

YOU CANNOT MANAGE WHAT DO NOT MEASURE

Danny Crumpton
INROCK

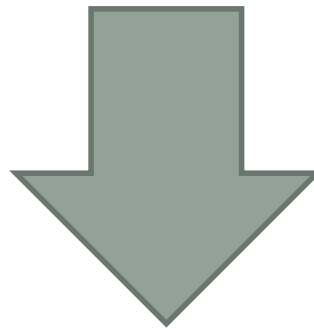


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Electronic Data Recorder (EDR)

An interconnected system of software and hardware that collects, stores and presents HDD drilling data; allowing the users to monitor and manage rig operations



Improve drilling performance and increase profitability



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Why us an EDR?

Monitor
projects in
real time

Analyze and
improve
performance

EDR

Create
independent
record of
project

Easy &
economical
to deploy

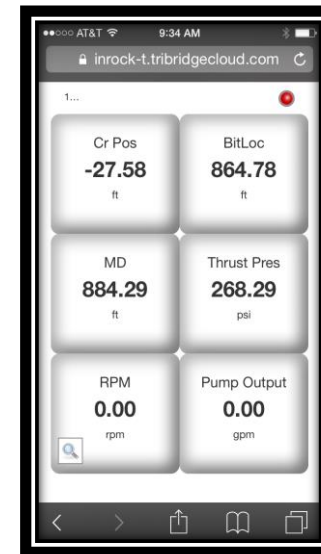
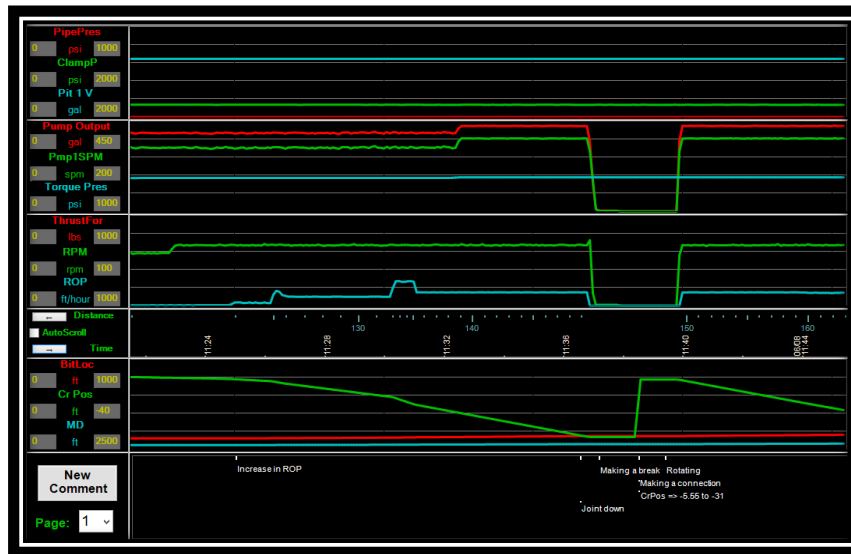


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Monitor projects in real time

- Real-time analysis of HDD projects
- Ensure compliance with key parameters (pressure)
- Monitor multiple projects simultaneously
- Reduce time to receive information
- Reduce administrative requirement of reporting

