## COSL COMPLETION CENTER P.O DIVISION COSL Diligently

## **High Quality CompletionTools Suppliers**

- Completion Tools
- Sand Control Screen
- Completion Service



## 我们·产液编得更好 ALWAYS DO BETTER







## **Brief Introduction**

The Well Completion Center is a subsidiary specialized well completion company of Production & Optimization Division, China Oilfield Services Ltd. We are a comprehensive designer and provider of completion equipment and field services. We offer a proven portfolio of well completion technologies, together with domain expertise, skillful manufacture and commitment to flawless execution to win the leading position in the market.

We provide customized screens, upper and lower completion tools which could meet the requirements of all kinds of upper artificial lift modes, lower gravel pack and stand-alone design. We have numerically controlled machining equipment available with highly trained machinists who take pride in producing quality products. These products are machined on advanced large-scale CNC processing equipment to assure precise tolerances and repeatability. Service and completion tools are assembled, tested, packaged and labeled in Tianjin, China then shipped to customer. With an in-house hydro testing facility all the products are tested in compliance to API standards. For technical services, we have mature well completion sand-control experimental ability and field servicing personnel to conduct formation sand fineness testing, sand-control test evaluation, and ensure the multiple simultaneous operations.

With the guidance of concept Well Completion Integrated Service, we have formed the service network of R&D, design, manufacture and marketing to meet of the oilfield production actual needs.

## **Enterprise Qualification**

We have established a comprehensive QHSE management system which meets the requirement of ISO9001 and API Q1 certification and petroleum industry safety production standard well completion operation implementation specifications. We have also obtained the API Spec Q1 and ISO 9001 quality management system certifications as well as API -11D1, API-5CT, API-14A, API-14L product certifications to guarantee the safe, high-quality, efficient services for our clients.



Over 70 patents forms a series of high-performance products with proprietary intellectual property rights.



## **Major Achievements**

Since 2003, we have provided the ESP packers, subsurface safety valves, Y-blocks, sliding sleeves and bailing pumps for more than 900 wells, and sand-control packers, isolation packers and sump packers for over 300 wells, as well as 200000m sand-control screen products. Our products are widely used in domestic and overseas onshore and offshore oilfields, which supported excellent commercial credits.

In 2015, the integrated well completion services for 11 wells of CFD Oilfield have been widely acclaimed by our clients. In was our first time to provide the whole set of self-developed well completion tools in single well of CNOOC offshore oilfield.

The CFD Oilfield project was finally proved to be a great success. The performance of self-developed completion tools and servicing ability has been highly praised by our clients. The CFD Oilfield project which fully demonstrated the integrated well completion capability is a milestone for the fast development of the completion center.



## **Main Business**

# Well Completion Tool Development





We have a research group with high education, currently possesses the matching R&D capability for all kinds of screens, upper and lower completion tools which could meet the requirements of different upper artificial lift modes, lower gravel pack and stand-alone design. We have 14 patents of sand-control screens, and published 4 CNOOC screen product technical standards. Currently, the completion center has the capacity in continuously improving the completion tools and sand-control screens, meeting requirements of the clients.



## **Main Business**



For the manufacturing, our professional technicians with modern production management knowledge and processing experience, who operate over 50 advanced processing equipment as screw-on machines, screen production lines.

Our main products include the safety valve, ESP packer, production sliding sleeve, gas vent, top packer, isolation packer, sump packer, pack sliding sleeve, wire-wrapped screen, CMS screen and slotted liner.





## **Main Business**

## **Field Services**





We could provide integrated services of program design, tool research design tool material preparation and field operation with a group of experienced field servicing technicians. We have 8 senior engineers with 10-year working experience, 5 sand-control engineers with 10-year working experience, 5 team leaders with 6-year experience, 10 team leaders with 10-year experience, over 20 tool operators with 2-year working experience. We have 4 groups of sand pump service personnel with 5-year working experiences.



## 利何·产源编得建好 ALWAYS DO BETTER



## CATALOG

### **Production Tools**

Y– block ESP production string	2
Production completion string of gas lift	3
Flowing well production completion string	3
Retrievable hydraulic-set ESP Packer	4
Gas Vent Valve	5
Cable Pack-Off	5
Tubing retrievable subsurface safety valve	6
Deep water subsurface safety valve	6
Sliding sleeve	7
Y-Block	8
Retrievable hydraulic - set production Packer	8
Chemical medicament injection valve assembly	
Cas lift value and side peoplest mandral	
Gas lift valve and side pocket mandrel	
Auto guide shoe	
	11
Auto guide shoe	11 11
Auto guide shoe Pack-Off Assembly	11 11 12
Auto guide shoe Pack–Off Assembly Landing nipple	11 
Auto guide shoe Pack–Off Assembly Landing nipple Travel joint	
Auto guide shoe Pack-Off Assembly Landing nipple Travel joint Swivel joint	11 11 12 13 13 13 14
Auto guide shoe Pack-Off Assembly Landing nipple Travel joint Swivel joint Bailing pump	11 11 12 13 13 13 14
Auto guide shoe Pack-Off Assembly Landing nipple Travel joint Swivel joint Bailing pump Check Valve	
Auto guide shoe Pack-Off Assembly Landing nipple Travel joint Swivel joint Bailing pump Check Valve Sand Control Tools	11 11 12 13 13 14 14 14

## CATALOG

MCF Slide Sleeve	17
O-ring Sealbore	18
FSF Float Shoe	18
FVF Fluid Loss Control Valve	18
COSL Multi-Zone Sand Control System (CMZ)	19
Introduction of tools	19
Overall Configuration	19
HPF-H Sand Control Packer	20
IPF Isolation Packer	20
SPF Sump Packer	21
CSLF Locator Seal Assembly	21
COSL One-trip Multi-zone Gravel Pack System (CMP)	22
String tool descriptions	22
The completion string combination:	22
Top packer	23
Pack–Off Assembly	23
Seal bore	24
Extension	24
Sliding sleeve	24
Collar locator	25
Isolation packer	25
Sump packer	26
Snap latch	26



## CATALOG

### **Thermal Recovery Tools**

Thermal injection packer	29
Isolation packer	29
Segmented packer	30
Insulated Compensator	30
Insulated stabilizer	31
Uniform injection valve	31
Anti-Pollution String And Key Tools For Thermal Recovery Wells	32
Hanging packer	33
Underground switch	33
Plug-in sealer	34

### Sand Screen

Quality Control	. 36
CMS Screen	. 38
CMS-Slim Screen	. 39
CDWS Screen	. 40
Wire-Wrapped Screen	. 41
Punched Screen	. 42
Slotted Liner	. 43

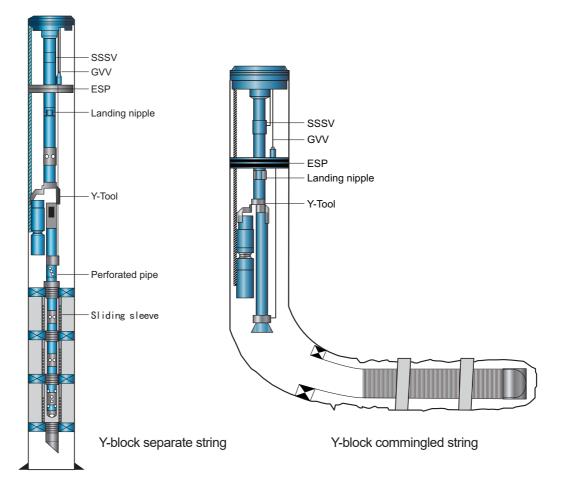
## **Completion Tools | Production Tools**



•

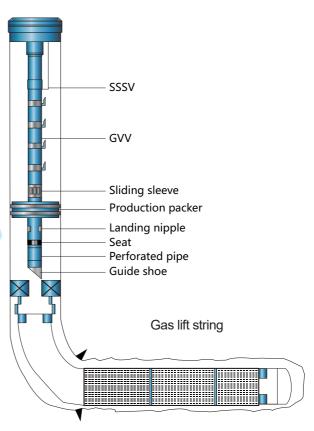
## • Y- block ESP production string

Y-block separate production string and Y-block commingled production string are the common completion strings of ESP artificial lift. Among them Y-block commingled production string configuration is simple and easy to operate. Under the same pressure system and fluid property of all layers, each layer can produce at the same time. Y-block separate production string is suit for separate production of single layer for multilayer zones, not to control commingled production or control commingled production, it is commonly conducted by slick line operation.



