PCP OPERATION & COMPLETION RECOMMENDATIONS

PCM VULCAIN™

keep it moving

HYDRAULICS

		Min	Recommended	Max
Speed (rpm)		50	100-250	350
Loading on head (%)	downhole viscosity < 500 cp (hot)	-	0-70	80
	downhole viscosity > 500 cp (cold)	-	0-90	120
Friction losses vs total head (%)		-	0-30	90
Submergence (m)	with downhole level monitoring system	10	30 and above	-
	without	30	100 and above	-
GVF at pump (%) excluding vapor content		-	0-20	40

FLUID

		Min	Recommended	Max
Specific oil gravity		-	8-45	-
Water cut (%)		-	0-100	-
Sand volume cut (% vol. / ppm)		-	0-5 000	1 / 10 000
CO_2 content (% vol.)		-	0-3	8
H_2S content (% vol.)		-	0-3	8
Viscosity at pump intake		-	up to 3 000	12 000
Steam flow rate (m^3/d)	AMPCP size: 4"	-	0-2 500	-
	AMPCP size: 4" 1/2	-	0-4 000	-

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PCM Vulcain™ operation & completion recommendations

WELL GEOMETRY & COMPLETION

		Min	Recommended	Max
Pump setting depth MD (m)		-	0-1 500	2 200
Dog leg above pump (°/100ft)	with sucker rods	-	0-6	12
	with continuous & hollow rods	-	0-10	16
Dog leg at pump depth (°/100ft)		-	0-2	4
Hole angle at pump depth (°)		-	0-70	90
Tubing & stator assembly radial clearance vs CGS ID (mm)		5	10 and above	-
Rotor radial clearance vs tubing ID (mm)		1	3 and above	-
Rod coupling radial clearance vs tubing ID (mm)		4	8 and above	-
Max (D rotor+4E; D rotor head+2E; CPLG+2E) radial clearance vs pup joint ID (mm)		2	6 and above	-
Rod centralizer contact load (kg)		-	0-50	75
Rod torque and stress load (%)		-	0-80	95
Well head flowing pressure (psi)		-	0-400	500
Well head static pressure (psi)		-	0-800	1 000
Temperature at surface	with standard sealing	-	0-80	120
	with HT sealing	-	0-180	260
Drivehead axial load (%)		-	0-80	100
Motor torque and power load (%)		-	0-80	90

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SURFACE EQUIPMENT

ITEM	REQUIREMENT	DESCRIPTION	COMMENTS
1	Compulsory	High temperature seal (drivehead)	High temperature sealing system to protect drivehead during steaming phase and/or during high temperature production
2	Compulsory	Double high temperature BOP	TOP RAM (above flow line): Blind or PR HT RAM according to operator practice (to protect Drive Head from steam during steaming) BOTTOM RAM (bellow flow line) : PR HT RAM or 2 x single BOPs

TUBING STRING

ITEM	REQUIREMENT	DESCRIPTION	COMMENTS
1		Tubing	Control radial clearance of tubing & stator assembly (especially Cross Overs) with Casing ID
2	Recommended	3 x AVS	AVS#1 above Pup Joint + 1 x Tubing + AVS#2 + 2 x Tubing + AVS #3 (*Note : AVS#1 is the most critical)*
3	Compulsory	Cross over	Control radial clearance of Cross Overs with Casing ID
4	Compulsory	Pup joint (min length = total space out + 2ft)	To avoid rotor head contact on tubing, PCM recommends to install a Pup Joint above Stator. Control radial clearance of Rotor Head (specially coupling) with Pup Joint ID. Pup Joint length should be equal to total space out value +2ft minimum, usually equal to 4ft or 6ft (shorter length are prohibited, longer length are ok providing that it guaranty 1st rod centralizers will not be located inside pup joint)
5	Compulsory	Cross over	Control radial clearance of Cross Overs with Casing ID
6	Compulsory	Stator	PCM Vulcain™ stator
7	Compulsory	Short tag bar	Perforated plate should be preferred vs transversal pin to avoid rotor blockage in case of low space out. Minimum flowing area equal to tubing flowing area should be guaranteed. No side slot design to limit solid at intake. Attention: Tag Bar for PCM Vulcain™ should be shorter than Tag Bar for PCM Moineau™.
8	Compulsory	Centralizer torque anchor	To limit vibration and risk of tubing back off, PCM highly recommend to install centralized torque anchor.
9	Compulsory	Slotted joint	To protect intake of pump from solids, PCM recommend to install slotted joint. flowing area of slotted joint = 3 x pump flowing area minimum (to be adapted to application/ viscosity) recommend slot width of half inch.
10	Compulsory	Bull plug	

PCM Vulcain™ operation & completion recommendations

ROD STRING COMPLETION

ITEM	REQUIREMENT	DESCRIPTION	COMMENTS
1	Compulsory	Polished rod	
2	Compulsory	Polished rod coupling	Provide additional PR coupling as spare parts, for back up on field
3	Compulsory	Pony rod	As per space out requirement, but at least 1 pony rod in order to connect 1 x HT centralizer as close as possible to Polished Rod (but no centralizer directly connected to polished rod)
4	Compulsory	High temp. rod centralizer #3	To limit drive head sealing wear, PCM recommend to install HT rod centralizers close to surface (but not directly on polished rod to avoid possible connection issues or damages on polished rod, but bellow a pony rod connected to polished rod)
5	Recommended	Sucker rods & HT centralizers or continuous rod	For sucker rod completion, at least 1 x Rod Centralizer every 10 x sucker rods should be installed along rod string. More centralizers may be installed depending on application : deviation, load, oil property, tubing & rod size,...
6	Recommended	High temp rod centralizer #2	A second HT rod centralizers above rotor and above a second pony rod, may be installed in order to absorb more eccentricity.
7	Recommended	Pony rod 12ft	
8	Compulsory	High temp rod centralizer #1	To properly absorb PCP eccentricity and so limit vibration and wear of PCP system, PCM recommend to install a HT Rod Centralizers above a 12ft (10ft mini) pony rod above rotor. Centralizer should never be installed directly above rotor.
9	Compulsory	Pony rod 12ft	To manage properly eccentricity of PCP and taking into account flexibility of rod, PCP recommends to install a 12ft pony rod above stator (10ft long pony rod mini).
10	Compulsory	Coupling sim hole	Full size CPLG can be ok but double check clearance vs PJ
11	Compulsory	Rotor	PCM Vulcain™ rotor

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