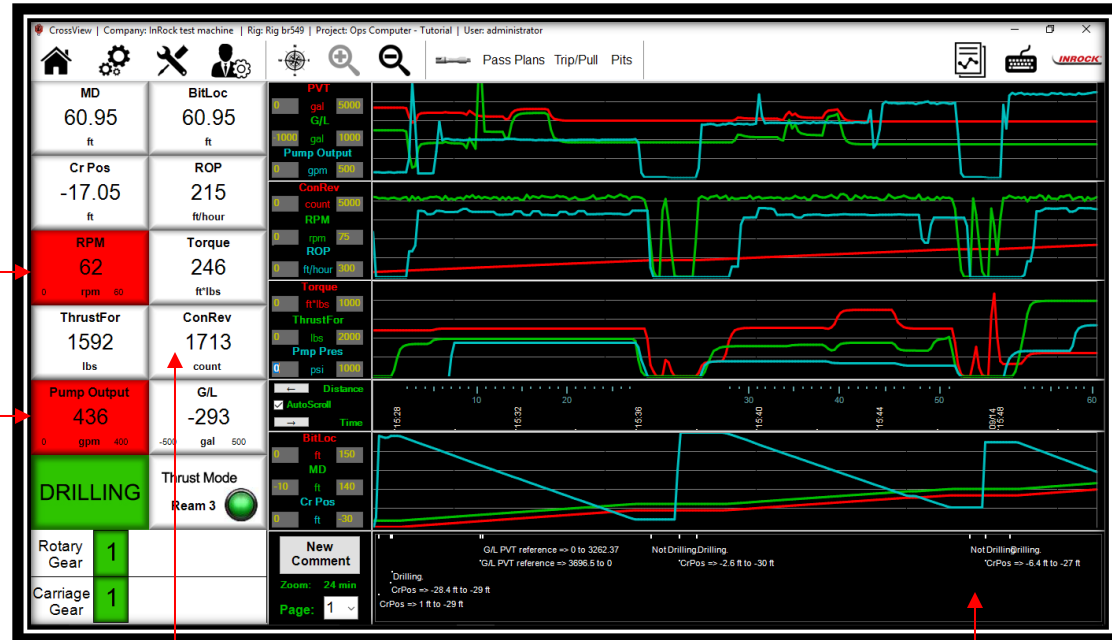


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Analyze and improve performance

- Visualize trends in data and react
- Analyze operations for improvements
- Identify potential problem areas
- Compare drilling passes
- Track tooling life and performance
- Evaluate actual performance versus plan



Alarms notify users when parameter high/low values exceeded

Assists operator in tracking tool life

Comments allow operator to add context to data

Analyze and improve performance (cont'd)

CrossView | Report Viewer

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Find | Next

Daily Summary Report

Contractor	
Project Name	
Location	
State/Province	
Operator	
Job Number	2

8/8/2016	Daily Totals
	Total
Drilling Hours	01:15:54
Total Hours	11:19:06
MD Total	253.11 ft
ROP Avg	200 ft/hour
Total Days	1
Torque Avg.	3296 ft*lbs
Torque Max	4131 ft*lbs
PumpOutput Avg.	284 gpm
Pump PSI Avg.	156 psi
Pull Force Avg.	2238 lbs
Pull Force Max	30429 lbs
Thrust Force Avg.	3756 lbs
Thrust Force Max	30429 lbs

09/12/2016	Pass 1 Totals
	Total
Drilling Hours	21:25:12
Total Hours	179:17:36
MD Total	6948.03 ft
ROP Avg	324 ft/hour
Total Days	21
Torque Avg.	3207 ft*lbs
Torque Max	26491 ft*lbs
PumpOutput Avg.	339 gpm
Pump PSI Avg.	187 psi
Pull Force Avg.	5433 lbs
Pull Force Max	81014 lbs
Thrust Force Avg.	9229 lbs
Thrust Force Max	89220 lbs

INROCK®
CROSSVIEW
ELECTRONIC DATA RECORDER SYSTEM

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Why is drilling time so low as % of total hours?

Why is ROP today lower than the pass average?

