CoilData™

Coiled Tubing Online

String performance analysis using multi-company data reveals new insights

ICoTA-Canada Roundtable

October 2018

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Scope of Presentation

- String performance metrics
- Use of CoilData as a source of performance metrics for
  a) an individual service company
  b) a pipe manufacturer
  c) the industry at large
- Possible industry initiative

String performance metrics

- Record status of strings when ‘retired’ from service
  - Running feet (meters)
  - Fatigue level
  - Working history
  - Reason for retirement
- Perform statistical analysis to quantify running feet at retirement for each pipe diameter/material combination.
- Calculate a ‘Running Feet per Dollar’ metric to estimate the relative Return on Investment (ROI) for each pipe configuration.

CoilData as a source of performance metrics

- Commercial website since 2009
- Service companies upload string and job data for analysis and planning
- 5,152 strings total as of October 2018
- 146,557 jobs (depth/pressure/weight data)
- 27 service companies, predominantly North America
- Data is confidential to each subscribing company

Database of Retired Strings

All Vendors (2987 qualifying strings from 5152 in database)

	0.126	0.281	1.00	1.25	1.50	1.75	2.00	2.375	2.625	2.875	3.25		
70					1	1				1		3	0.1%
80				16	49	22	55	18		5		165	5.5%
90				89	29	56	414	194	13	22		817	27.4%
100				4	5	23	661	602	103	1		1399	46.8%
110					2	3	89	189	46			329	11.0%
125							14	137	36			187	6.3%
130						1	18	48	15			82	2.7%
140								5				5	0.2%
	0	0	0	109	86	106	1251	1193	213	29	0		
				3.6%	2.9%	3.5%	41.9%	39.9%	7.1%	1.0%			

String Status

Current status : Retired Last reel : 2857M

Date retired : 27 Aug 2018

What were the reasons for taking this workstring out of service?

Primary reason : Pinholed

Secondary reason : High fatigue if applicable

Where is it now : Scrapped

Remarks : String pinhole around 8,734' it was close to a bias weld. Manufacturer cut the pinhole and is going to do a in house analysis.

If this string failed prematurely (pinholed or parted)

Where did it fail : Pipe body

Failure analysis performed : Yes, externally

Do you want this string included when analyzing past results?

Internal analysis : Include

Some other information that may provide context

Was the decision to retire : Voluntary based on normal company policies

Was this a result of : Normal operating conditions

Was this string profitable : Marginal

Save Retirement Data

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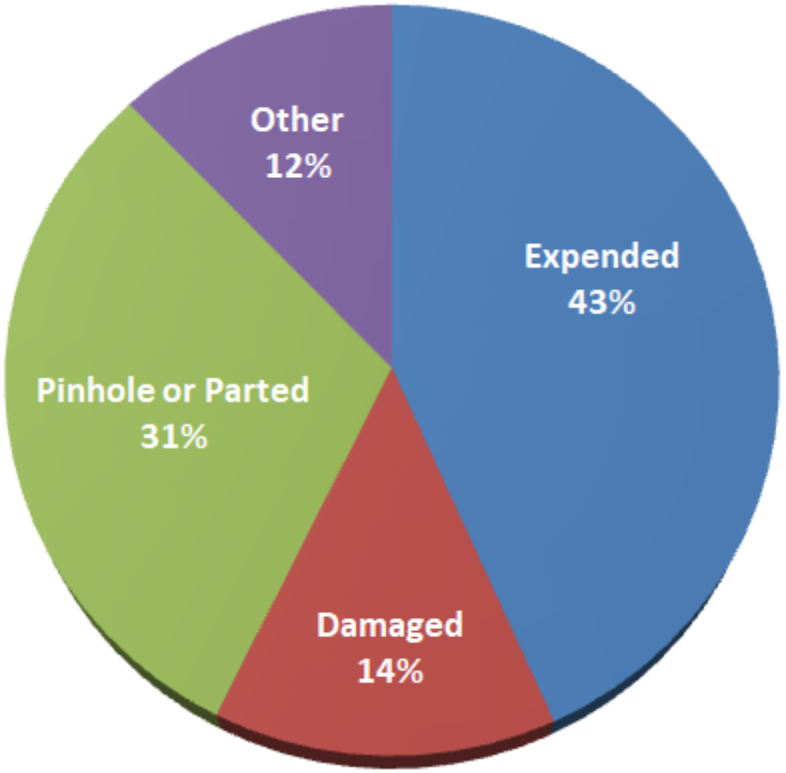
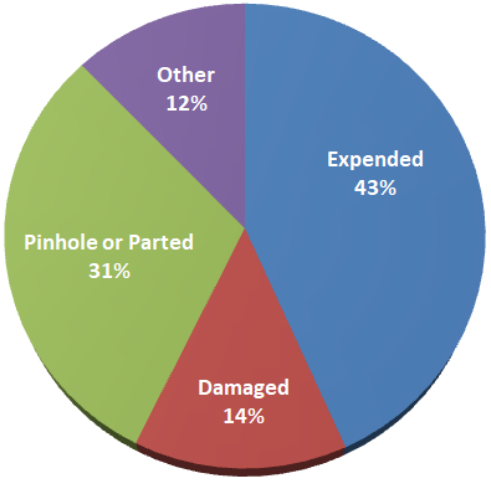
Save Retirement Data