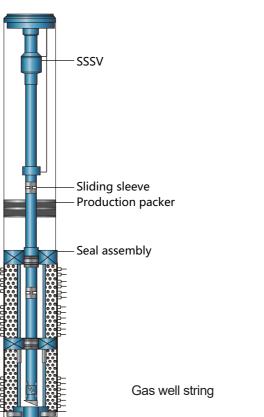
## • Production completion string of gas lift

Gas lift production has characteristics of large fluid rate, deep gas lift capacity, corrosion resistance, and easy operation and management, etc. It is suit for high ratio of fluid to gas, deep well, sand production well and deviated well. Gas lift production can form huge production drawdown within wellbore. It is an ideal method of carrying fluid, and can be a steady technology of oilfield development. In addition, the main equipment of production technology (compressor, etc.) is installed on ground, it is easy to check and maintain, less occupancy of deck area, and suitable for offshore oilfield.



## • Flowing well production completion string

The production completion string of flowing well is simple, and it uses retrievable hydraulic –set production Packer. The tool material (include seal elements) has corrosion resistance in the consideration of detailed tool configuration. It is commonly used with high quality seal, special screw thread of metal to metal seal (such as FOX, NEW VAM, TS-3SB,HSM-2, etc.). Depending on the production requirements, its tool configuration can add chemical medicament injection valve, traveljoint, etc.



## • Retrievable hydraulic-set ESP Packer

#### Introduction

Retrievable hydraulic-set ESP packer is used for ESP completion. The inner clip with spring load is used for packer to set lock framework. The lower mechanical outer clip can keep the packer in the state of setting, and it can endure the force acted on the Packer upward and downward. The seal elastomeric cylinder can keep the Packer in the state of good setting under high pressure and low pressure or inner casing of regulation. Release method of Packer is divided into pulling the tubing string upward and hydraulic release.

#### **Features**

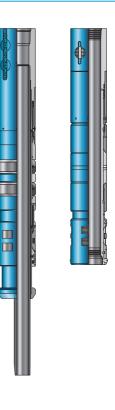
- A pack-off power cable is provided for thread connections on the top of Packer.
- Additional bores can be attached to gas vent valve, chemical-injection lines, hydraulic pressure control lines and wellbore monitoring devices through the packer.
- Double-seal elements have the same or different hardness.
- Bi-directional slips of exterior hot worked elements can endure the force acted on the Packer upward and downward.
- An upper pressure-actuated hydraulic slips can accommodate the differential pressure of above and below Packer.
- Setting and release force can be adjusted by Shear screws.

#### **Benefits**

- Low setting pressure.
- Release by pull straight or hydraulic release.
- Allows varied setting pressure with varied numbers of shear screws.
- Allows adjust setting and release force by adjustment of shear screw number.
- Allow adjust release force on site.
- Efficiently reduce the overall costs of submersible pump completions.

#### **Specifications**

Max	. OD	Major Path	Cable Crossing	Air Bleeder	Other Path 1	Other Path 2	Lincet M/av	Pressure rating	TEMP grade						
in.	mm		Path	Path Path Other Path 1 Other Path 2 U		Unset Way	Psi	°C							
		3-1/2" API EU	ir-Tight 1.9" API NU (1) 3/8" NPT(2) 1/4" NPT(2) pull-										3/8" NPT(2) 1/4" NPT(2)		
		3-1/2" Air-Tight			3/8" NPT(2)	1/4" NPT(2)	pull								
		4-1/2" API BC			•	3000									
8.48	215.4	(2) NU 5/6 N(1(3)			3/8" NPT(3)				135						
			hydraulic												
			(1)		3/8" NPT(2)		•	5000							
6.00	152.4	2-7/8" API EU	1.9" API NU (1)	1.0" NPT	3/8" NPT(2)		pull-to- release	3000							



### Gas Vent Valve

#### Introduction

Gas vent Valve is installed above the ESP packer, and it is attached to the packer with thread. It is controlled by hydraulic control line through surface manipulation. When pressure load isapplied in hydraulic control line, the valve opens, it allows gas which has accumulated vent to the annulus below the packer. When control line pressure is released, the valve will return to the normally closing state. When the hydraulic line fail the gas vent valve can be switched through applying pressure and releasing pressure.

#### **Features/Benefits**

- Gas vent valve can be switched by applying pressure and releasing pressure.
- Open pressure can be adjusted.
- Metal to metal seal, reliable, long service life.
- Little OD, large flow area.

#### **Specifications**

Tubing Size		Open	Area	PressureRating	Max	. OD	ConnectingThread
in.	mm	in. <sup>2</sup>	mm <sup>2</sup>	Psi	in.	mm	in.
1	25.4	0.7854	506.71	5000	1.42	36.0	1 NPT P×1/4 NPT B
1.9	48.3	1.7670	1140.00	5000	1.97	50.0	1.9 NU P×1/4 NPT B

Note: Other specification products are available.

## • Cable Pack-Off

#### Introduction

Cable Pack-Off Assembly is installed above the ESP packer to provide seal between the packer and the electric cable which is installed through the two end of the ESP packer. There are three types of Cable Pack-Off Assembly, including mechanical, fast insert integrity and injection elastomeric integrity.

The upper Joint and lower Joint of mechanical insert –style cable are stabbed to the packoff Joint by mechanical torque inside Cable Pack-Off Assembly which is enwrapped by elastomeric , which makes elastomeric cylinder compress, therefore, the seal function is achieved. Seal effect depends on the mechanical torque, make-up torque should be controlled about 200 ft-lb.

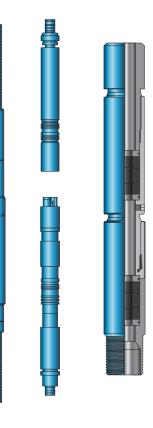
Fast insert cable seal adopts modularization design, it is suit for all kinds of wellbore power cable stabbed by changing corresponding seal elements. It can be installed on site. Super insulation materials are used by insulator inside the inserting Joint, seal elements are made of elastomeric material, it can be selected depending on the wellbore operation condition.

The cable seal of injected elastomeric integrity adopts factory installation, which is provided by integral molding products while leaving factory. Inner insulator adopts super insulation material, elastomeric sulfuration, elastomeric material can be selected depending on wellbore operation condition.

#### **Specifications**

OD	≤2.44 in	Connecting Thread	1.9"NU
Rated Voltage	AC5000V	Rated Current	160A
Top Rated Pressure	35MPa	Lower Rated Pressure	35MPa

Note: Other specification products are available.



## • Tubing retrievable subsurface safety valve

#### Introduction

Tubing retrievable subsurface safety valve is the important tool componentof completion production string. It can control flow of wellbore fluid. It requires high quality and high reliability. Hydraulic driving equipment of Safety valve enhance the reliability of tools. Its special configuration effectively isolates fluid into inner string. The main connection and key equipment use integrity metal to metal seal. It not only saves cost but also achieve high quality seal. Simple and compact design of safety valve enhances integrity reliability. It can effectively reduce operation failure.

#### **Features**

- Isolate well by metal to metal seal. Special actuated elements (single piston, flow pipe).
- Hydraulic chamber configuration achieves effective isolation between the inner parts of SSSV and outer fluid.
   Biggest piston area and spring force.

#### **Benefits**

- Metal to metal seal has been validated for sand control service.
  Flow pipe configuration can effectively prevent the solid sedimentation of wellbore from accumulating at the top of piston.
- Achieve isolation between key elements and wellbore environment.

#### **Specifications**

	Tubing Size		Max. OD		Internal Pack Bore		Lock	Pressure Rating	Opening Pressure	Closing Pressure
	in.	mm	in.	mm	in.	mm	Profile	Psi	Psi	Psi
	2 7/8	73.0	4.63	117.5	2.313	58.8				
	3 1/2	88.9	5.38	136.7	2.812	71.4	CX	5000	2200	500
1	4 1/2	114.3	7.13	181.0	3.812	96.8				

Note:Other specification products are available.

## • Deep water subsurface safety valve

#### Introduction

Deep water subsurface safety valve is a double -line equilibrium SSSV. It has double piston configuration. Its equilibrium of power piston is through the equilibrium piston action. The setting depth of SSSV is increased consequently. Setting depth of SSSV is only restricted by temperature in theory due to the temperature limitation of piston seal elements. The valve is constant –closing, the SSSV will come back to close when the pressure of control line releases.

