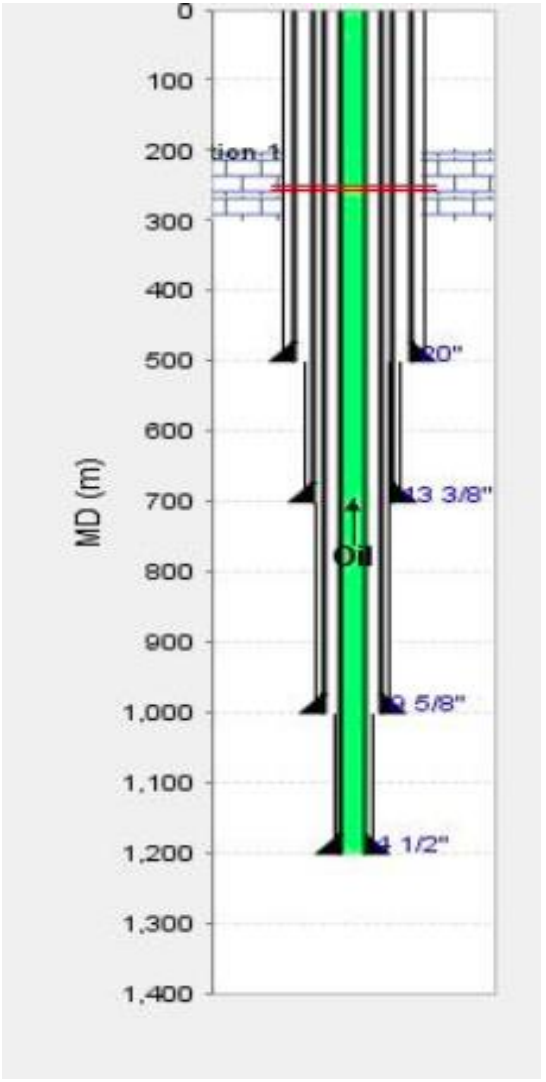
Casing 3	20	133	J55

THE OPTIONS

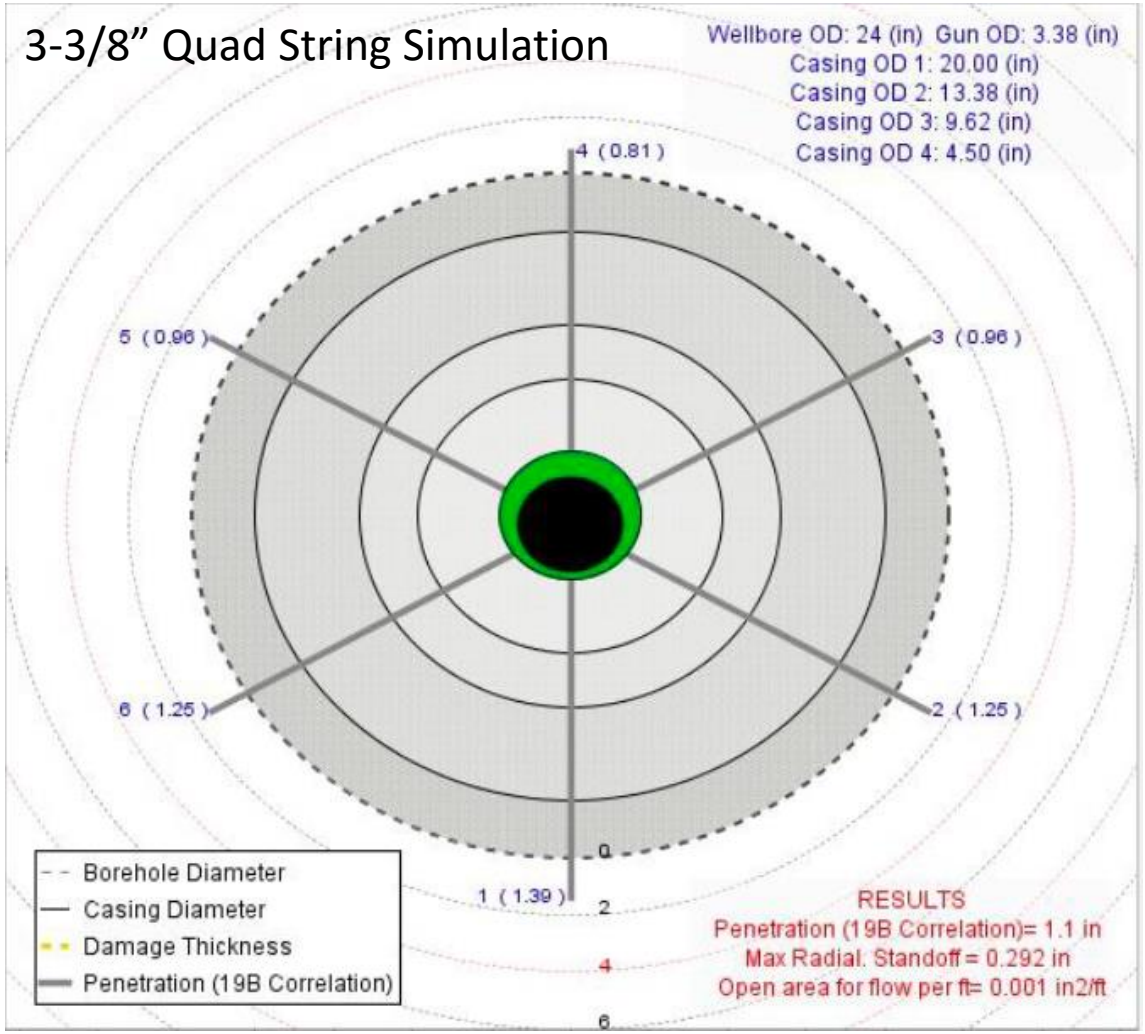
- Perforation Simulation Software
  - Simulation can provide a quick indication of performance
- Technical Experience
- Lab Tests in Coupons
  - For a more confident result and to validate a higher risk solution
- In Country Tools