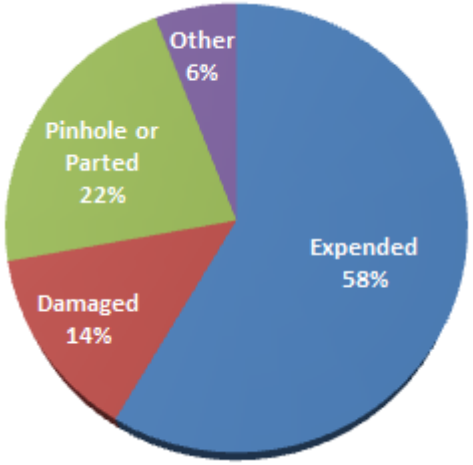
Reason String Retired Interpreted data	
High fatigue	33.1%
Pinholed	15.7%
Parted at surface	13.7%
High footage	7.7%
Damage - General	7.2%
Other	6.2%
Lost downhole	4.3%
Butt weld	2.9%
Sold	1.3%
Oversize diameter	1.2%
Hung off	1.1%
Parted downhole	1.0%
Damage - Wellbore	0.9%
Damage - Abrasive	0.9%
Damage	0.8%
Damage - Corrosion	0.7%
Uncertain history	0.6%
Damage - Wellhead	0.4%
High job count	0.2%
Overpulled	0.1%
Expended (no failure)	43.3%
Damage related	13.9%
Fatigue failures	30.5%
Other or Unknown	12.2%

Reason for String Retirement
(all strings)

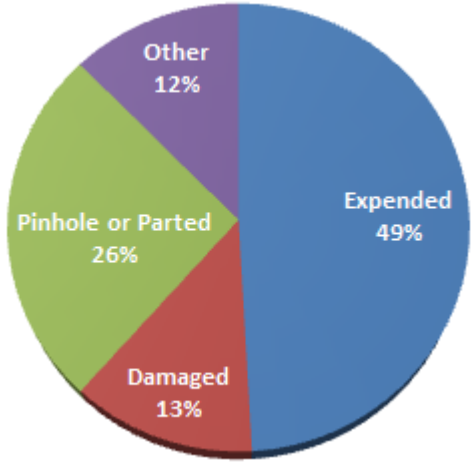




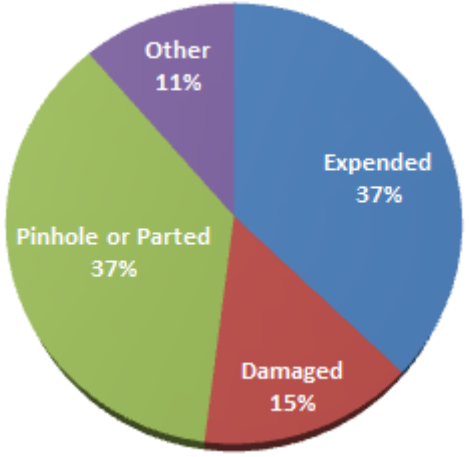
All



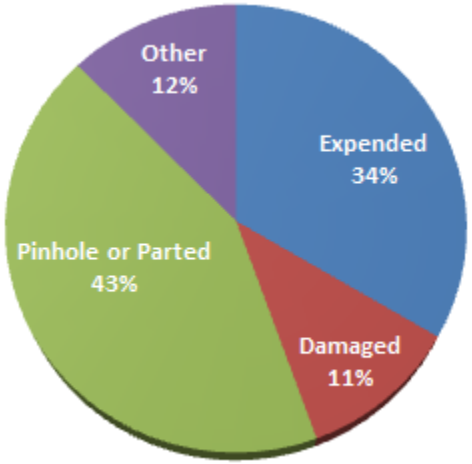
1.75”



2.00”

