Liberty Proppant Testing

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PS-50 TESTING

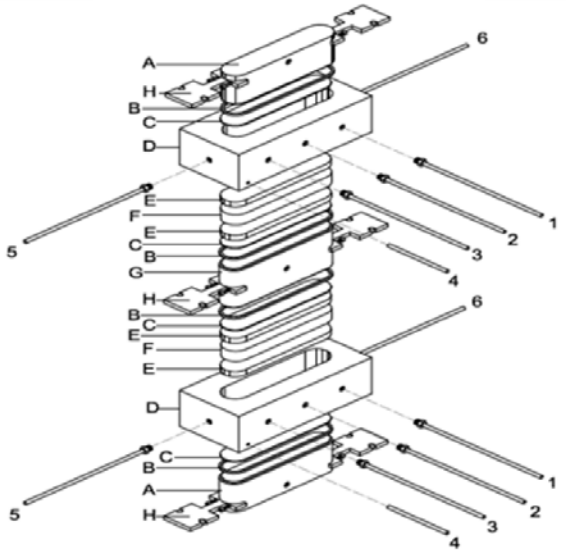
- Pressure is changed based on basin
- Temp is set to 250F and cell is packed at 2 lb/ft²

PROCEDURE

Conductivity: $kW_f = 26.78\mu Q/(\Delta P)$ ***

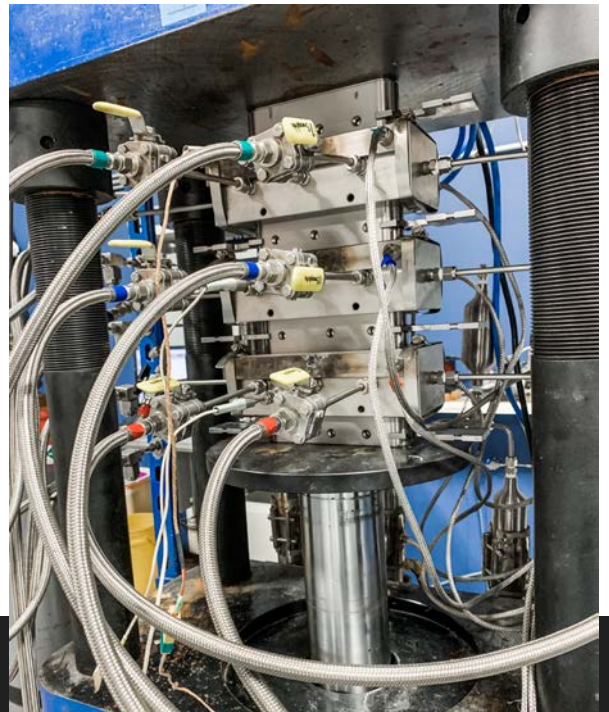
Permeability: $k = 321.4\mu Q/[(\Delta P)W_f]$ ***

k	*is the proppant pack permeability, expressed in Darcy*
kW_f	*is the proppant pack conductivity, expressed in millidarcy-feet*
μ	*is the viscosity of the test liquid at test temperature, expressed in centipoises*
Q	*is the flow rate, expressed in cubic centimeters per minute*
ΔP	*is the differential pressure, expressed in psi*
W_f	*is proppant pack width, expressed in inches*