#### **Feathers**

- Use valve board switch of double -control line. Use metal to metal seal to close the well.
- The valve board is a optimization designed wedge board valve, more equilibration for the force acted on valve.

#### **Benefits**

- Optimization configuration design, reliable, deep setting depth.
  Dynamic seal uses non-rubble seal material, has chemical inertia, its property is not effected by environment.
- Pole type piston, less working drag, and it is suit for deep well.

#### **Specifications**

Tubin	g Size	Max	. OD	Internal F	ack Bore	Opening Pressure	Closing Pressure
in.	mm	in.	mm	in.	mm	Psi	Psi
2 7/8	73.0	4.50	114.3	1.63	41.4	5000	1200~1800

## • Sliding sleeve

#### Introduction

Sliding Sleeve is a fluid control tool. The switch function can be controlled by slickline operation. Therefore, the payzones are communicated. Sliding sleeve can be in the state of full opening, equilibration or closing by three-position elastomeric clip lock groove. When sliding sleeve switch is in the state of full opening or full closing, the differential pressure between tubing and tubing and casing annulus can be balanced through the equilibrium orifice of inner sliding sleeve. It can be selectively switched for certain sliding sleeve depending on requirements.

The collapse strength, tensile strength and burst strength of circulation sleeve are equal to or greater than that of N80 tubing. Some model sliding sleeve is also available, which strength is equal to or greater than that of P110 tubing.

#### **Features**

• Non-elastomeric seals.

- High polished seal surface.
- The flowing area of circulation sleeve / production is the same as that of tubing section.
- Circulation sleeve is in the state of stillness seal after opening / closing switch.
- Three-position elastomeric clip lock groove.
- High differential pressure can be balanced through the equilibration orifice of inner sleeve.

#### **Benefits**

- Equilibration differential pressure can reach to 7500 psi.
- Even though sand is full of external sleeve, inner sleeve can still be opened, closed.
- Multi-circulation sleeve can be run in single string.
- Sliding sleeve can be fully opened or closed by single –trip slickline operation, certain sleeve can be opened or closed selectively depending on the requirements.
- Inner sleeve can be opened, closed time after time.

#### Application

- Single –string separate production.
- Secondary production development.
- Circulation kill well.
- Wash well above the packer.

#### **Specifications**

Si	ze	Max	. OD	I	D	Duction	TEMP Rating	Pressure Rating
in.	mm	in.	mm	in.	mm	Profiles	Ĉ	Psi
4 1/2	114.3	5.56	141.2	3.813	96.9			
3 1/2	88.9	4.5	114.3	2.813	71.5		CX 190	7500
2 7/8	73.0	3.75	95.3	2.313	58.8	СХ		
2 7/8	73.0	3.22	81.8	2.313	58.8			
2 7/8	73.0	3.22	81.8	1.875	47.6			

#### ProductionTools

## • Y-Block

#### Introduction

Y-Block is applied to Electric Submersible Pump completion string. The upper part of Y-Block is attached to the landing nipple, and the lower part of Y-Block connects to both landing nipple and the ESP. The tensile strength and compress strength of Y-Block is equal to or greater than that of N80 grade tubing, it also has corrosion resistance at the same time.

#### **Features**

large flow area
 simple design

#### Applications

- vertical, deviated or horizontal well
- single- string selective completion

#### **Specifications**

Casing Size		Top Connecting Thread	Bottom Major Thread	Lower by-pass Thread	Pressure					
in.	mm	in.	in.	in.	Psi					
		3-1/2 API EU	3-1/2 API EU	2-7/8 API EU						
9-5/8	244.5	3-1/2 API NU	3-1/2 API NU	3-1/2 API NU						
0 0/0	211.0	211.0	21110				3-1/2 NEW VAM	3-1/2 NEW VAM	3-1/2 NEW VAM	
		3-1/2 FOX	3-1/2 FOX	2-7/8 FOX	5000					
		2-3/8 API EU	2-3/8 API EU	2-3/8 API EU						
7	177.8	2-7/8 API NU	2-7/8 API NU	2-3/8 API NU						
		2-7/8 NEW VAM	2-7/8 NEW VAM	2-3/8 NEW VAM						

Note: Other specification products are available.

## • Retrievable hydraulic -set production Packer

#### Introduction

Retrievable hydraulic set production packer is a packer for a single string hydraulic setting and shear release. It is used for annulus isolation of tubing and casing of production well. It has the function of isolating multi-zones, protecting casing, reducing wellhead annulus pressure and isolating tubing and casing.

#### **Features**

- Adopt high quality elastomeric seal element, products can normally work under the temperature condition of 150°C.
- Optimization piston design, product can be reliably set in the pre-determined differential pressure.
- Packer is released by pulling string.
- Release force can be adjusted depending on the requirement on site.

#### **Specifications**

Size		Max	. OD	I	D	Pressure Rating	Unset Pulling Power
in.	mm	in.	mm	in.	mm	Psi	$ imes 10^4$ Lbs
7	177.8	5.91	150	2.92	74.2	5000	2、3、4、5





## • Chemical medicament injection valve assembly

#### Introduction

Chemical medicament injection valve assembly includes chemical valve and fixed chemical injection joint, which is a wellbore equipment for controlling chemical medicament into tubing. Fixed injection valve is attached to fixed nipple before running in wellbore. A control line is connected to chemical valve and wellhead. Chemical medicament is injected into the production string by the surface chemical injection pump through control line, and fixed chemical injection valve. It may be unnecessary to connect control line, it can be injected into production string directly through annulus of tubing and casing.

#### **Features**

- Rupture tray adopts breakable glass or metal.
- Injection valve adopts standard NPT.
- Has check valve design for injection valve.
- The materials of injection valve which has stainless steel and NCONEL can be selected depending on requirement of well condition.
- The integral configuration of nipple is used, it is firm and durable.
- The connection thread of nipple and chemical injection valve is 1/2" NPT.
- Many kinds of materials can be selected for injection join.

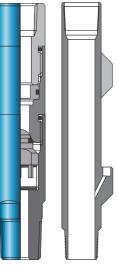
#### **Specifications**

Chemical medicament injection valve

Top Connecting Thread	3/8"NPT BOX	Pressure Rating	6500Psi
Bottom Connecting Thread	1/2"NPT PIN	TEMP Rating	149°C
Max. OD	1.00"	Security SD	1800m

Fixed chemical injection NPL

Tubing Size		Max	. OD	Bore Size		Bore Size		PressureRating	Valve ConnectingThread
in.	mm	in.	mm	in. mm		Psi	in.		
3-1/2	88.9	5.20	132.1	2.87	72.9	5000	1/2 NPT BOX		
2-7/8	73.0	4.72	119.9	2.36	59.9	5000	1/2 NPT BOX		



#### ProductionTools

## • Gas lift valve and side pocket mandrel

#### Introduction

Gas lift valve is incorporated with side pocket mandrel to achieve gas lift function.

#### **Features**

- Circular and elliptical side pocket mandrel can be selected.
- The crust of gas lit valve is made of Cr- Ni stainless steel, it has good corrosion resistance.
- Silicon oil is used to reduce vibration inside the ripple pipe of gas lift valve and journey restriction of mechanical configuration.
- Pressure endurance exceeds 40MPa, temperature endurance is excess of 160 °C, oil resistance, gas resistance.

#### **Specifications**

GLV technical parameter

Во	ttom Data						
OD(in.)	Availab leareaAb(in. <sup>2</sup> )	Valve seat bore diameter (in.)	Valve orifice area Ap (in.²)	Ap/Ab	1- (Ap/Ab)	Tubing effect factor T.E.F	
		0.126	0.0127	0.0406	0.9594	0.0423	
0.749	0.211	0.185	0.0272	0.0992	0.9078	0.1016	
0.740	0.748 0.311	0.252	0.0503	0.1645	0.8385	0.1926	
		0.280	0.0619	0.1986	0.8021	0.2476	



#### GLV structure

Max. OD(in.)	1
Full Length(in.)	18.9
Bellow Available Area (in.²)	0.31
Valve Seat Bore Diameter(in.)	φ3.2、φ4.7 φ6.4、φ7.1

Side pocket mandrel

Tubing Size(in.)	2-7/8
Max. OD(in.)	4.75
Bore Size(in.)	2.347
Orifice Diameter(in.)	1
TEMP Rating(°C)	150
Pressure Rating (psi)	5000



## • Auto guide shoe

#### Introduction

The role of Auto guide shoe is attached to the bottom of the production string for guiding the string to set on the position smoothly.