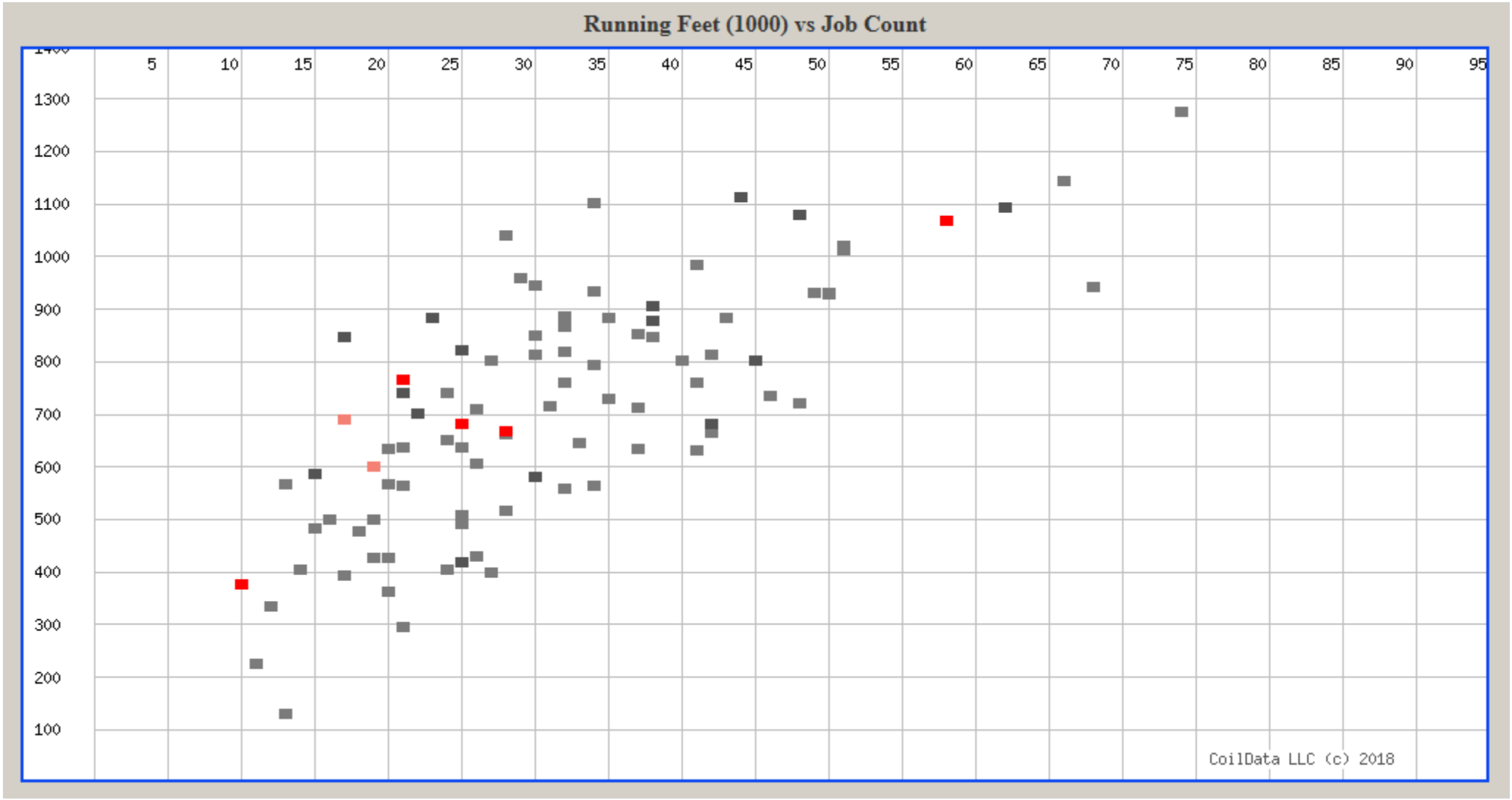


2.375”



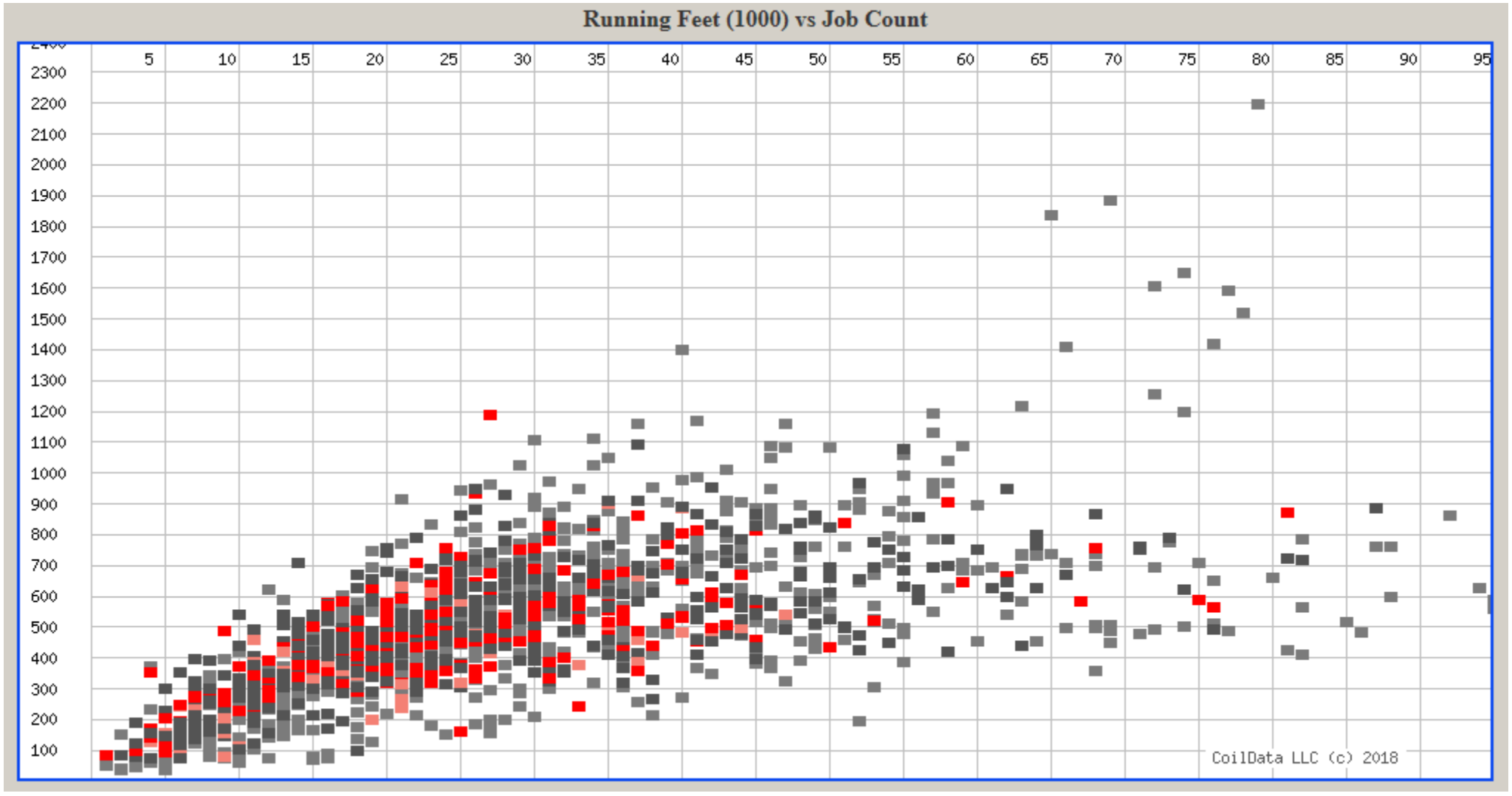
2.625”