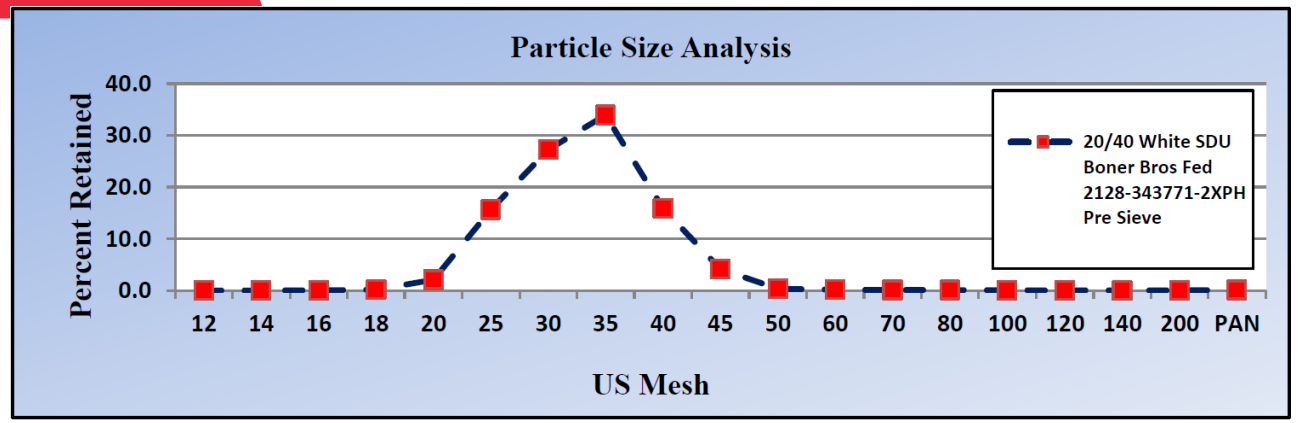


1. Lower pressure port
2. Thermocouple
3. High pressure port
4. Not used
5. Inlet
6. Outlet

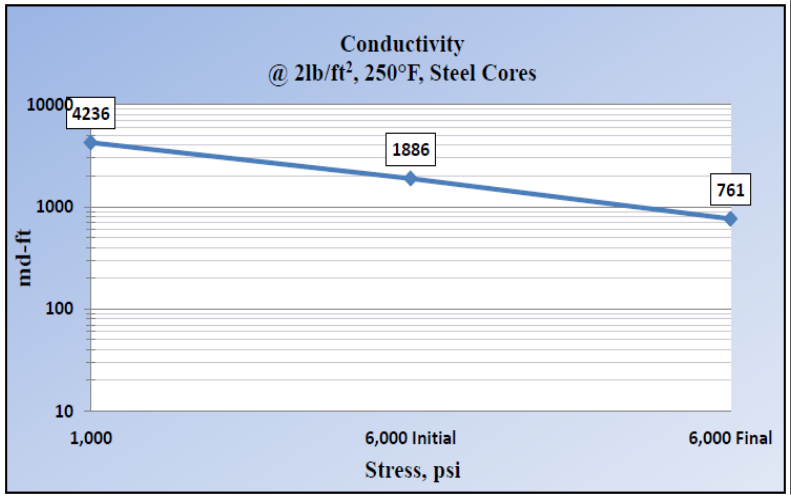
A. Upper/lower pistons
B. Tetraseal
C. Metal shim
D. Cell body
E. Steel Cores
F. Proppant
G. Center piston
H. Width slots
I. Set screws

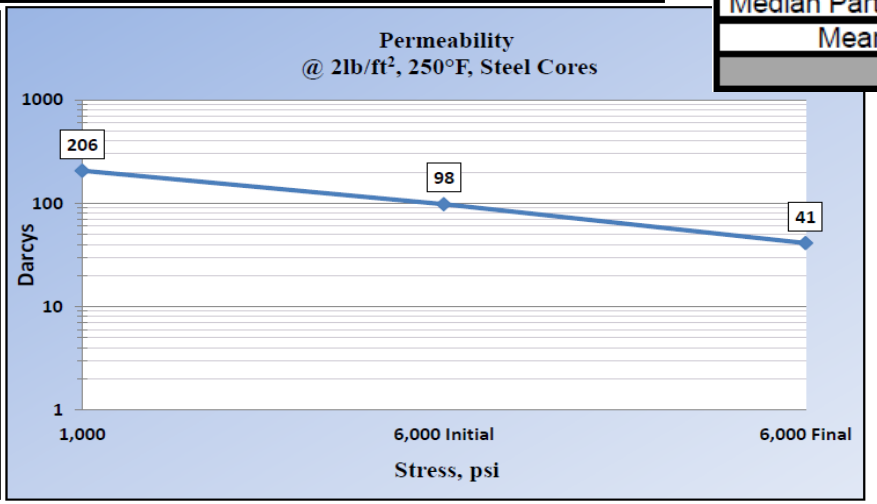


EXAMPLE REPORT



Stress, psi	Time @ stress	Time (Total)	Conductivity (md-ft)	Permeability (Darcy)	Width (in)
1,000	24 hrs.		4236	206	0.246
6,000	Initial / 0 hrs		1886	98	0.231
6,000	Final / 50 hrs.		761	41	0.222