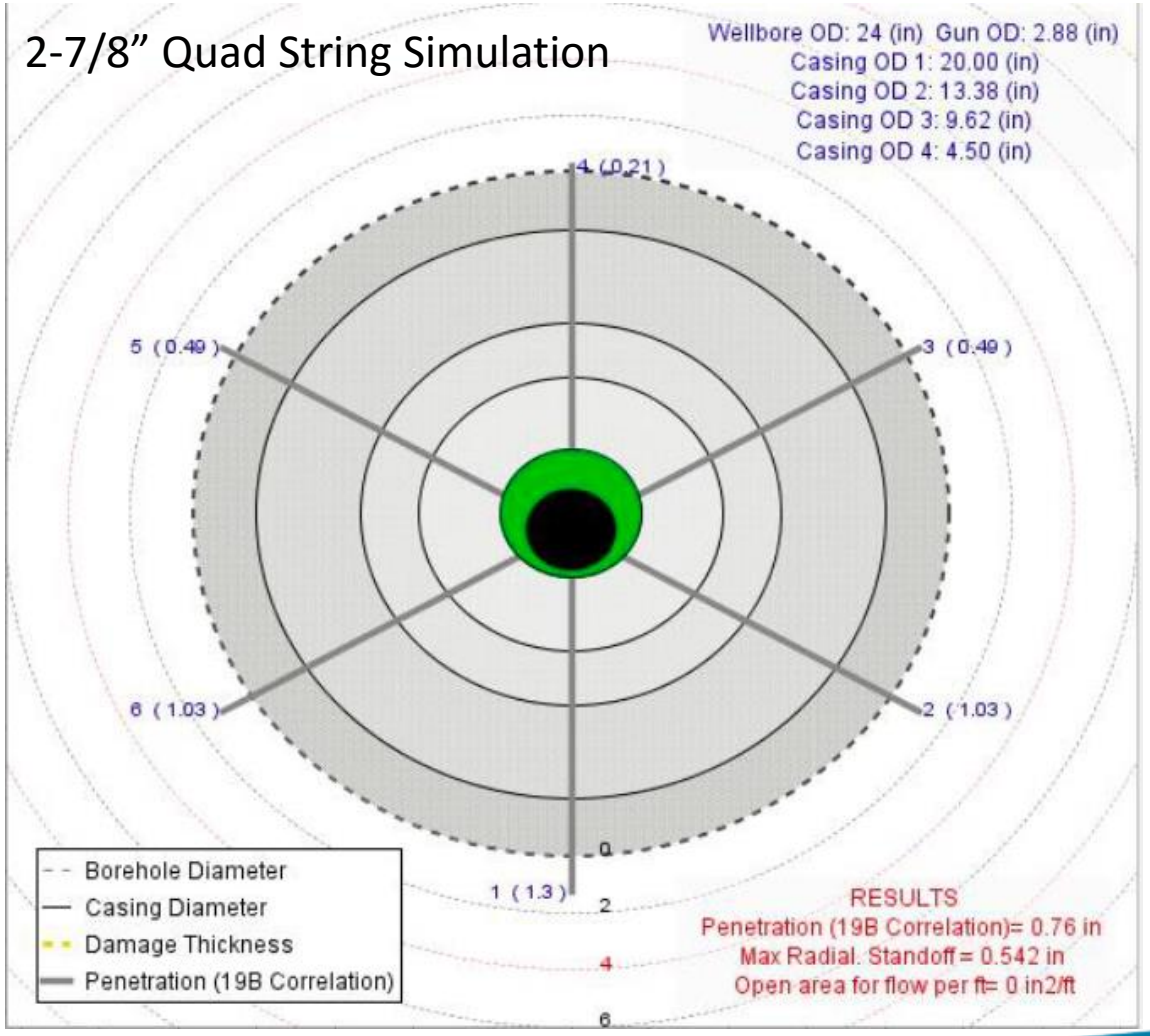


SIMULATIONS IN MULTI STRING

3-3/8” Quad String Simulation



2-7/8” Quad String Simulation



SIMULATIONS IN MULTI STRING

Results: Communication is doubtful

Phasing	Penetration (19B Correlation) (in)	EHD 1 (in)	EHD 2 (in)	EHD 3 (in)	EHD 4 (in)
1	1.39	0.68	0.48	0.19	0.02
2	1.25	0.57	0.41	0.17	0.02
3	0.96	0.35	0.26	0.1	0.01
4	0.81	0.23	0.16	0.06	0.01
5	0.96	0.35	0.26	0.1	0.01
6	1.25	0.57	0.41	0.17	0.02
Average	1.1	0.458	0.33	0.133	0.013

3-3/8” Quad String Simulation

Phasing	Penetration (19B Correlation) (in)	EHD 1 (in)	EHD 2 (in)	EHD 3 (in)	EHD 4 (in)
1	1.3	0.52	0.36	0.14	0.01
2	1.03	0.44	0.31	0.13	0.01
3	0.49	0.27	0.2	0.08	0.01
4	0.21	0.17	0.12	0.05	0.01
5	0.49	0.27	0.2	0.08	0.01
6	1.03	0.44	0.31	0.13	0.01
Average	0.76	0.349	0.25	0.101	0.01

2-7/8” Quad String Simulation

SIMULATIONS AND MULTI STRING APPLICATIONS

- Hole Size and Penetration results are typically extrapolations from a single data point from an API 19B style test
- Other methods are being applied:
  - Incorporation of new Section 2 type base data
  - Incorporation of Porosity based penetration models
  - Incorporation of Parametric Water Gap base Data
  - Incorporation of predictive curve fit from API 19B Section 1 Data

- NONE OF THESE ADEQUATELY INCORPORATE THE EFFECT OF CHARGE DESIGN IN THE MANY POSSIBLE MULTI STRING SCENARIOS.