2.375” one medium-sized company



pinholed or parted

2.375” all grades, multiple companies



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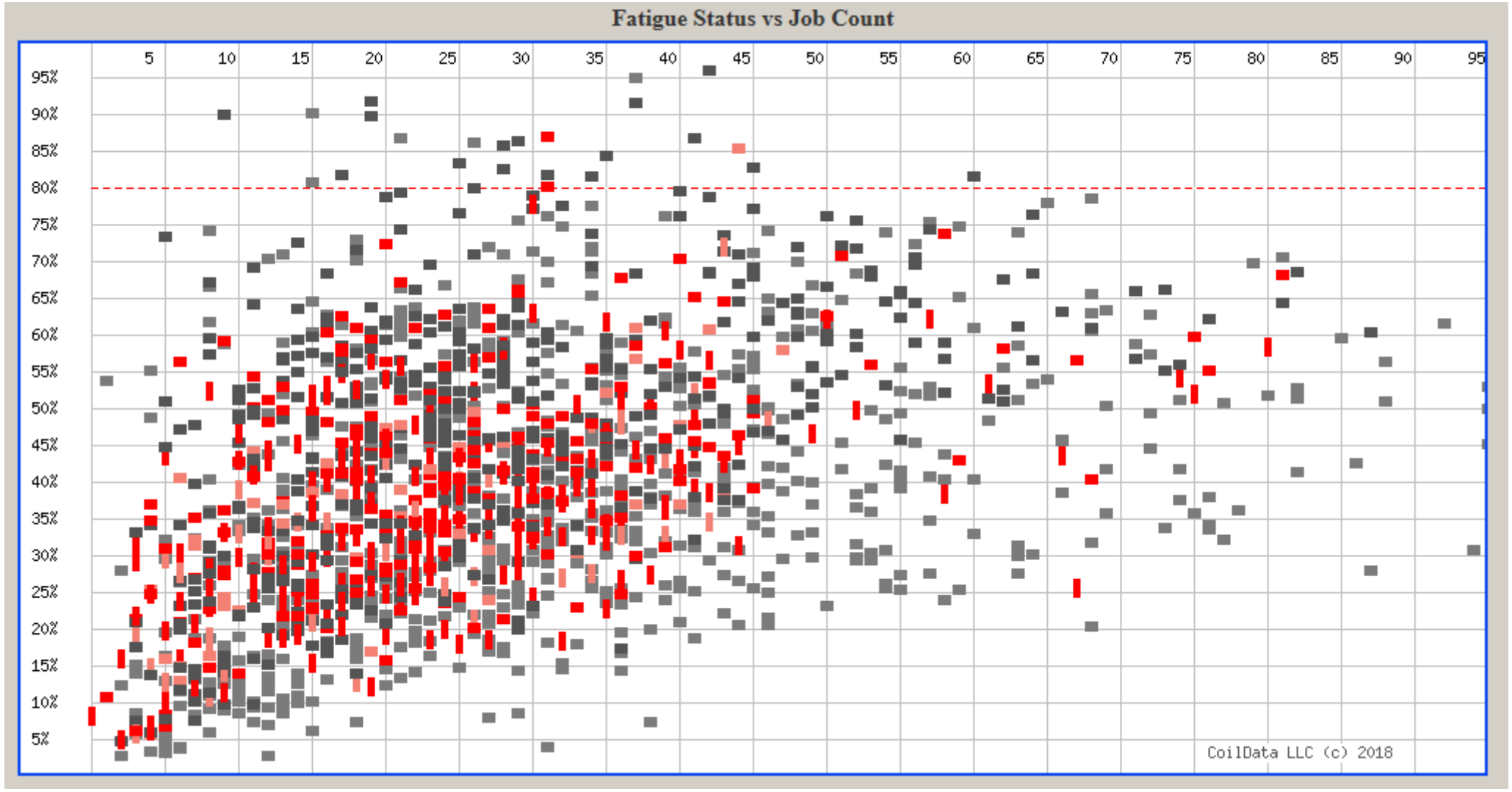
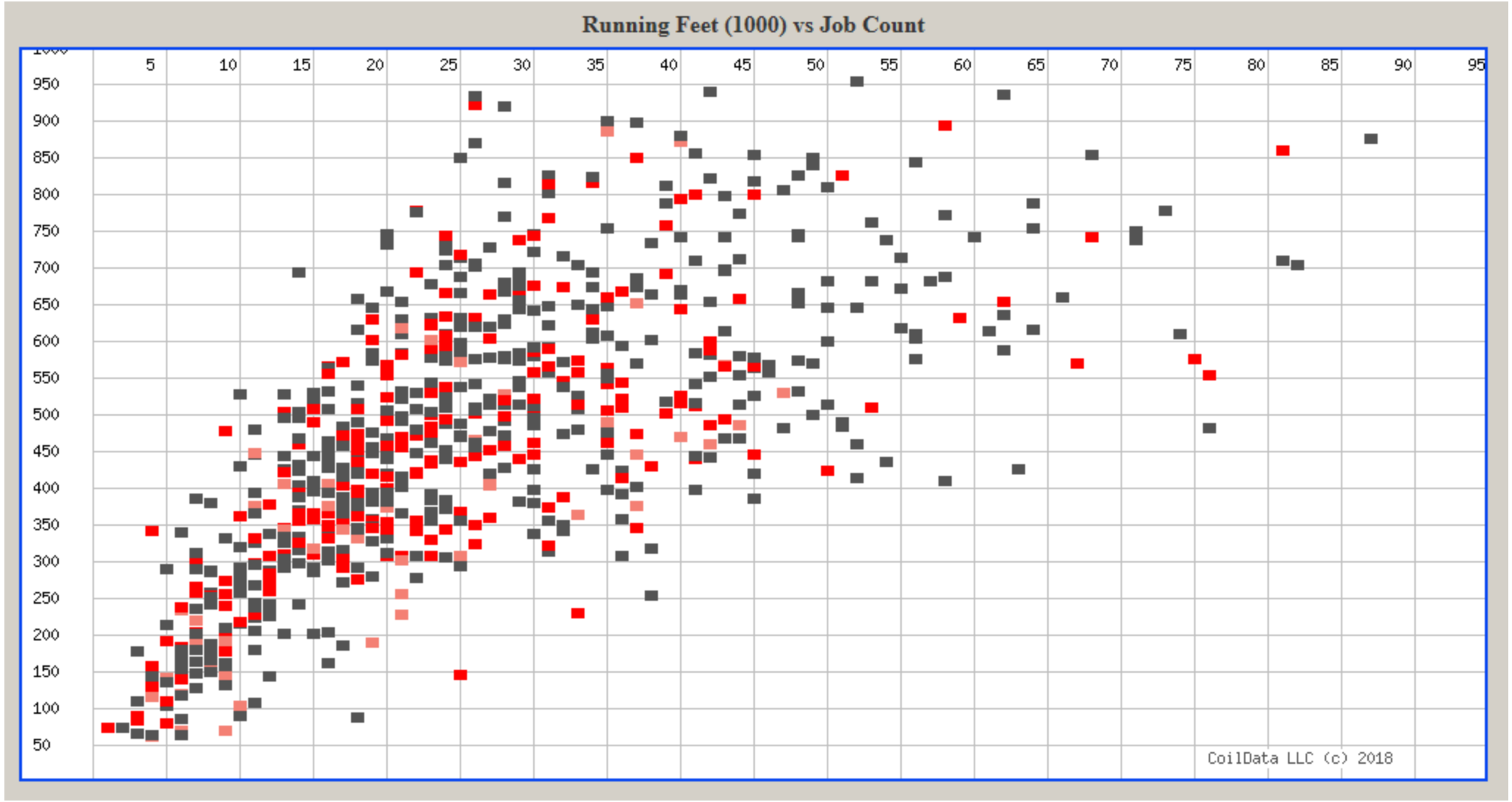