Quick Chek ✓			API RP 19C	20/40 White SDU Boner Bros Fed 2128-Pre Sieve	
Particle Size Distribution	(mm)	Mesh size			
	1.700	12		0.0	
	1.400	14		0.0	
	1.180	16	≤ 0.1%	0.1	
	1.000	18		0.2	
	0.850	20		2.1	
	0.710	25		15.6	
	0.600	30		27.3	
	0.500	35		33.9	
	0.425	40		15.9	
	0.355	45		4.1	
	0.300	50		0.4	
	0.250	60		0.1	
	0.212	70		0.1	
	0.180	80		0.1	
	0.150	100		0.1	
	0.125	120		0.0	
	0.106	140		0.0	
	0.075	200		0.0	
	<0.075	PAN	≤ 1.0%	0.1	
		Total		100.0	
In-size (%)		(-20+40) sieves	≥ 90%	92.7	
Median Particle Diameter (MPD, mm) / (MPD, inches)				0.585	0.023
Mean Particle Diameter (mm) / (inches)				0.601	0.024
			ΔMPD:	0.585	0.0

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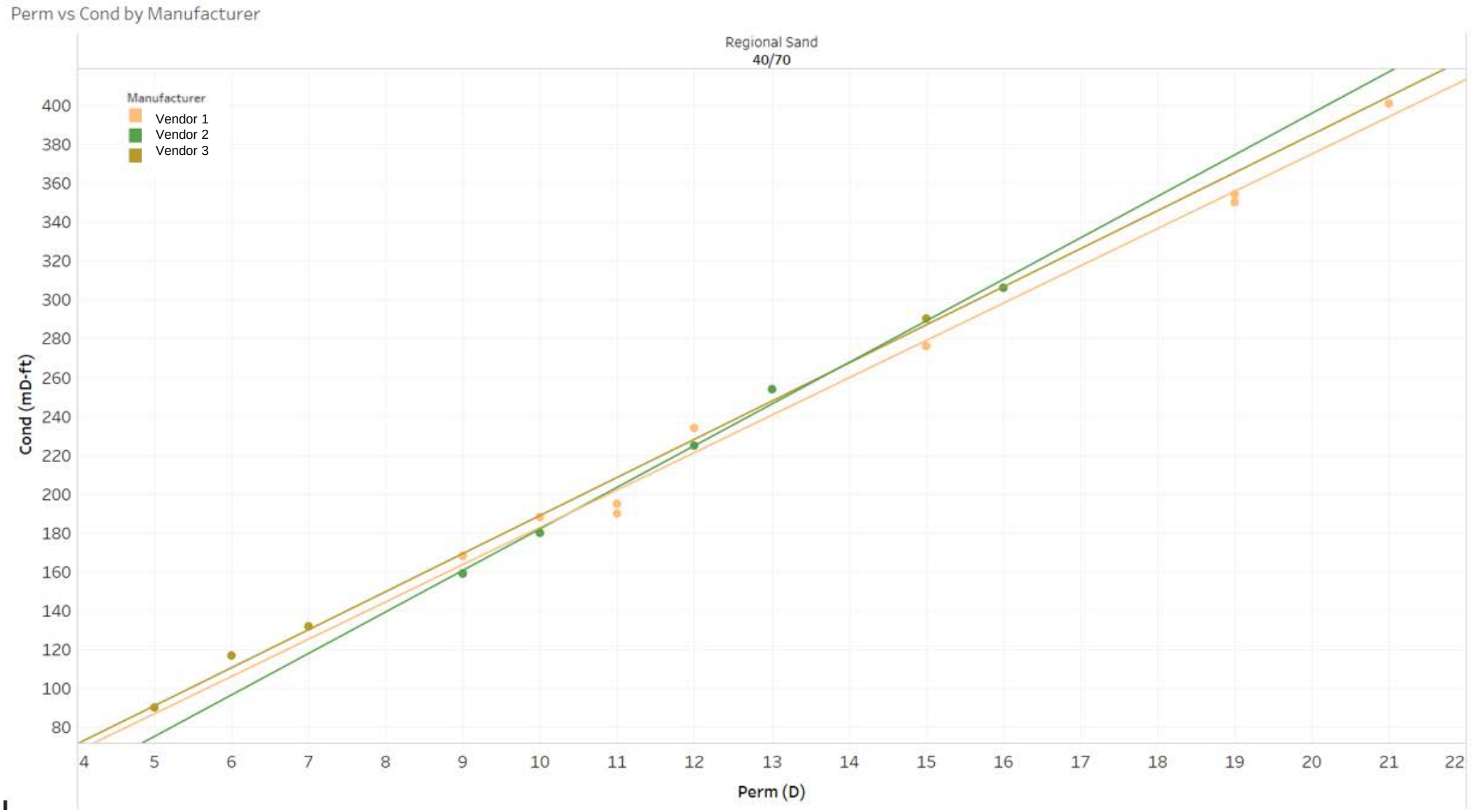
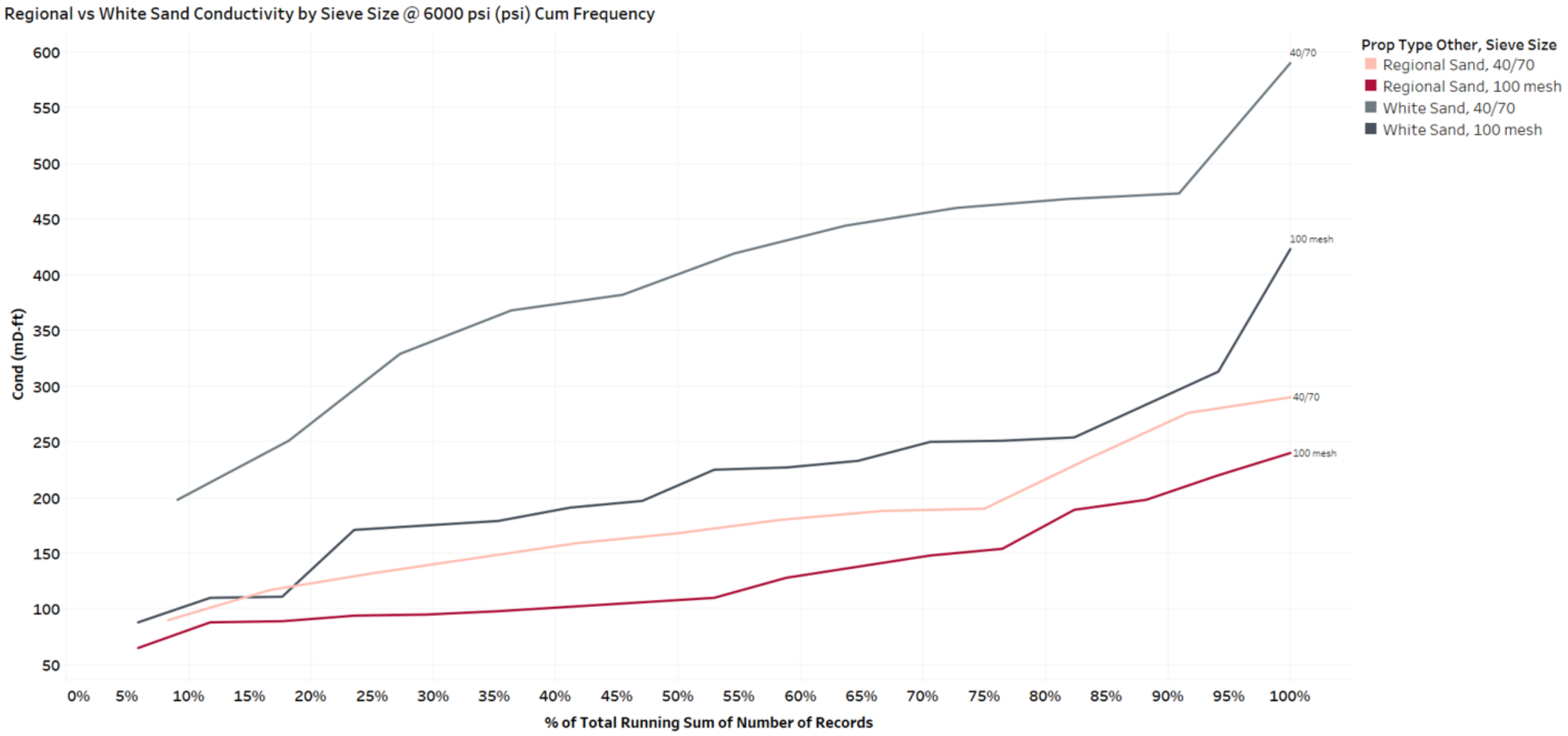
PERM VS COND BY MANUFACTURER



REGIONAL VS WHITE SAND CONDUCTIVITY BY MESH



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