Monashee Pumps Inc.

All Metal Power Section

for Coil Tubing Applications

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Power Sections in CT

Monashee

Cleanouts
Confirmation Runs

Cement Drilling
Milling plugs

Metal Rotor

Rubber Stator

Power Sections

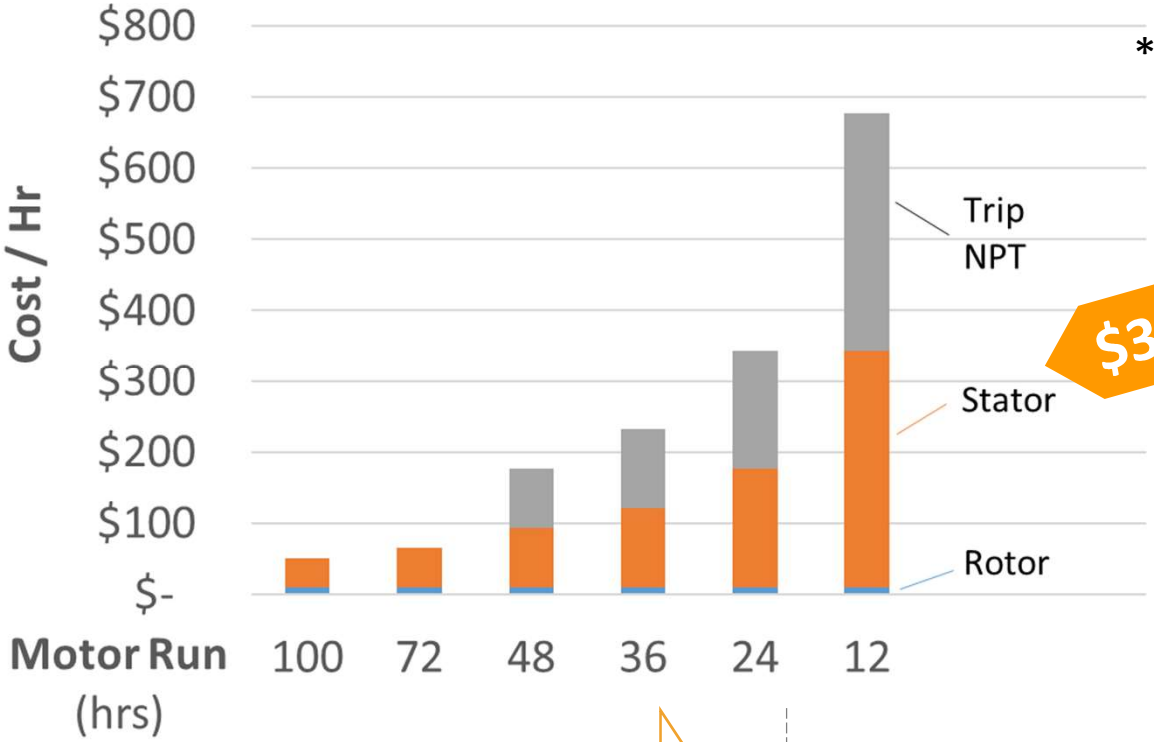
Rubber Limitations

Temperature
Nitrogen
Acids & solvents
Stalling

Vibratory Tool

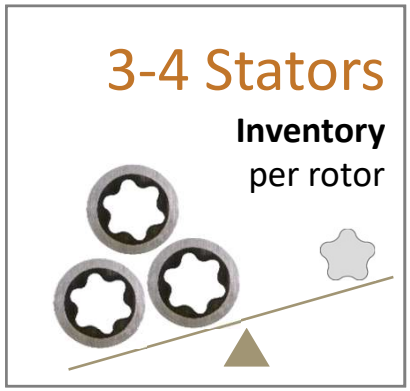
Motor

Cost Factors



*Vibratory ~1/3 - 1/2 cost; NPT N/A

$350 MM



High Temp
250-375 °F
120-190 °C

Nitrogen = 1 run
(NPT N/A)

Extreme Temp
+ 375 ° F
+ 190 ° C

Acid/ Solvent
Intervention

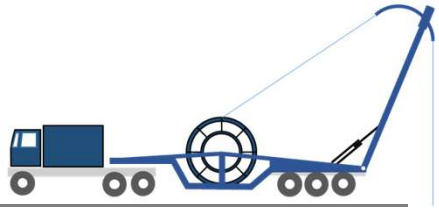
Alternative Solutions

$500 – $1,400 / hr

MacDrill™
Metal Rotor-Stator
Turbine

Our Focus

2 $^{7}/_{8}$" Non-rubber Power Sections



Vibratory Tools

Speed ≤ 500 rpm

5 rev / gal
(1.3 rev/l)