2.375” 100Kpsi



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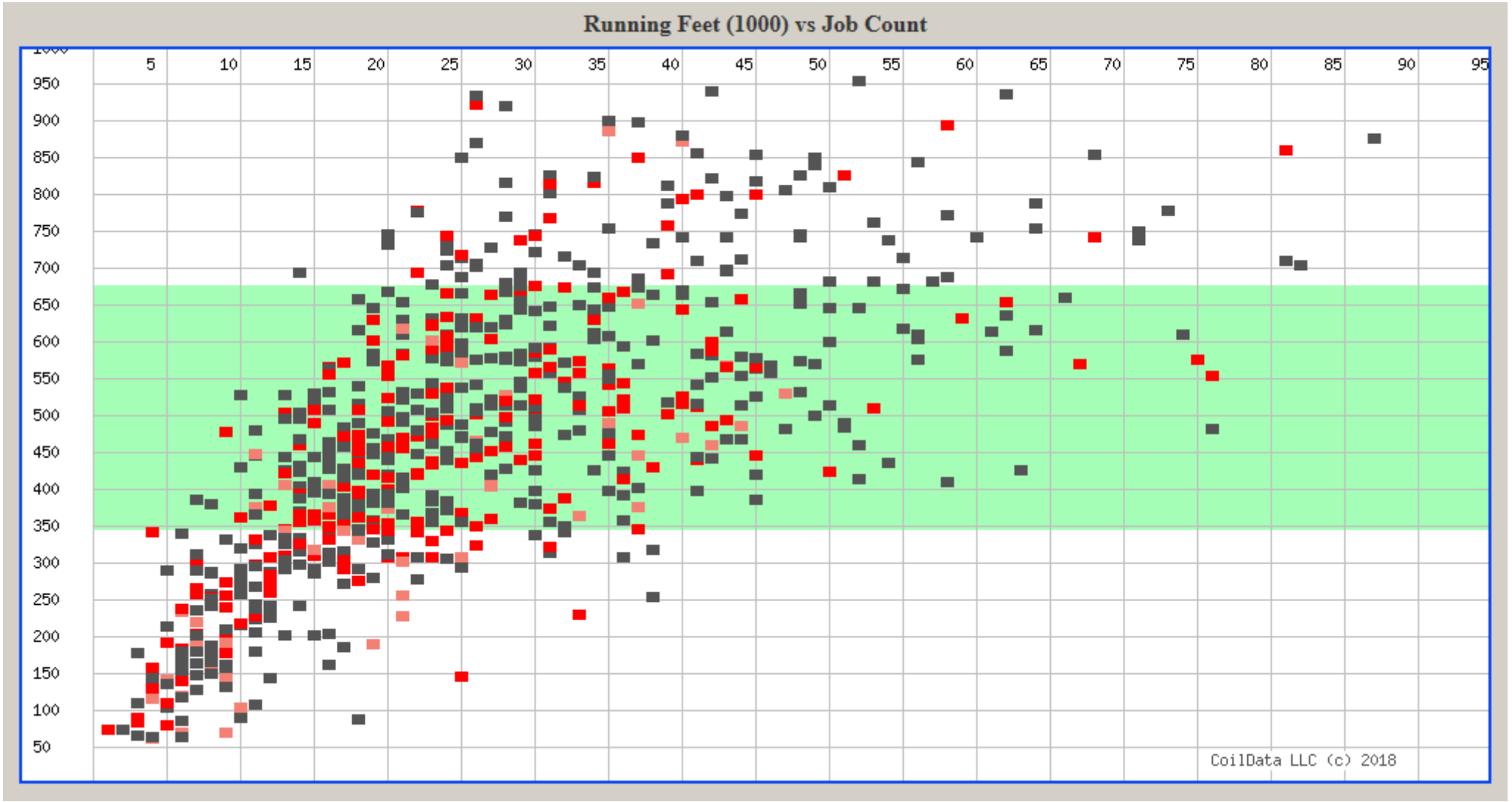