#### **Features**

- Auto guide shoe can rotate through mechanical action.
- Large ID, meets the need of production.
- Small OD, can stab through the sand control packer.
- Thread can be custom-tailor according to requirement.

#### **Specifications**

Si	ze	0	D	ID		Freedon	n Length	Min L	ength
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
2-7/8	73.0	3.24	82.3	2.36	60.0	24.72	628.0	20.06	509.4

Note: Other specification products are available.

## Pack-Off Assembly

#### Introduction

#### 1. Locator Tubing Seal Assembly:

Locator Tubing Seal Assembly is the most basic sealing method of sealbore packers. It is run in the wellbore with production string. Its "locator" is set on the top of the packer, which is achieved by no-go shoulder itself. The locator of sealbore packer can be achieved by one or multi group seals, which make up the seal between packer and tubing. Tubing is ordinarily in the state of compress after locator tubing seal is set on the packer, which can compensate for the tubing distortion, but it is impossible and not necessary to provide enough downward weight, especially in deep deviated well. Under this condition, it is needed to increase the length of seal bore packer by using the seal bore extension.

#### 2. Tubing Anchor Seal Assembly:

Tubing Anchor Seal Assembly is run into the well with the production string. While locating , the anchor's threaded latch is engaged into the thread correspondingly at the top of the packer. Once engaged, the anchor and tubing are securely locked in place. Any tubing contraction will cause a tensile load which applied to the tubing string. Ensure tensile forces development, which do not snap the tubing whenever Tubing Anchor Seal Assembly is used. To release the anchor, it must be rotated by right -hand 10 to 12 turns.

#### **Specifications**

Sealin	Sealing Size		Max. OD		D	Connecting Thread
in.	mm	in.	mm	in.	mm	
3.250	82.55	3.60	91.4	1.995	50.7	
3.880	98.55	4.25	108.0	2.441	62.0	Satisfy all the
4.750	120.65	5.10	129.5	3.548	90.1	connection type
6.000	152.40	6.40	162.6	4.892	124.3	

ProductionTools

## • Landing nipple

#### Introduction

Model CX and CXN landing nipple are run in wellbore in conjunction with completion string, exact landing position is provided for wellbore flow control tool. CX and CXN type landing nipple are applicable for standard grade tubing.

Multi-same ID landing nipple can be run at will in the string at a will order. Many positions at discretion are provided by string to set and lock wellbore flow control tool. Flow control tool is run in wellbore in conjunction with lock nipple by a wireline service tool.

Service tool is selected by operator accordingly. Flow control tool can be set on the designed depth of certain landing nipple. If the position is not suitable or wellbore condition has changed, another suitable landing nipple can be found by pulling or tripping in flow control tool through slickline operation, and it is unnecessary to kill well during the whole operation.

Model CXN landing nipple is used for the single landing nipple operation. It can also be used at the bottom of CX landing nipple string. The ID of CXN and CX is the same for the same specification tubing string.

#### **Features**

- Large ID, reduce flow restrict.
- More commonly used for the same inner section configuration.

#### **Benefits**

- Multi-function, it can reduce completion and maintenance cost.
- Easy to operate.
- Mach choice can be selected to run, land and retrieve flowing control tool.

#### **Application**

- Hanging testing tool.
- Wellbore flow control tool can be set and locked at any position.

#### **Specifications**

Tubing Size		CX Sealing Size		CXN Sea	aling Size	NO-GO ID	
in.	mm	in.	mm	in.	mm	in.	mm
2-7/8	73.0	2.313	58.8	2.313	58.8	2.2	55.9
3-1/2	88.9	2.813	71.5	2.813	71.5	2.666	67.7
4-1/2	114.3	3.813	96.9	3.813	96.9	3.725	94.6





## Travel joint

#### Introduction

Travel joint is designed for application in both single string and multiple string completions, and provide alternative methods of compensating for the tubing contraction and elongation in producing, injection, and disposal wells. It is run as an integral part of the tubing string and has a full tubing drift ID which is compatible with other downhole control equipment. After the packers and associated equipment are in place, travel joint may be activated. Depending on the application, travel joint may be activated by shear pins or standard wireline tools.

The travel joint may be sheared by tension or compression. They may also be sheared during initial completion operations or left the pin to be sheared at a predetermined value later. The travel joint can be pinned at any point in the stroke. The release value can be varied by the number of shear screws. The tool can compensate for 10 ft tubing movement.

#### **Features**

- compensating for tubing movement in various conditions.
- tool can be locked in open, mid-stroke, or closed positions.
  ID of the tool is compatible with tubing ID.
- shear screws easily added or removed to adjust shear value.

#### **Specifications**

Si	ze	Max	. OD	Bore Size		Max. Shear	Travel	Length
in.	mm	in.	mm	in.	mm	lbs	ft	m
2-7/8	73.0	4.53	115.1	2.441	62.0			
3-1/2	88.9	5.12	130.0	2.992	76.0	40000	10	3.05
4-1/2	114.3	6.53	165.9	3.875	98.4			

Note: Other specification products are available.



#### Swivel joint

Swivel joint is used for both single - and dual -string completion, it can continuously swivel 360 degree while keeping isolation of tubing and casing annulus. Swivel joint can be run in hole along with integral tubing string which act as a part of tubing string, its inner diameter is the same as the standard tubing, it can be incorporated into other down hole control tools. Swivel sub can act by cutting the shear pin.

#### **Specifications**

Size		Max. OD		Path Size		Max. Shear
in.	mm	in. mm		in.	mm	lbs
2-7/8	73.0	4.3	109.2	2.370	60.2	40000
3-1/2	88.9	4.8	121.9	2.930	74.4	40000

#### **ProductionTools**

### • Bailing pump

#### Introduction

Bailing pump is a reliable and effective downhole wash tool. It can wash the large sands in wellbore with single trip. When applying, its two ends are attached to connection ball valve and sand store bucket. Seal system adopts premium V-shape seal assembly. The highest working temperature is 248°F(120°C). The seal assembly has cushion ring and wearable ring. It can ensure nature long work time. Six square nipple can transmit torque.

#### **Features**

- Run in wellbore, easy operation.
- Adopt V- shape seal assembly, excellent seal performance.
- Differential pressure:5000 psi, the highest working temperature: 248° F (120° C).
- Has wash device at the two end of seal assembly.
- Can transmit torque.

#### **Specifications**

Tubing Size		Max. OD		Bore Size		Capacity		Travel Length		
	in.	mm	in.	mm	in.	mm	gal	L	ft.	m
	2-7/8	73.0	3.615	91.8	1.585	40.3	1.6	6.1	5.0	1.52
	2-7/8	73.0	3.915	99.4	1.950	49.5	3.7	14.0	8.5	2.59
	3-1/2	88.9	4.515	114.7	2.380	60.5	6.3	23.9	10.5	3.20
	3-1/2	88.9	5.515	140.1	2.485	63.1	10.3	39.0	12.0	3.66

Note: Other specification products are available.

## Check Valve

#### Introduction

It is mainly used with bailing pump and connected to both ends of the bailing pump. It allows the fluid to flow upward and blocks the fluid to flow downward.

#### **Features**

- Used with hydraulic setting packer.
- Large flow area.
- Capable to work under high pressure and temperature.
- Single trip.
- Used with bailing pump.

#### **Specifications**

Si	ze	Flow	Area	Max. OD		
in.	mm	ln.²	mm²	ln.	mm	
2-7/8	73.0	3.61	2329	3600	93.0	
3-1/2	88.9	4.90	3161	4500	114.3	





**Completion Tools | Sand Control Tools** 

前的步派编得爱好 Always DO BETTER

### Sand Control Tools

### COSL Openhole Horizontal Gravel-Pack System (COHP)

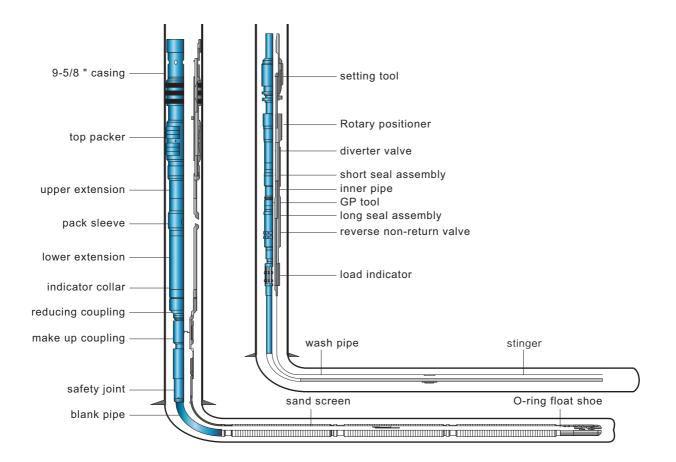
#### Introduction

COSL Openhole Horizontal Gravel-Pack System applied for gravel-pack sand control completion in openhole horizontal wells, which can successfully accomplish the string tripping in, setting, testing, releasing, circulation, gravel pack, acid washing, tripping out etc. The designed string can maintain the pressure in horizontal wellbore, which is greater than that of formation, protecting the stability of openhole wall and ensuring smooth of the gravel pack operation.