8 or 16 hz

1 or 2 pulse/rev

Motors

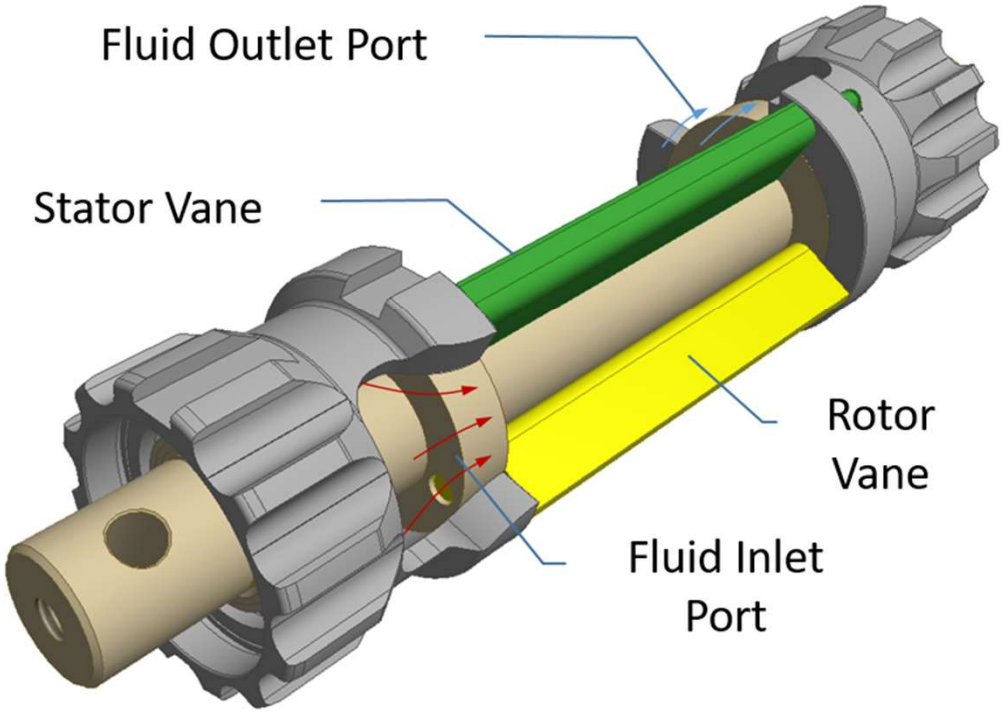
Torque ≥ 300 ft-lbs
(400 Nm)

Pressure ≤ 2,500 psi
(17 MPa)

Once proven, develop higher torque/ power, other CT sizes, directional motors, and other pump applications