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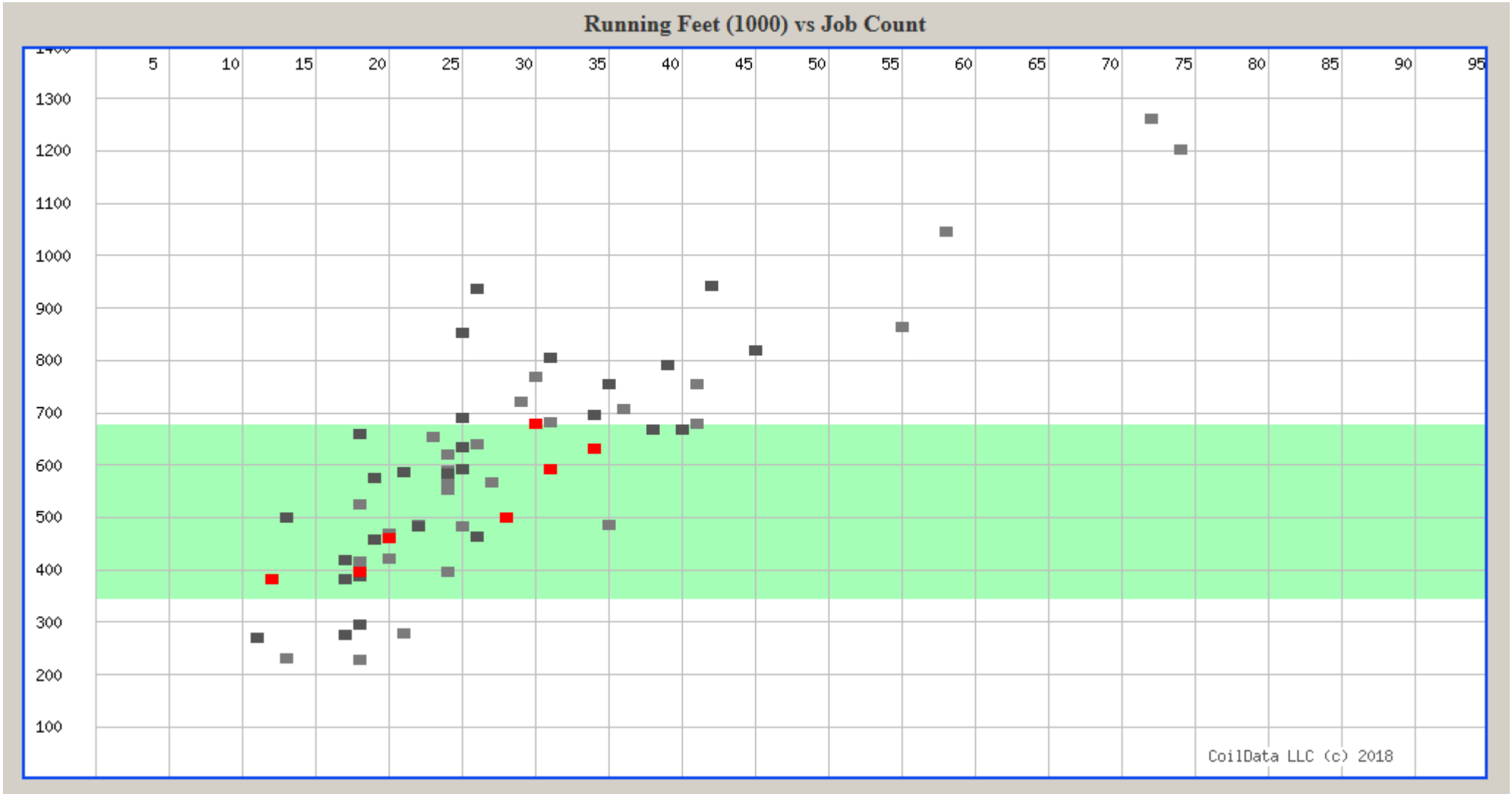