#### **Features**

- COHP allows normal circulation and proper rotating to resolve the problem of tight trip quickly, when tripping.
- The packer of COHP with beginner diameter has reliable setting and hanging performance, and two-stage setting mechanism.
- COHP can bear load to prevent pipe moving and ensure the best filling result, when pack.
- COHP can keep the well bore clean after pulling the service tool from the hole at the end of pack.
- COHP can withstand 46MPa working pressure and 300 degrees F (150 degrees C) working temperature, which could meet the requirement of frac-pack Completion.

### **Overall Configuration**



#### Sand Control Tools

## • HPF-H Sand Control Packer

#### Introduction

HPF-H sand control packer is designed for sand control well completion with properties of retrieve ability and hydraulic setting, which can bear the weight of downhole well completion tools. Perfect setting includes pressuring through drilling pipe, pushing pistons, cut down setting pins, pushing the slips, squeezing the seal elements etc. After setting, services tools could divorce from packer, and form the seal between oil pipe and casing during packing.

#### **Features**

- Several different steel grade of HPF-H are available, such as P110、T95、N80 etc.
- HPF-H has bi-direction slips, surface carbonation, reliable anchor, which is suitable for P110 or greater casing steel grade.
- HPF-H does not need rotate pipe when tripping in, setting, and retrieving.
- HPF-H has inner locking element with high reliability.
- The sealing element of HPF-H can stand high pressure.
- HPF-H is convenient for subsequent operation with the big seal bore size.
- HPF-H can transfer large torque, and bear rotating when encountering resistance.

#### **Specifications**

(	Casing Size		0	D	ID		Pressure Rating		TEMP Rating	
Size		weight	OD						TEIMF Raung	
in.	mm	lb/ft	in.	mm	in.	mm	psi	MPa	۴F	°C
9-5/8	244.5	40-47	8.45	214	6	152.4	6700	46	300	150

## • MCF Slide Sleeve

#### Introduction

Slide Sleeve can provide for COHP an inner path while gravel-pack, which can be opened and closed by appropriate tools. In addition, closing slide sleeve can isolate formation after pack.

#### **Features**

- Several different steel grade of MCF are available, such as P110、T95、N80 etc.
- MCF with special structure design can avoided opening or closing by mistake.
- MCF can decrease pack friction by the design of large flow area.

#### **Specifications**

	Thread Type	Flow Area	Area Max. OD		Min. ID		Pressure Rating		TEMP Rating	
		cm <sup>2</sup>	in	mm	in	mm	psi	MPa	۴F	°C
	7-3/4-8ACME.B× 7-3/8-8ACME.P	14.92	8.33	211	6	152.4	6700	46	300	150



### Sand Control Tools

## • O-ring Sealbore

#### Introductions

O-ring sealbore can be incorporated with stinger to form sealing, which could create a circulation channel.

#### Specifications:

Thread Turne	Max. OD	Min. ID	Collapse	Burst	TEMP Rating
Thread Type	in.	in.	MPa	MPa	°C
5-1/2" LTC.B×P	6.06	2.99	43.3	53.3	150

## • FSF Float Shoe

#### Introduction

Float Shoe are assembled at the bottom of COHP, which can use for check valve, float shoe and circular channel. In addition, it can prevent gravel flowing into screen when pack.

#### **Features**

- FSF has the special design, which is convenient for running string.
- FSF has the double-valve design, which is more reliable.
- Opening pressure of FSF is less than 300Psi.
- FSF has a large flowing area in Middle and by-pass.

#### **Specifications**

Thread Turne	Max. OD	Flow Area	Sealing Pressure	TEMP Rating
Thread Type	ln.	in <sup>2</sup>	MPa	°C
5-1/2″ LTC B	6.1	0.03	50	150

## • FVF Fluid Loss Control Valve

#### Introduction

Fluid loss control valve is one of the nonessential tool of COHP, which can keep the smooth of operation when pack. After service tools assembly pulls out of hole, FVF can prevent completion fluid leaking into formation.

#### **Features**

- FVF with Ceramic structure can be crushed if necessary, operating easily and reliably.
- FVF with inner protection shroud makes tools pass through easily, and protects ram and valve seat undestroyed.
- FVF can easily open under reversed pressure, which can be repeated several times with no damage.
- FVF has extension spring reset unit, which can increase the life of tools.

#### **Specifications**

Thread Type	Max. OD		Min. ID		Collapse Pressure	Burst Pressure	TEMP Rating	Tensile Strength
	in.	mm	in.	mm	MPa	MPa	°C	KN
5-1/2″ LTC.B×P	8.14	206.76	4.87	123.7	57.3	58.1	150	2550



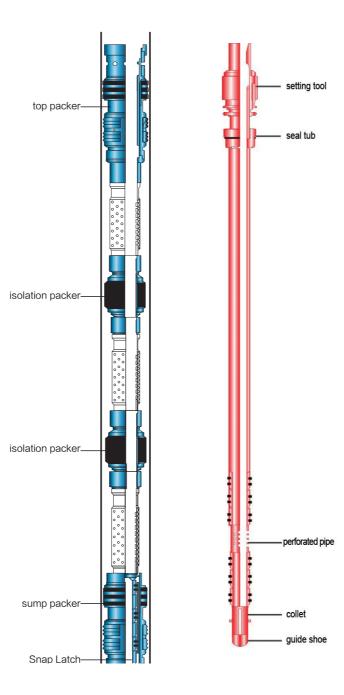


## COSL Multi-Zone Sand Control System (CMZ)

COSL Multi-Zone Sand Control System is fitted for multilayer stand-alone sand control in offshore 9-5/8" or 7" casing wells. CMZ can withstand the pressure of 40MPa, and the temperature of 150°C.Several different steel grade of SSCS are available( such as API P110, API N80, API L80-9Cr, API L80-13Cr etc.), which can meet different requirements.

### **Introduction of tools**

### **Overall Configuration**



### Sand Control Tools

## • HPF-H Sand Control Packer

#### Introduction

HPF-H sand control packer is designed for sand control well completion with properties of retrievable and hydraulic setting, which can hang the weight of downhole completion tools. Perfect setting includes pressure through drilling pipe, pushing pistons, cut down setting pins, pushing the slips, squeezing the seal elements etc. After setting, services tools could separate from packer, and form the sealing between tubing and casing during pack.

#### **Features**

- Several different steel grade of HPF-H are available, such as P110、T95、N80 etc. HPF-H has bi-direction slips, surface carbonation, reliable anchor, which is suitable for P110 or greater casing steel grade.
- HPF-H does not need rotate pipe when tripping in, setting, and retrieving.
- HPF-H has inner locking element with high reliability.
- The sealing element of HPF-H can stand high pressure.
  HPF-H is convenient for subsequent operation with the big seal bore size.
   HPF-H can transfer large torque, and bear rotating when encountering resistance.

#### **Specifications**

	Casing size			סו		ID		o Poting	Temperature	
S	Size Weight		OD				Pressure Rating		Temperature	
in.	mm	lb/ft	in.	mm	in.	mm	psi	MPa	°F	°C
9-5/8	244.5	40-47	8.45	214	6	152.4	7500	51.7	300	150
7	177.8	23-29	5.87	149.23	3.88	98.43	7500	51.7	300	150

## • IPF Isolation Packer

#### Introduction

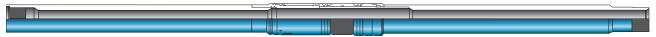
IPF isolation packer has the characteristic of retrievable and hydraulic setting, which is used for zonal isolation in CMZ. Perfect setting includes pressure through drill pipe pushing pistons, cutting shear pins, squeezing the seal elements etc.