Articulating Vane Technology

Patent Pending



Stack multiple stages

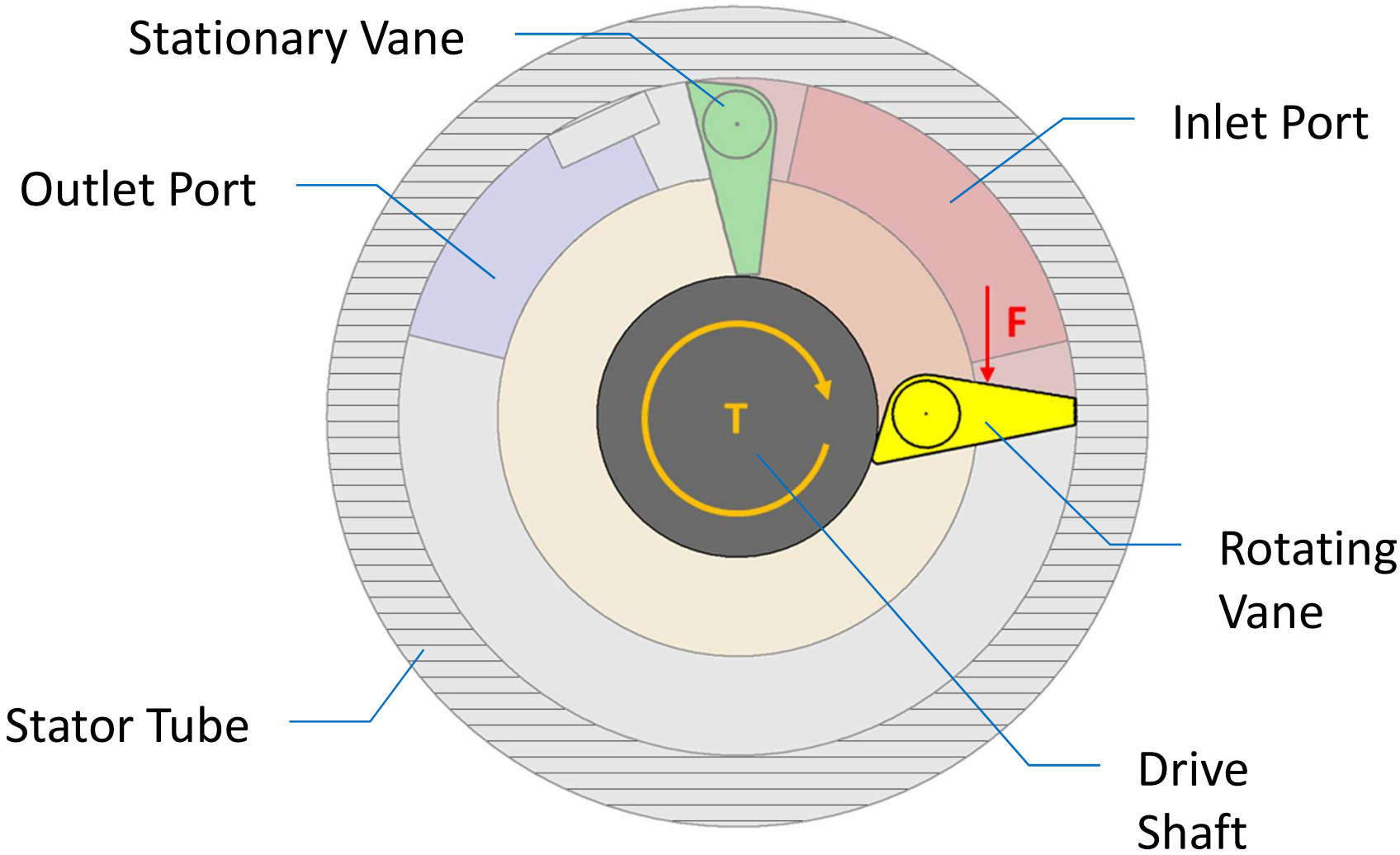
Modular and customizable

Simple to assemble, service & inspect

No transmission

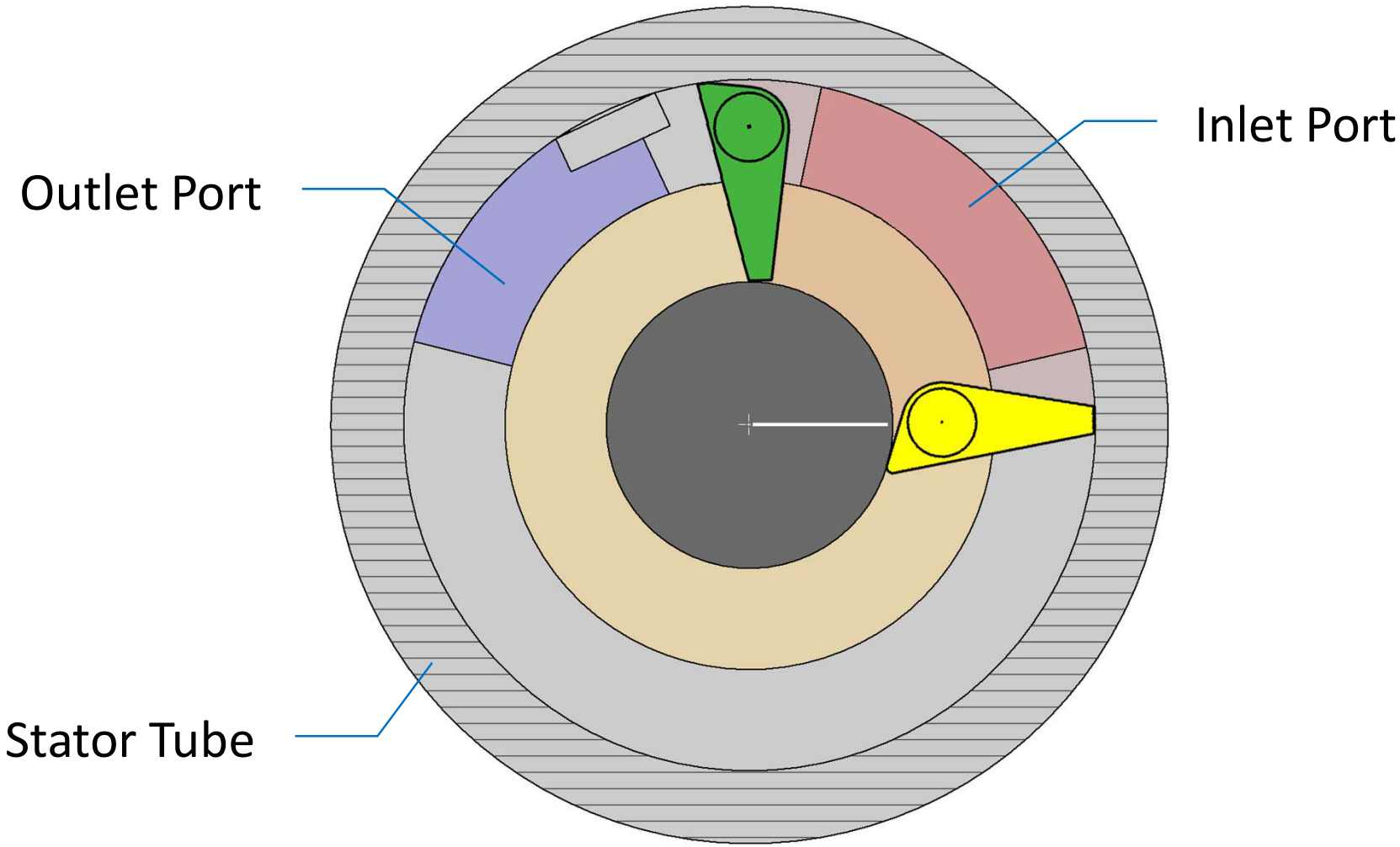
Articulating Vane Technology

Patent Pending

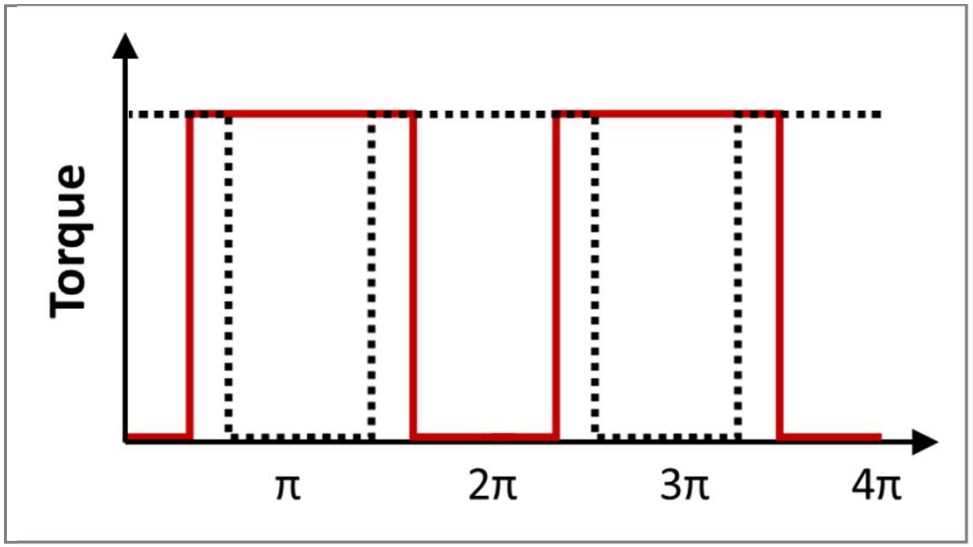


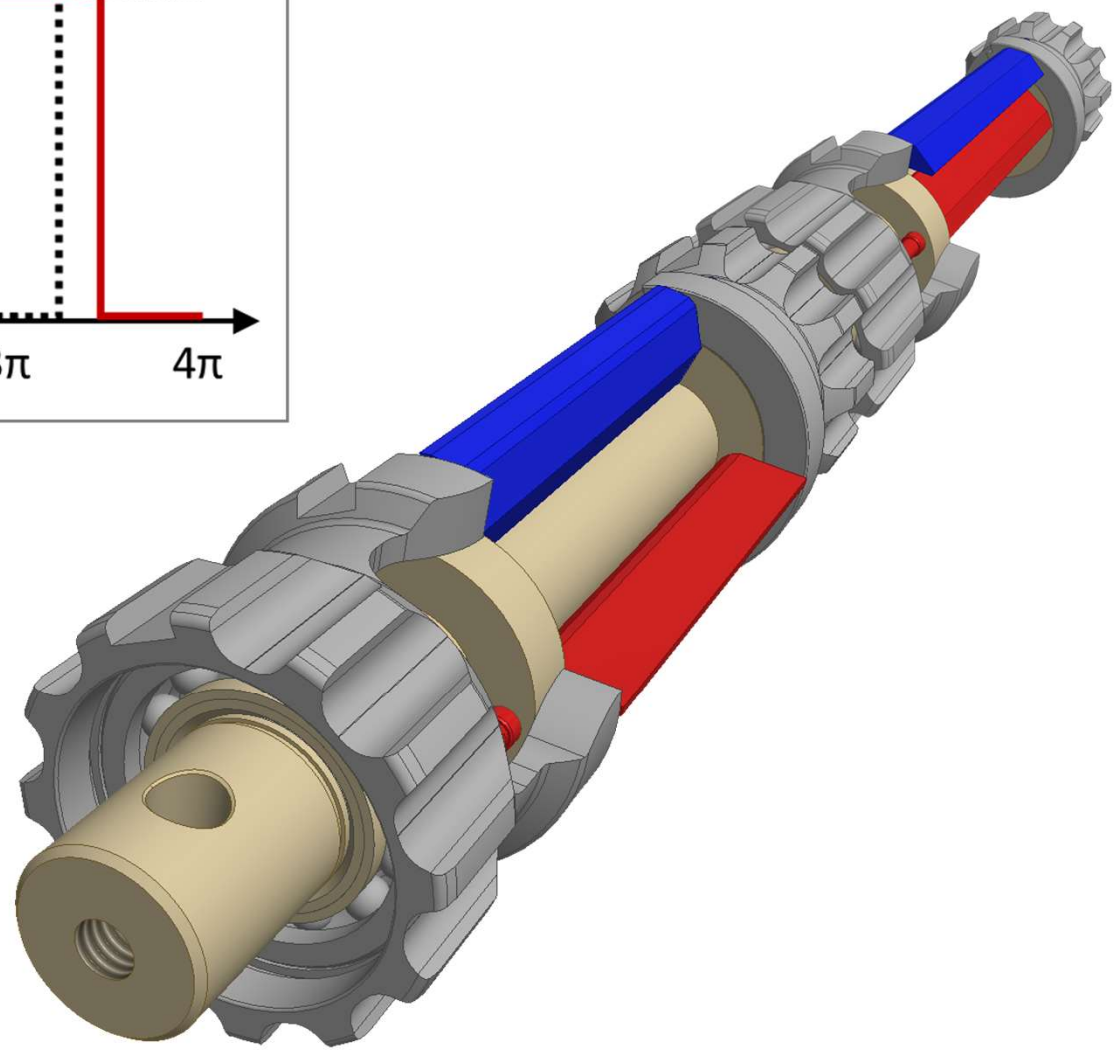
Articulating Vane Technology