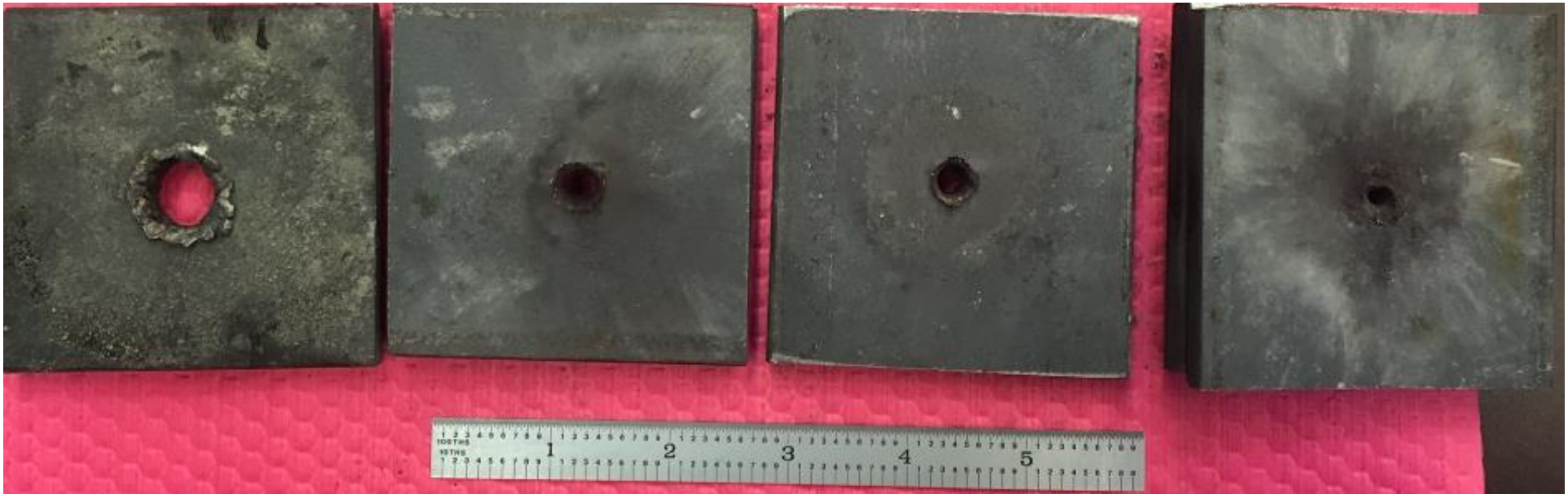
- EXPERIENCE MUST BE APPLIED, AND THE BEST SIMULATION MODELS WILL BE CONSERVATIVE – IE PREDICT FAILURE WHEN THERE IS DOUBT

25G CHARGE IN 3-3/8” GUN TEST RESULTS

MIMIMUM HOLE 0.17”

PENETRATION 12+”

16 HOURS REMIAN



FEEDBACK FROM CLIENT

- THERE IS CURRENTLY AN OBSTRUCTION IN THE WELL, AND A LOWER DIAMETER SOLUTION IS NEEDED!

- ADDITIONAL TESTS WITH 23G CHARGE (LOWER SWELL) AND 2-7/8” GUN SYSTEM ARE PLACED IN THE TESTING QUEUE

23G CHARGE IN 3-3/8” GUN TEST RESULTS

MIMIMUM HOLE 0.17”

PENETRATION 6+”

13 HOURS REMAIN

15G CHARGE IN 2-7/8” GUN TEST RESULTS

MIMIMUM HOLE 0.12”

PENETRATION 2.5+”

13 HOURS REMAIN

SUMMARY OF GUN TEST RESULTS

8 HOURS REMAIN

String	Size	Weight	Grade	3-3/8"	2-7/8"
Tubing	4-1/2	12.75	K55	0.44	0.37
Casing 1	9-5/8	40	K55	0.27	0.23
Casing 2	13-3/8	54.5	NT55	0.2	0.19
Casing 3	20	133	J55	0.17	0.12

THE RESULT

- SOLUTIONS WERE DEPLOYED TO FIELD
- WELL RESULT WAS POSITIVE
- DATA WAS GENERATED FOR SUBSEQUENT WELLS
- FAST RESPONSE ENSURED CORRECT SOLUTION WAS DEPLOYED WITHOUT ADDITIONAL EXPENSE
- TEAMWORK BETWEEN TESTING AND SERVICE COMPANIES ENABLED SUCCESS
- SIMULATION RESULTS USED IN CONJUNCTION WITH RAPID LABORATORY TESTING IS A POWERFUL TOOL FOR SUCCESS

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QUESTIONS?
THANK YOU!