#### **Features**

Several different steel grade of IPF are available, such as P110、T95、N80 etc.
 IPF does not need rotate pipe when tripping, setting, retrieving.
 IPF has inner locking element with high reliability.
 Sealing element of IPF can stand high pressure.
 IPF with big inner diameter is convenient for subsequent operation.

#### **Specifications**

	Casing size			OD		ID		o Poting	TEMP Rating	
Si	ze	Weight	UU		U		Pressure Rating			
in.	mm	lb/ft	in	mm	in	mm	psi	MPa	°F	°C
9-5/8	244.5	40-47	8.218	208.74	4.75	120.65	7500	51.7	300	150
7	177.8	23-29	5.75	146.05	3.25	82.55	7500	51.7	300	150



## • SPF Sump Packer

#### Introduction

SPF sump packer is a permanent packer, which needed to be set by special hydraulic or wireline pressure-operated setting tool. Also, it can be used as injecting & extrusion and testing bridge plug.

#### **Features**

- SPF with the firm structure permitted higher speeds during tripping without damage and midway setting. After setting, SPF can provide safe and permanent setting.
- SPF has double internal slips for a steady setting without displacement.
- SPF does not need to rotate or lift up the string while setting.
- The shear ring makes the whole string with a larger diameter.
- SPF designs with a seal bore.

#### **Specifications**

	Casing Size		OD				Drocour	o Poting		TEMP Rating	
Si	ze	Weight			ID		Pressure Rating				
in.	mm	lb/ft	in	mm	in	mm	psi	MPa	°F	°C	
9-5/8	244.5	40-53.5	8.386	213	6	152.4	5000	34.5	300	150	
7	177.8	23-32	5.875	149.2	4	101.6	7500	51.7	300	150	

## • CSLF Locator Seal Assembly

#### Introduction

CSLF Locator Seal Assembly is used at the bottom of CMZ, which can match with sump packer to seal inner and outer pipe.

#### **Features**

- Several different steel grade of CSLF are available, such as P110、T95、N80 etc.
- CSLF can help locate the position with collect fingers.
- CSLF has high reliability configuration with multi-section sealing.

#### **Specifications**

Thread Turpa	SealSize	OD		ID		Pre	essure Rating	TEMP Rating	
Thread Type	in.	in.	mm	in.	mm	psi	MPa	۴F	°C
7″ BTC BOX	6	8.125	206.4	4.875	123.8	5000	34.5	300	150
4-1/2" LTC BOX	4	5	127	3.07	78	5000	34.5	300	150



### Sand Control Tools

#### COSL One-trip Multi-zone Gravel Pack System (CMP setting tool One-trip multi-zone gravel pack system is used for the oil&gas wells with multiple perforated zones with each zone requiring gravel pack. The process can be one-time trip in multi-zone service tools, zoneby-zone setting, pack, sealing and isolating to prevent leaking, top packer realizing one-trip multi-zone unequal distance net pay gravel pack operations, greatly reducing well completion time. One-trip string, realizing packer setting and each-Pack off Pack-Off assembly zone separated pack for single-well multi-zones, high seal bore upper extension operation efficiency. pack sliding sleeve One-trip string for multiple sand-control service. İ lower extension " wash pipe 4 • Locating tool for the pack ,preventing string moving collar locator during pack. Isolation between layers when pack, preventing 27/8 " wash pipe sand screen, blank pipe completion fluid leaking. Examination after every-layer pack, repack if necessary. isolation packer String tool descriptions upper extension The completion string combination: pack sliding sleeve lower extension collar locator Wellbore tool string structure top packer + pack off Assembly + sealing tub + upper extension +pack sliding sleeve + lower extension + collar locator + sand screen/blank pipe + isolation packer + upper extension + pack sliding sleeve + lower extension + collar locator+ sand screen/blank pipe +snap latch + sump packer. The string uses ACME thread connecting with higher joint strength isolation packer besides using LTC casing thread, and the tool surface location uses middle seal contour localization, having the function to prevent tool rotating and upper extension to assist sealing. pack sliding sleeve Service tool string structure lower extension Setting tool + pack off + 4"&2-7/8"wash pipe + middle seal + GP Tool collar locator GP tool + MARS valve + load indicator + one way tool + two way tool + lower seal. Mostly using tougue&groove system+ O-ring to connect tools, MARS reducing wall thickness, increasing the insider/outsider diameter, load indicator higher joint strength; commonly using contour localization for the tool one way tool surface location, functioning in preventing tool rotating and assisting two way tool sealing. sump packer lower seal Snap latch

22 龙的产质做得更好 Always DO BETTER

#### Sand Control Tools

## • Top packer

Top packer is high-performance retrievable, used in gravel pack sand-control operation, horizontal well gravel pack, stand-alone completion or as separate packer. Bearing the weight of the wellbore string, leading the direction of the fluid, sustaining the up-down differential pressure; bearing extension and compression loading when tripping in, setting and releasing, also delivering bigger torque when tripping in well.

#### **Main features**

- No need of rotating string during tripping in, setting and retrieving.
- Not easy releasing in locking system, high reliability.
- Strong pressure bearing ability of rubber sleeve.
- Surface carburization slips easily cutting in casing with steel gradeP110 or higher.
- Big Internal drift diameter, convenient for following operations.
- Rotating string when tool meeting resistance or tripping-in difficulty.

#### **Specifications**

	Casing Size Size Weight		Max. C	Max. Outside		Min. Inside		o Poting	TEMP Poting	
S			Diameter		Diameter		Pressure Rating		TEMP Rating	
in.	mm	lb/ft	in.	mm	in.	mm	psi	MPa	۴F	°C
9-5/8	244.5	40-47	8.52	216.5	6	152.4	6293	43.4	300	150

• Pack-Off Assembly

Pack-Off assembly is installed at the lower part of top packer, collaborating with sealing module for sealing the annulus between packer and  $4^{"}$  wash pipe, forming sealing incorporated with the sealing module, realizing annulus sealing between packer and wash pipe during multi-zone pack.

#### **Specifications**

Max Outside Diameter	8.25in	Both-end Joint	7-7/8-8UNS.P×5-1/2LTC.B
Min Inside Diameter	5.11in	TEMP Rating	150°C
Total Length	6.44in	Pressure Rating	41.37Mpa
Material	ALLOY		



### Sand Control Tools

### • Seal bore

As part of the sand-control string, seal bore is used for sealing. During the process of setting, examining sealing and every-layer gravel pack, incorporated with 4.75" sealing elements, realizing the whole operation procedure.

#### **Specifications**

Name	Seal bore	Pressure Rating	48.2MPa
Tool outside Diameter/in.	5.55	Both-end Joint	5-1/2 LTC.P×P
Internal drift Diameter/in.	4.75	Length/in.	53.54

### • Extension

As part of the sand-control string, extension is used for length design. Upper extension endures the impact of the pack fluid when pack.

#### **Specifications:**

Name	Upper Extension	Lower Extension	Both-end Joint	6-5/8" 28#API LTC.P×P	5-1/2" 17#API LTC.P×P
Tool Outside Diameter/in.	6.69	5.55	Length/in.	48.5	72.0
Internal Drift Diameter/in.	5.69	4.81	Pressure Rating/MPa	48.2	48.2
Temperature Rating/°C	150°C	150°C			

## • Sliding sleeve

It is installed between the upper extension and lower extension, and mainly having two functions. The first is to provide channel for gravel pack during pack, the other is to isolate the formation after pack.

#### **Main features**

• Stepper string not opening the sliding sleeve mistakenly when through pack sliding sleeve.

• Tool safety device ensuring the tool smooth tripping out of the bore.

#### **Specifications**

Max. OD	7.27 in	Temperature rating	≥150°C
Min. ID	4.75 in	Pressure Rating	48.2Mpa
Total Length	60.81 in	Service Environment	STD
Material	ALLOY	Gaging Hole Overflowing Area	7.29in2
Both-end joint	6-5/8" 28# API-LTC.B×5-1/2" 17# API-LTC.B		



# Sand Control Tools

# • Collar locator

Incorporated with load indicator, Collar locator can realize the string location in CMZ.

#### **Specifications**

Max. OD	6.11in	Connecting type	Box-Pin
Min.ID	4.75in	Connecting joint	5-1/2" 17# API-LTC.BXP
Total length	16in	Temperature rating	150°C
Material	ALLOY	Pressure rating	48.2MPa
Material strength	760Mpa		



# • Isolation packer

A high-performance pull-release sand-control packer, majorly used in inter-layer isolation in layered pack well, also can be used in normal inter-layer isolation or layer plugging. Through inner pressurizing of tubing to transmit pressure to piston, making it to push inner lock-ring moving forward to compress the rubber sleeve setting, sealing the annulus space between tubing and casing to realize the isolation of each layer.