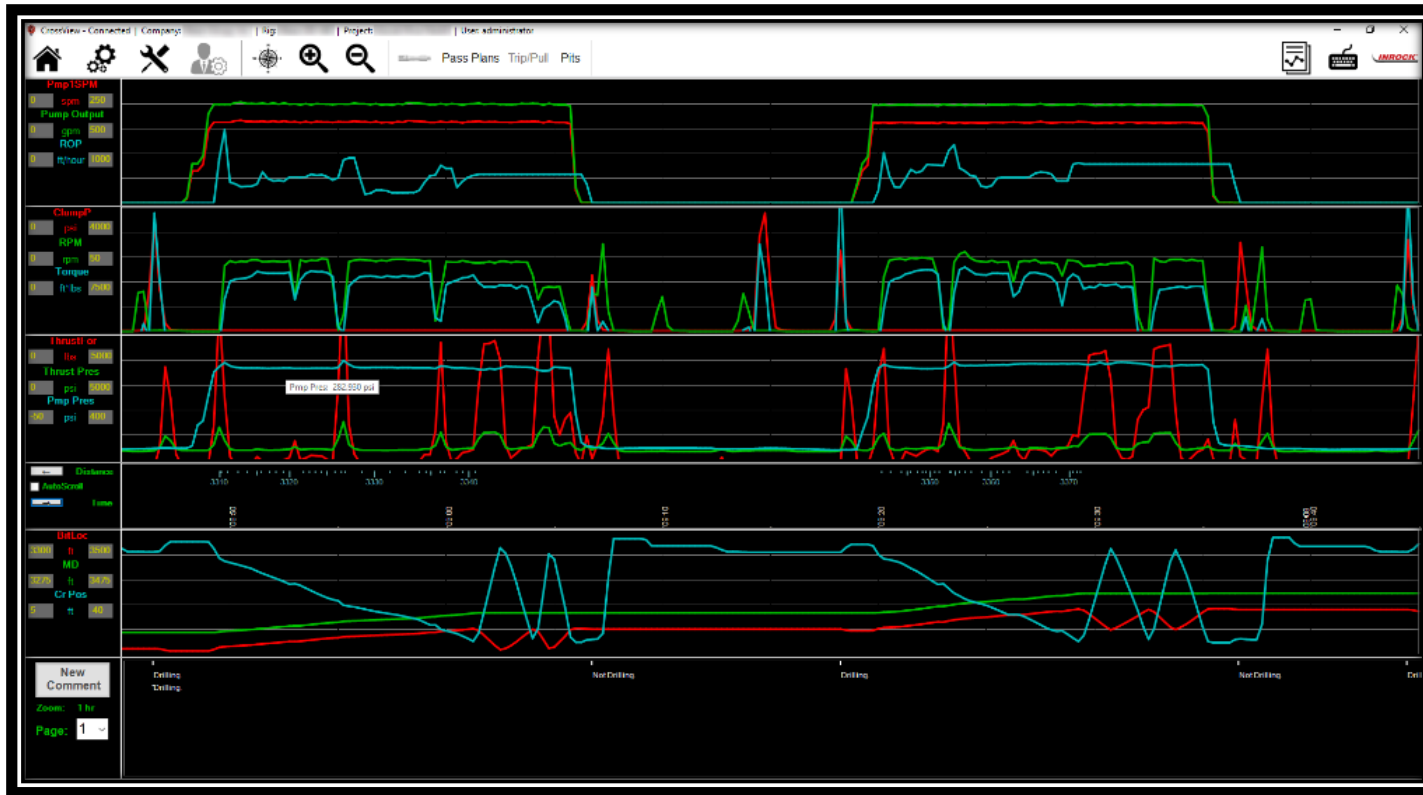
Am I pumping enough?



Is present with us for The Utility Infrastructure Industry

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Analyze and improve performance (cont'd)



What is driving torque spikes?

Why is my ROP declining?

Should I be concerned about pressure levels?



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Create independent record of project

- Create detailed record of project
 - Independent data source
- Useful in dispute resolution
 - Pull product report
- Reduce reliance on paper records