Patent Pending



Stack Stages

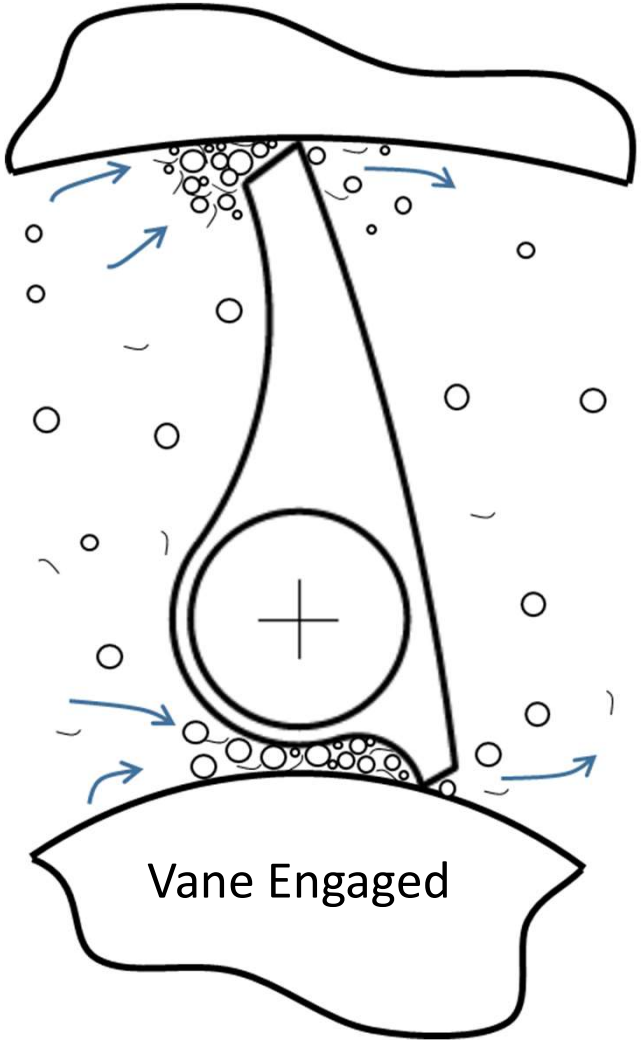


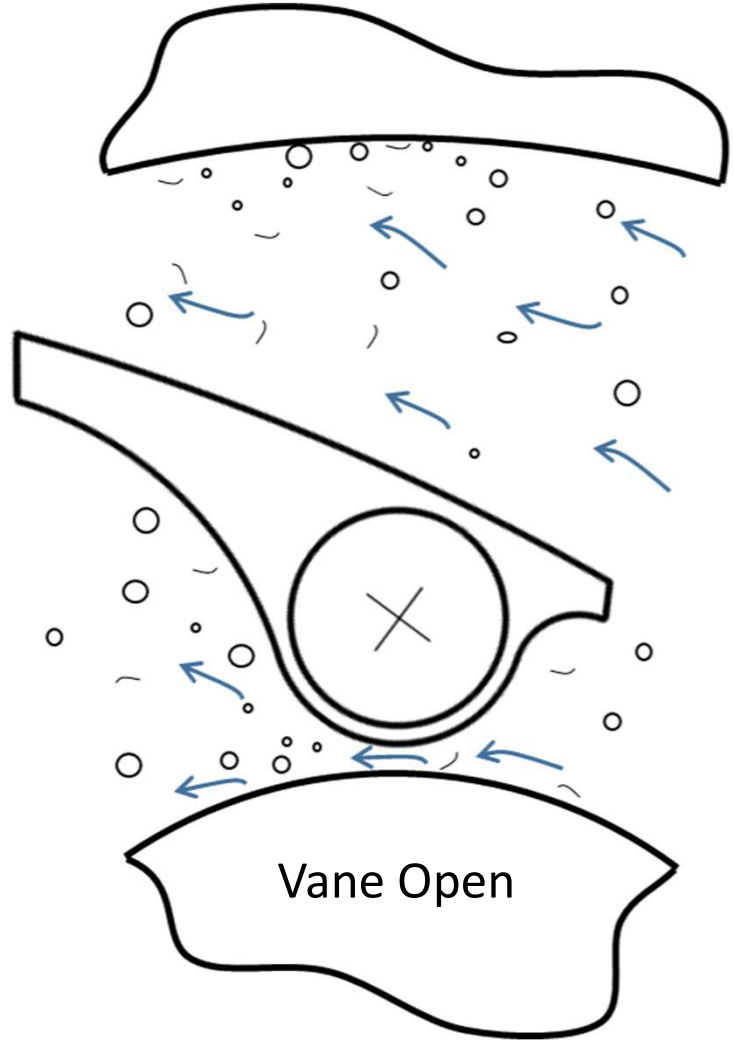


Minimum 2 stages

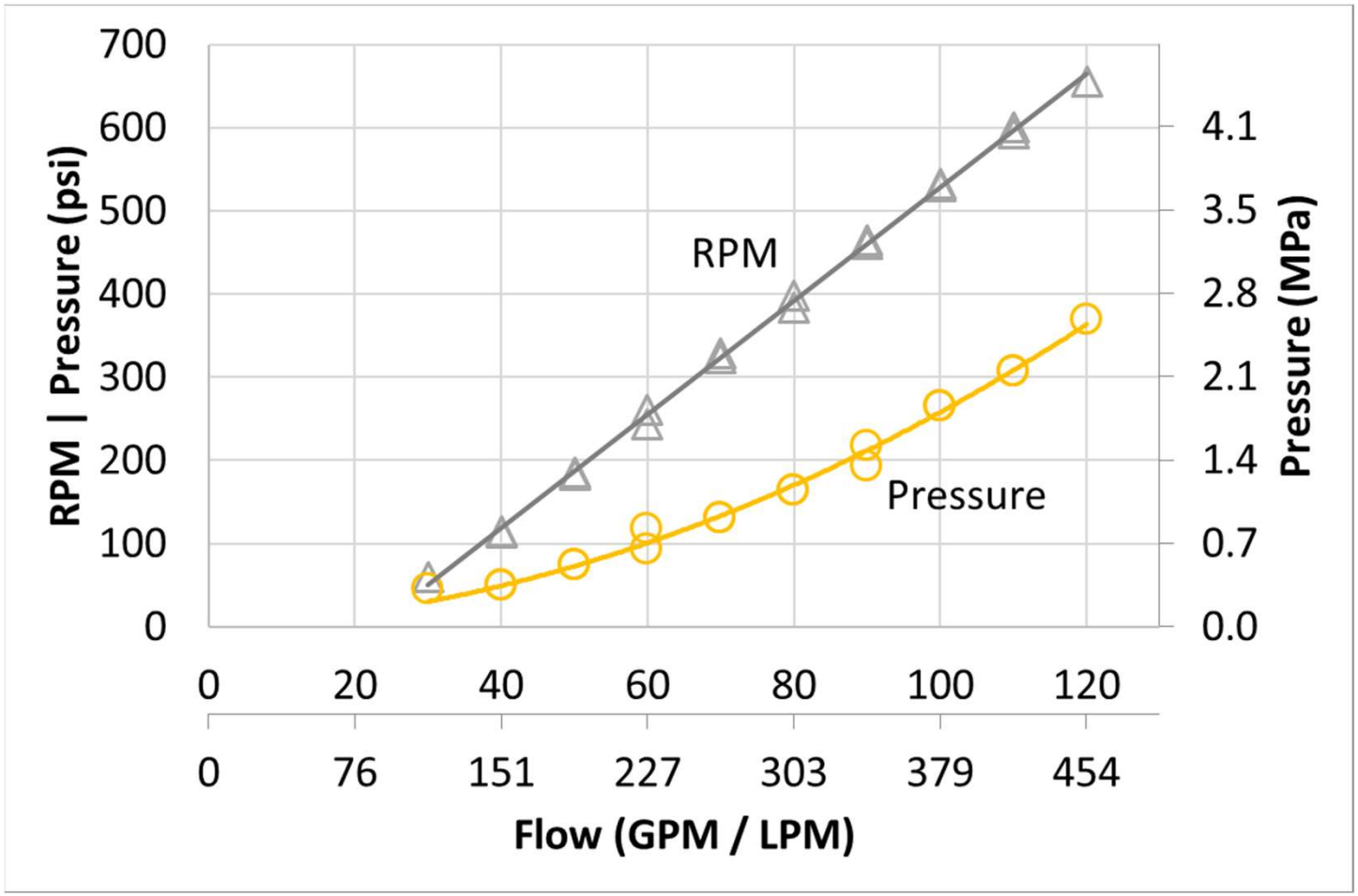
Add stages to increase torque and power

Solids Compatibility

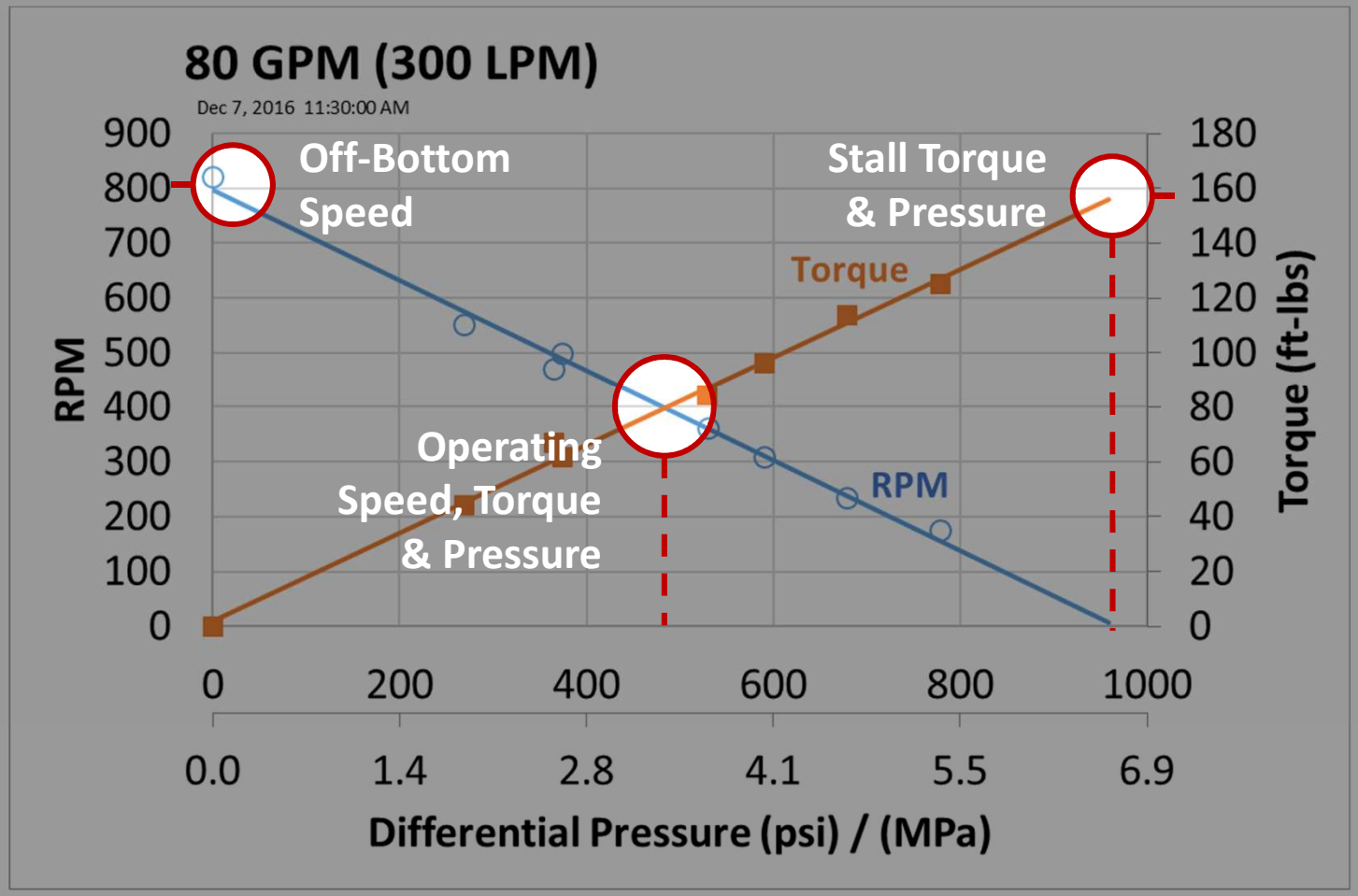




Typical Performance Off-Bottom (No Load)



Typical Performance Dyno Load Curve



VIBRATORY TOOL TESTING