(	Casing Siz	e	Mox		D die		Dressur	o Doting		Deting	Set
Si	ze	Weight	Max	. 00	IVIII	n. ID	Pressur	e Rating	TEMP	Rating	Pressure
in.	mm	lb/ft	in.	mm	in.	mm	psi	MPa	۴F	°C	MPa
9-5/8	244.5	40-47	8.31	211	4.75	120.65	6700	46	300	150	8-10



### Sand Control Tools

# • Sump packer

Sump packer is used at the bottom of sand-control well, functioning for bearing string and gravel. Through the setting tool moving the outer cylinder, it shears the setting pins and pushes slips to compress rubber. According to different types of well, it uses cable or drill pipe for tripping in.

#### **Main features**

- Metal material selection: P110、T95、N80.
- No need of rotating string during tripping in, setting, retrieving.
- Dual internal slip locking system, high reliability.
- Strong bearing ability of rubber sleeve.
- Big Internal drift diameter, convenient for following operations.

#### **Specifications**

	Casing Siz	e	Mov		Mire	n. ID	Drocour	o Doting	TEMD	Poting	
Si	ze	Weight	Max. OD		IVIII	I. ID	Pressure Rating		TEMP Rating		
in.	mm	lb/ft	in.	mm	in.	mm	psi	MPa	°F	°C	
9-5/8	244.5	40-47	8.22	208.78	6	152.4	5000	34.5	300	150	



# • Snap latch

Usually used at the bottom of multi-zone outer string, incorporated with sump packer sealbore to realize the sealing of inner/outer string. The tool has collet configuration to enter sump packer (or same size sealbore) and plug-in load increasing greatly. This situation shows that the tool has entered the sump packer. When the tool tripping in to the designated location, the upper locating step setting at the packer spindle, the middle multiple sealing units can realize the sealing isolation of the upper-lower two parts of the packer spindle.

Applicable Seal Bore	6in	Upper Connecting Joint	5-1/2"LTC BOX
Max. OD	6.6 in	Tensile Strength	148.6T
Min. ID	4.82 in	Operating Differential Pressure	5000psi
Length	104.72 in		





**Completion Tools | Thermal Recovery Tools** 

がいが液体時度好 Always DO BETTER

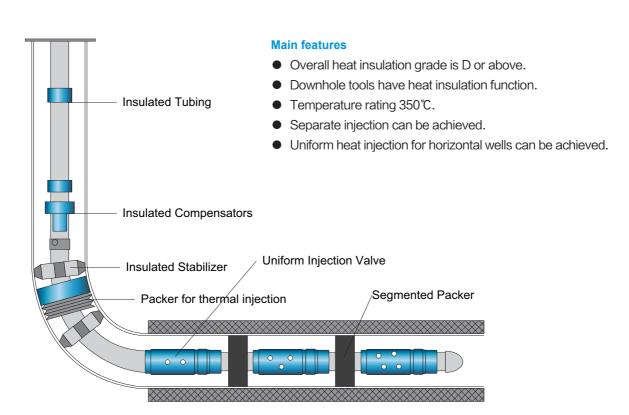
100

### Thermal Recovery Tools

# String and key tools for layered uniform injection with high efficient heat insulation performance in heavy oil thermal recovery wells

#### Introduction

These tools are mainly used in CSS, displacement, SAGD process to realize wellbore high insulation, separate layer steam injection and homogeneous heat injection of horizontal well. The tools can also improve the thermal effect and oil formation development of the thermal recovery wells.



#### Thermal Recovery Tools

# Thermal injection packer

#### Introduction

Thermal injection packer is mainly used in heavy oil thermal recovery well cyclic steam stimulation, displacement, SAGD process to reduce heat loss, protect casing and cement sheath by pack casing annular above oil layers and avoiding steam up cross into annular space of casing and cement sheath. The packer is the one of hydraulic-seal, bi-directional anchor and be locked by lifting the string.

#### **Main features**

- Temperature rating: 350°C, pressure rating: 20MPa. Anchor is secure. Using multiple-slips-uniform-distribution to reduce the casing damage.
  Using specially made packer rubber to ensure seal in steam stimulation process.
  Using special clasp type for lock ring and locking tube to ensure reliability of locking.
- Using running independently unlock institutions and lock institutions to ensure reliability of locking and unlocking.
- Easy and fast operation.

#### **Specifications**

CasingSize	Thread		. OD	Drift Dia	meter	Maxir Seat S Press	ealing	Sea Differ Pres	ential	Releasing	g Force	Pressure	e Rating	TEMP	Rating
in.		in.	mm	in.	mm	psi	MPa	psi	MPa	lbf×103	kN	psi	MPa	°F	°C
9 5/8	3 1/2 EU	8.267	210	2.992	76	2610	18	2900	20	22.5	100	5800	40	662	350
				2											

# Isolation packer

#### Introduction

Isolation packer is mainly used in heavy oil thermal recovery well cyclic steam stimulation, displacement, SAGD process with packer for thermal injection as well. The packer is designed between the reservoir unit to realize the reservoir unit seal, separate the high permeability layer and low permeability layer effectively. Therefore, the packer can prevent interference of the injected fluid and guarantee the accuracy of the each unit injection quantity. The packer uses thermal agents as the power source of the elastomeric element. When the temperature rises, thermal reagent volume will swell, pushing the piston to set the elastomeric element.

#### **Main features**

- Temperature rating 350°C, pressure rating 20MPa.
- Using lock configuration to maintain sealing effect of packer considering temperature changes.
- Thermal set and released by lifting the string.

CasingSize	Thread	Max	OD	Drift Dia	meter	Seal Tempei		Sea Differ Pres	ential	Pressure	e Rating	TEMP	Rating
in.		in	mm	in	mm	۴F	°C	psi	MPa	psi	MPa	۴F	°C
9 5/8	3 1/2 EU	8.267	210	2.992	76	464	240	2900	20	5800	40	662	350

### Thermal Recovery Tools

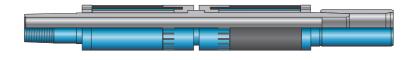
# Segmented packer

#### Introduction

This segmented packer is mainly used in heavy oil thermal recovery pack. Horizontal section is separated into several relatively independent steam injection units, each unit can be separately independent steam injection to prevent the interference between two paragraphs. This packer is used with equilibrium heat injection valve to realize segmented equilibrium vapor injection of horizontal well and improve the effect of the horizontal well steam injection and reservoir producing extent.

#### **Main features**

- This sealer is of bi-directional bearing.
- Multiple sets of thermal sheet metal are equally arranged, glue barrel radial stress is uniform.
- Sealing temperature is 200°C.
- Unlocking after cooling.
- Simple and compact design.



#### **Specifications**

Casing Size	Thread	Max. OD		Drift Diameter		Sea Tempe	•	Sea Differe Press	ential	Pressure Rating		TEMP Rating	
in.		in.	mm	in.	mm	۴F	°C	psi	MPa	psi	MPa	۴F	°C
5 -1/2	2- 7/8 EU	4.567	116	2.441	62	392	200	2175	15	5800	40	626	330

# Insulated Compensator

#### Introduction

The insulated compensator can be applied to CSS, steam drive and SAGD in thermal wells. It can compensate the wellhead elongation and shortening with excellent heat insulated performance which can effectively reduce wellbore heat loss.

#### **Main features**

- Temperature rating: 350°C, working pressure rating: 20MPa.
- Sealing is not affected by temperature alternation.
- Extendable capability can be adjusted to the demands.
- Torque can be transmitted.
- Insulation performance level: D.

Max. Trav	vel Length	Thread	Max	. OD	Drift Di	ameter	Sea Tempe	lling erature	Pressur	e Rating	Temper Rati		Insulation Level
ft	mm		in	mm	in	mm	psi	MPa	psi	MPa	°F	°C	Lever
5.249	1600	3 -1/2 EU	5.708	145	2.441	62	2900	20	5800	40	662	350	D
		•											

### Thermal Recovery Tools

# Insulated stabilizer

#### Introduction

The contact of the injection string and casing will increase the heat loss during heat injection causing temperature rise in the casing and strength drop in the cement sheath. The insulated stabilizer can hold the string to make sure the heat injection string not to get in touch with the casing. It will not cause heat loss because of its excellent heat insulation performance.