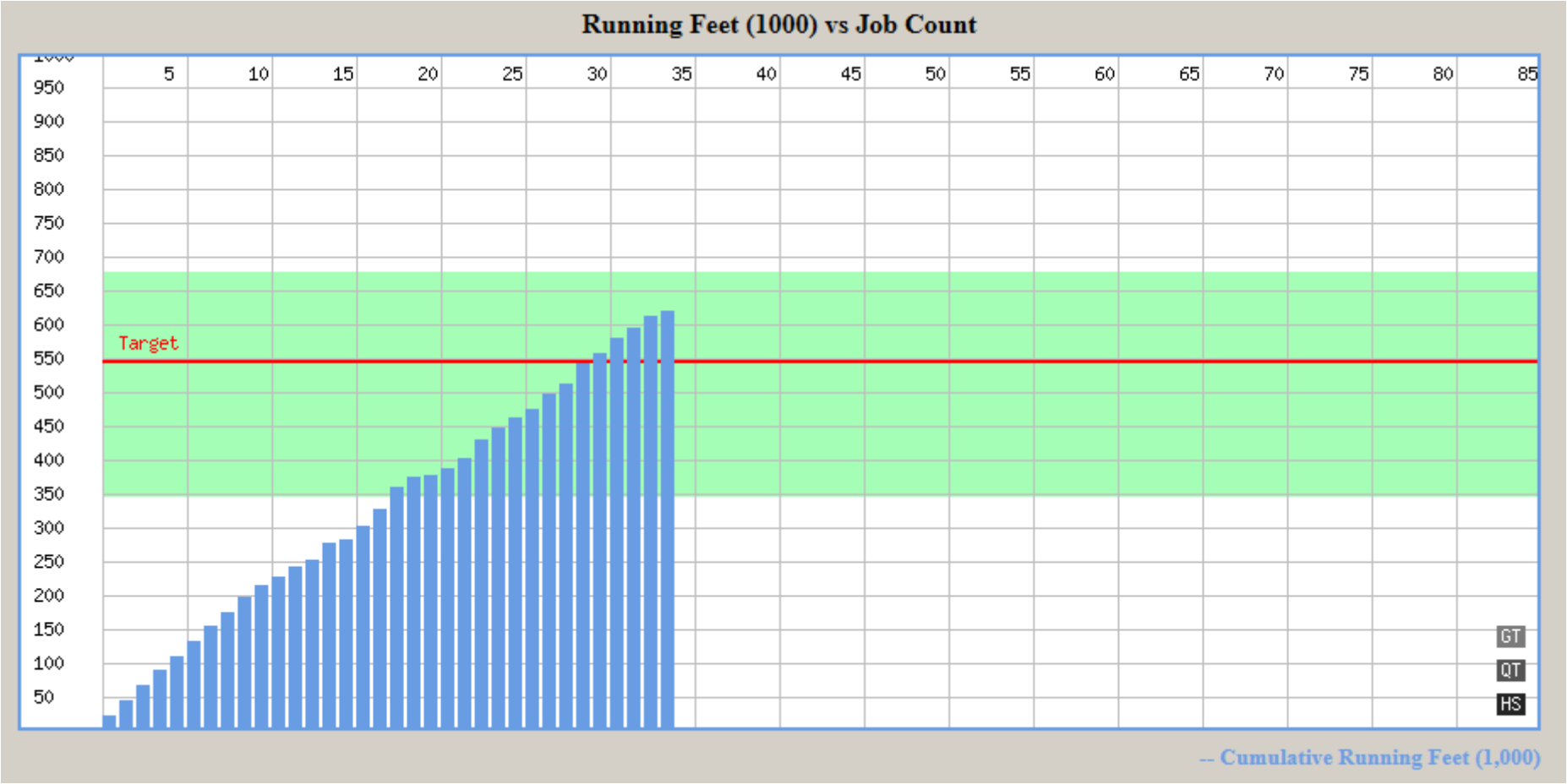
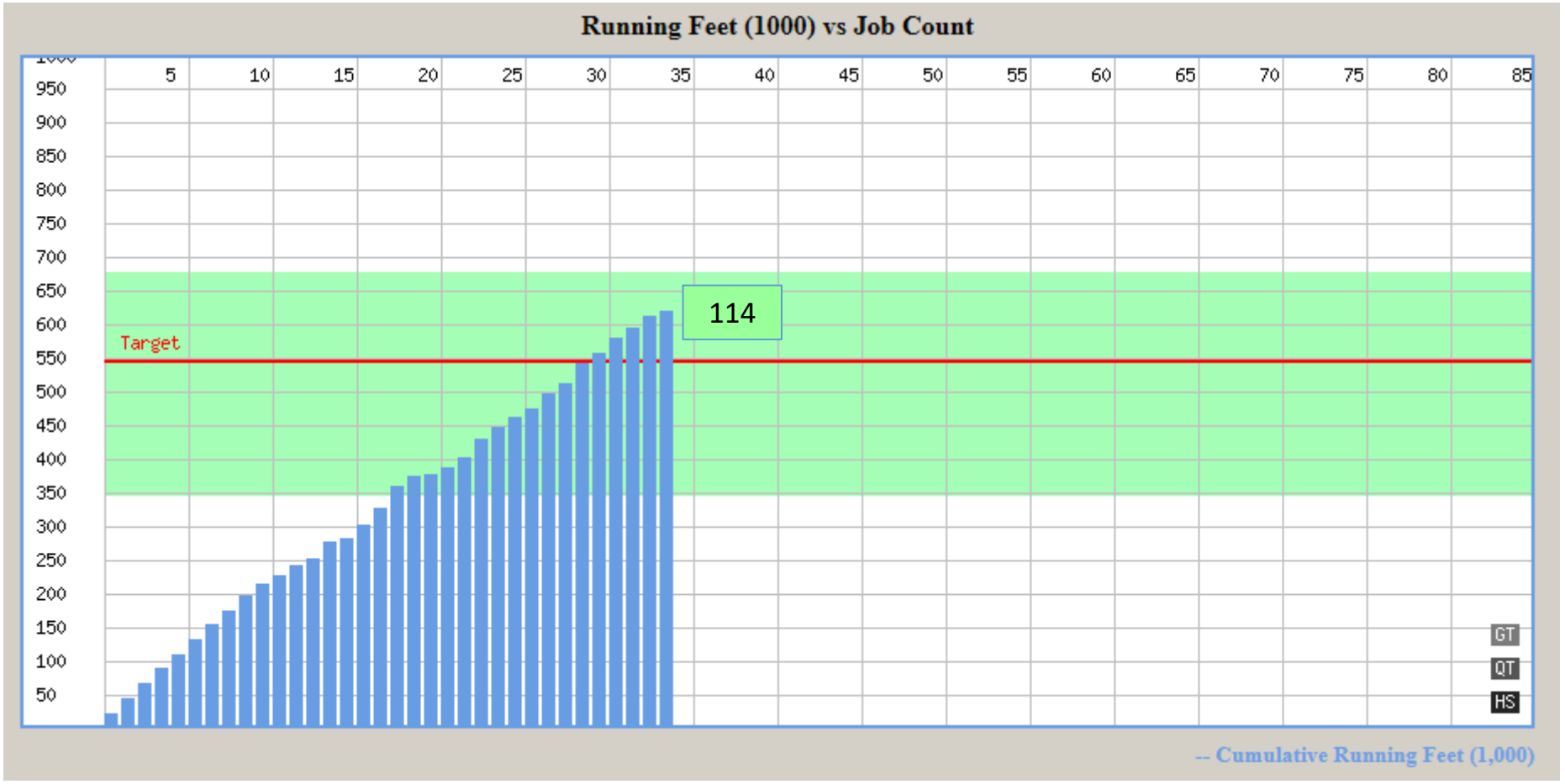