CrossView | Report Viewer

Pull Product Report
09/12/2016

Start Date: 08/25/2016
Duration: 00:05

Contractor
Project Name
Location
State/Province
Operator
Job Number

Joint #	Joint Length	Time Start	Time End	Time	Bit Depth	Torque	Pull Force	Thrust Force	RPM	Pump Output	Total Strokes
0	30.76 ft	17:35:14	17:39:03	00:03:49	30.76 ft	6268.81 ft*lbs	127043.05 lbs	127043.05 lbs	116	0.00 gal	
1	31.08 ft	17:28:17	17:35:14	00:06:57	61.84 ft	7306.34 ft*lbs	118446.68 lbs	118446.68 lbs	154	0.00 gal	
2	31.21 ft	17:23:16	17:28:17	00:05:01	93.05 ft	7258.98 ft*lbs	115041.86 lbs	115041.86 lbs	118	0.00 gal	
3	31.34 ft	17:10:37	17:23:16	00:12:39	124.39 ft	6553.10 ft*lbs	114929.36 lbs	114929.36 lbs	116	0.00 gal	
4	32.00 ft	17:01:45	17:10:37	00:08:52	156.39 ft	7737.24 ft*lbs	119569.56 lbs	119569.56 lbs	116	0.00 gal	
5	31.81 ft	16:57:16	17:01:45	00:04:29	188.20 ft	8723.61 ft*lbs	122904.22 lbs	122904.22 lbs	119	0.00 gal	
6	31.79 ft	16:52:28	16:57:16	00:04:48	219.99 ft	14215.74 ft*lbs	117796.63 lbs	117796.63 lbs	135	0.00 gal	
7	31.32 ft	16:48:35	16:52:28	00:03:53	251.31 ft	13121.08 ft*lbs	109791.14 lbs	109791.14 lbs	145	0.00 gal	
8	31.74 ft	16:44:39	16:48:35	00:03:56	283.05 ft	9142.69 ft*lbs	116084.77 lbs	116084.77 lbs	159	0.00 gal	
9	31.74 ft	16:40:33	16:44:39	00:04:06	314.79 ft	9284.75 ft*lbs	117813.35 lbs	117813.35 lbs	114	0.00 gal	
10	31.94 ft	16:29:19	16:40:33	00:11:14	346.73 ft	9760.83 ft*lbs	118215.12 lbs	118215.12 lbs	152	0.00 gal	
11	31.52 ft	16:24:45	16:29:19	00:04:34	378.25 ft	9890.82 ft*lbs	189703.09 lbs	189703.09 lbs	143	0.00 gal	
12	29.61 ft	16:20:29	16:24:45	00:04:16	407.86 ft	10824.11 ft*lbs	117137.32 lbs	117137.32 lbs	137	0.00 gal	
13	31.90 ft	16:16:03	16:20:29	00:04:26	439.76 ft	8775.64 ft*lbs	114181.52 lbs	114181.52 lbs	116	0.00 gal	
14	29.48 ft	16:07:08	16:16:03	00:08:55	469.24 ft	7158.27 ft*lbs	112184.67 lbs	112184.67 lbs	116	0.00 gal	
15	30.62 ft	15:57:16	16:07:08	00:09:52	499.86 ft	6548.29 ft*lbs	115107.84 lbs	115107.84 lbs	119	0.00 gal	
16	31.49 ft	15:47:32	15:57:16	00:09:44	531.35 ft	5627.80 ft*lbs	174977.85 lbs	174977.85 lbs	118	0.00 gal	
17	29.87 ft	15:43:05	15:47:32	00:04:27	561.22 ft	6590.96 ft*lbs	111727.83 lbs	111727.83 lbs	141	0.00 gal	
18	31.38 ft	15:31:35	15:43:05	00:11:30	592.60 ft	4953.54 ft*lbs	110327.41 lbs	110327.41 lbs	130	0.00 gal	
19	30.90 ft	15:27:04	15:31:35	00:04:31	623.50 ft	5739.25 ft*lbs	103986.98 lbs	103986.98 lbs	139	0.00 gal	
20	31.63 ft	15:22:31	15:27:04	00:04:33	655.13 ft	10503.55 ft*lbs	181420.42 lbs	181420.42 lbs	159	0.00 gal	
21	31.89 ft	13:58:49	15:22:31	01:23:42	687.02 ft	9119.70 ft*lbs	126634.56 lbs	126634.56 lbs	141	0.00 gal	
22	31.22 ft	13:53:34	13:58:49	00:05:15	718.24 ft	8310.49 ft*lbs	105902.04 lbs	105902.04 lbs	116	0.00 gal	
23	31.42 ft	13:48:22	13:53:34	00:05:12	749.66 ft	8722.77 ft*lbs	106334.16 lbs	106334.16 lbs	161	0.00 gal	
24	31.30 ft	13:30:59	13:48:22	00:17:23	780.96 ft	10163.08 ft*lbs	113293.74 lbs	113293.74 lbs	127	0.00 gal	
25	31.80 ft	13:26:08	13:30:59	00:04:51	812.76 ft	8611.22 ft*lbs	108618.28 lbs	108618.28 lbs	120	0.00 gal	
26	31.65 ft	13:14:33	13:26:08	00:11:35	844.41 ft	11866.34 ft*lbs	114530.68 lbs	114530.68 lbs	114	0.00 gal	
27	31.67 ft	13:10:04	13:14:33	00:04:29	876.08 ft	7736.27 ft*lbs	107220.94 lbs	107220.94 lbs	116	0.00 gal	
28	31.99 ft	13:05:43	13:10:04	00:04:21	908.07 ft	5929.19 ft*lbs	107987.31 lbs	107987.31 lbs	119	0.00 gal	
29	31.30 ft	12:53:17	13:05:43	00:12:26	939.37 ft	8241.44 ft*lbs	111259.09 lbs	111259.09 lbs	115	0.00 gal	

Easy & economical to implement

- Does not require significant operator focus – most systems are automated
- Operator training performed during installation
- Remote support available
- Secure – share data only with those who are authorized to see it
- Low cost relative to value
 - Less than mud motor rental
 - Gains in operational efficiency can be dramatic



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Questions?



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