$2\,^{7}/_{8}$ 2 Stage, Low Speed		
	Length	3 ft
Torque Factor (Slope)		0.3 ft-lbs/psi
Off-Bottom	Speed	550 rpm (9/18 Hz)
	Pressure	260 psi (1.8 MPa)
Stall	Torque	175 ft-lbs
	Pressure	580 psi (4 MPa)

*Performance at 100 GPM (380 lpm) flowrate

Speed ≈ Off-Bottom
Adjustable with bypass:

Speed	Stall Torque
440 rpm (-20%)	130 ft-lbs (-25%)
350 rpm (-35%)	95 ft-lbs (-45%)

- Vibratory pulses of tool comparable to conventional
- Reduces length by 2 ft
- Commencing field tests
- Economical for High Temp and N_2

Motor Testing

2 7/8 2 Stage, High Speed		
	Length	2 ft
Torque Factor (Slope)		0.15 ft-lbs/psi
Off-Bottom	Speed	1050 rpm
	Pressure	360 psi (2.5 MPa)
Operating	Power	7.5 hp
	Torque	75 ft-lbs
	Speed	525 rpm
Stall	Torque	150 ft-lbs
	Pressure	1,000 psi (6.9 MPa)

*Performance at 100 GPM (380 lpm) flowrate

High Speed:

High power/ short length

Comparable to turbines

Req. high pressure to deliver torque (+3,000 psi for 300 ft-lbs)

Low Speed:

Power limited by bearing loads

Alternative arrangements reduce bearing loads/ increase torque factor

→ Neither demonstrate damage from stalling

Concluding Remarks

- Commercial focus on vibratory tool will help observe long term wear, economics, improvements, etc.
- Optimistic about improving torque and power with lower pressures
- Interested in discussing applications & other considerations
- Thank you to customers/partners that have assisted with input, testing, etc.

Thank You!

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ALL METAL
POWER SECTIONS
by Monashee Pumps Inc.