pinholed or parted

Status of a Working String



String Performance Index™ (SPI)



145

124

100

64

36

0

Effect of Working Pressure (2.375” pipe)

number of data points

average running feet (x1000)

Material A

All	270	517
0-2000	17	473
2000-4000	75	599
4000-6000	36	527
6000-8000	5	428

Material B

All	96	644
0-2000	0	0
2000-4000	28	696
4000-6000	56	640
6000-8000	4	344

Material C

All	137	815
0-2000	1	0
2000-4000	39	1052
4000-6000	56	760
6000-8000	8	468

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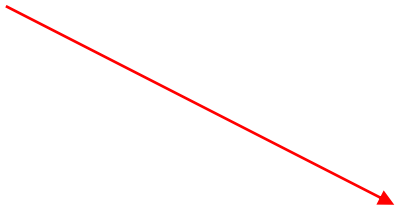

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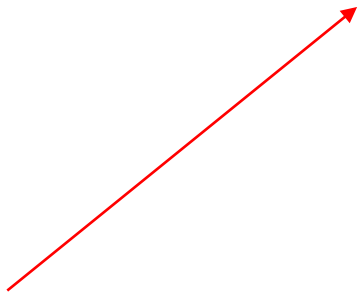

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0-2000	1	0
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6000-8000	8	468

Running Feet per Dollar (2.375” pipe)

				RF/$
Material A	All	270	517	2.4
	0-2000	17	473	2.2
	2000-4000	75	599	2.8
	4000-6000	36	527	2.5
	6000-8000	5	428	2.0
Material B	All	96	644	2.8
	0-2000	0	0	0.0
	2000-4000	28	696	3.0
	4000-6000	56	640	2.7
	6000-8000	4	344	1.5
Material C	All	137	815	3.0
	0-2000	1	0	0.0
	2000-4000	39	1052	3.9
	4000-6000	56	760	2.8
	6000-8000	8	468	1.7

Average running feet

String cost*

* Estimate based on original string design using known recent string cost data

2-3/8” vs 2-5/8”

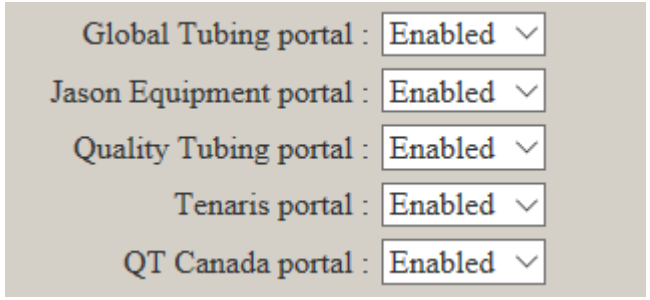
	2-3/8”		2-5/8”	
Material A	All	2.4		
	0-2000	2.2		
	2000-4000	2.8	2000-4000	2.4
	4000-6000	2.5	4000-6000	1.7
	6000-8000	2.0		
Material B	All	2.8		
	0-2000	0.0		
	2000-4000	3.0	2000-4000	2.5
	4000-6000	2.7	4000-6000	2.1
	6000-8000	1.5		
Material C	All	3.0		
	0-2000	0.0		
	2000-4000	3.9	2000-4000	2.5
	4000-6000	2.8	4000-6000	1.8
	6000-8000	1.7		

Commercial Considerations

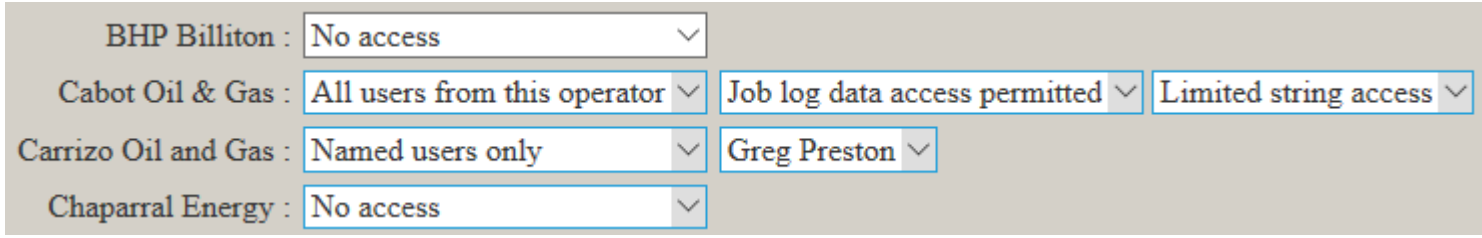
- Data is owned by each participating service company
- Data is private; permission to publish or use is required
- Comparison of pipe vendors is commercially sensitive
- Comparison of service companies is commercially sensitive
- Informal survey suggests many companies would be willing to release data if it were for the benefit of the industry at large, and done in a manner that did not compromise their business interests.
- One possible approach would be to do it in collaboration with an industry body, such as ICoTA.

Commercial Considerations

- Option already exists to make select data available to pipe vendors



- Option already exists to make select data available to operators



- Option could be added to make some data available to industry project

Conclusions

- A substantial amount of data exists of potential interest to the CT industry.
- That data is not currently available, but could possibly be made available through an industry initiative.
- Some preliminary discussions have taken place.

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