#### Main features

- Composite insulation structure design to guarantee heat insulation.
- Streamline design enable it to shrink under stress.
- Uniform distribution of the centralizing part makes sure uniform stress on stabilizer.

#### **Specifications**

Casing Size	Thread	Max	. OD	Drift Pa	rameter	Pressure	e Rating	TEMP	Rating	Insulation Level
in.		in.	mm	in.	mm	psi	MPa	°F	°C	
9 -5/8	3 -1/2 EU	7.480	190	2.992	76	5800	40	662	350	D
7	3- 1/2 USS	5.905	150	1.980	50.3	5800	40	662	350	D



# • Uniform injection valve

#### Introduction

The uniform injection valve is used for heat injection in horizontal section. It can achieve uniform injection in horizontal section with segmented sealing and achieve stratified injection in multiple formation with layered sealing. It can eliminate uniform injection of overall injection and control the injection amount to solve the problem of uniform recovery of the reservoir.

#### **Main features**

- Streamline design, easy to trip in.
- The fluid flowing direction is changed to the axis of the string after the valve so the risk of liner damage can be eliminated.
- A series of valves, more convenient for field operation.

#### **Specifications**

Liner Size	Туре	Thread	Max	. OD	Drift Pa	rameter	Pressur	e Rating	TEMP	Rating
in.			in.	mm	in.	mm	psi	MPa	°F	°C
4	O-I		3.149	80	2.047	52				
4	S-I	2- 3/8 EU	3.149	80	2.047	52	4250	20	660	250
5 -1/2	0	2 -7/8 EU	3.661	93	2.047	52	4350	30	662	350
5-1/2	S		3.661	93	2.047	52				

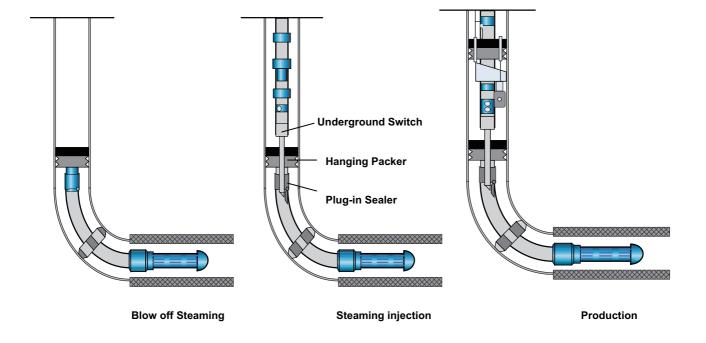


 創めが漢佩等更好 Always do Better 31

# • Anti-Pollution String And Key Tools For Thermal Recovery Wells

#### Introduction

This string is used in thermal recovery wells. When the injection operation is changed to production or vice versa, it is unnecessary to kill the well. So the pollution and cold formation damage caused by killing fluid can be avoided. The key tools are hanging packer, underground switch and plug-in sealer.



#### **Main features**

- The sealing is reliable both for injection under high temperature and tripping in under low medium temperature.
- Unnecessary to kill the well when changing the string, avoiding formation pollution.
- Double sealing.
- Pin lunge is used to change the switcher, easy to judge on or off situation.

### Thermal Recovery Tools

# • Hanging packer

#### Introduction

The hanging packer is used in CSS and water shutoff operation in thermal recovery wells. It can seal the annulus preventing the steam from getting to the annulus above the packer. Besides, the packer can hang firmly in the wellbore so it can also be used for hanging or supporting the anti-pollution string.

#### **Main features**

- Dual sealing design, sealing reliable.
- Temperature rating 350 °C, working pressure rating 20MPa.
- Sealing performance independent of temperature change on alternate.
- With release function.
- Reliable long-term sealing performance at high temperature;
- Anti-pollution string can be formed when the tool incorporating with underground switch.
- Can be used as a bridge plug for thermal recovery.

#### Main benefits

- Good performance of high-pressure and high-temperature.
- With reliable performance of sealing, anchoring and releasing.
- Can be placed in the well for long-term.
- Sealing performance is unaffected by temperature alternately changes.

#### **Specifications**

Casing Size	Thread	Max	. OD	Drift Di	ameter	Setting F	Pressure	Differ	lling ential sure	Tempe Rat	erature ling
in		in.	mm	in.	mm	psi	MPa	psi	MPa	°F	°C
9-5/8	2 7/8 EU Box 4 1/2 TBG Pin	8.267	210	3.858	98	2175	15	2900	20	626	330

# Underground switch

#### Introduction

Underground switch is an important part of anti-pollution string. It is mainly used for turning on or off the tubing channel. The switch is turned off during operating to seal the tubing to prevent the well bore fluid spray, and is tuned on during heat injecting and oil producing to form heat injection and oil production channel.

#### **Main features**

- Pressure rating 20MPa at 330 °C.
- Sealing performance is unaffected by temperature changes.
- Can be placed underground for long-term.
- Switch on or off can be easily judged.
- Can be turned on and off multiply to meet requirement of switch on and off for multiple cycles of steam injection - oil production.

Max Extendable Capability	Thread	Max. OD Drift Dia			ameter	neter Sealing Differential Pressure			Rating
in.		in.	mm	in.	mm	psi	MPa	°F	°C
9- 5/8	4-1/2TBG	7.874	200	3.937	100	3000	20.7	626	330



### **Thermal Recovery Tools**

# • Plug-in sealer

#### Introduction

Plug-in sealer is mainly used in conjunction with switch for thermal recovery to open the switch underground and seal the channel in packer. When sealer is inserted in the underground switch during steam injection or oil producing, the switch is turned on and reservoir is connected on; meanwhile, sealer is sealed with the seal bore to prevent thermal fluid channeling up to tubing casing annulus upon the packer; the switch is turned off after lifting the sealer for a certain distance.

#### Main features

- Plug-in sealer is tripped in and lifted with injection and production string.
- Easy to operate.
- Sealing reliable.

Name	Casing Size	Thread	Max. OD		Drift Diameter		Sealing Differential Pressure		TEMP Rating	
	in.		in.	mm	in.	mm	psi	MPa	۴	°C
Plug -in Sealer	7	3 -1/2 EU	5.118	130	2.362	60	3000	20.7	626	330
Seal Bore	7	4-1/2TBG	5.118	130	3.307	84				

# **Completion Tools | Screen Series**

1、4、チャ液線 浅速 好 Always DO BETTER







# 1 Material and Processing Inspection



Filtration rating test of metal mesh



Single welding point strength test of WWS

2 Type Approval Test



Tensile test



Torque test



Ultrasonic test

# 3 NDE for Welding



Dye penetrating inspection

### Sand Screen

### CMS Screen

CMS is one type of shrouded metal mesh screen. It is a patent product of COSL. The unique structure jacket can hold sand and maintain good flow-throng capability. CMS can be employed in most reservoirs which needed sand control.

#### **Key features**

- Two layers 316L stainless steel filter media, high reliability and good anti-damaging performance.
- Drainage layer between the filter media layers improves the flow properties.
- High permeability and porosity, large open area.
- Easy to run in the long horizontal wells.
- Anti-acid and alkaline, anti-high temperature, long service life.
- Simple construction, easy for operation, benefits to lower the completion costs, and increase the rate of success in installation.
- Remaining sand control performance even the radial deformation up to 40%.
- Aperture size of CMS screen usually ranges from 60 µ m to 500 µ m.

#### **Applications**

- Reservoir with  $d_{10}/d_{95} \le 10 \& d_{40}/d_{90} \le 5 \& sub44 \ \mu m \le 5\%$ .
- Stand-alone, open hole especially, gravel pack and frac-pack application also.
- High production rate well with electric submerged pump.
- High temperature high pressure well and corrosive well.
- Overhaul completion and thermal stimulation wells.

#### **Specifications**

Base Pipe		ID(mm)	OD	Sand Screen Weight	Effective Flow	Lowest Anti External Differential	Minimum Internal Differential	Minimum Tensile Load	
Standard(in)	Base Pipe Weight		(mm)	(±2kg/m) Area(cm²/m)		Pressure(MPa)	Pressure(MPa)	(kN)	
2-3/8	4.6	50.6	80	11.5	330	36.5	22.2	371.1	
2-7/8	6.4	62.0	94	14.5	391	36.5	18.9	516.1	
3-1/2	9.2	76.0	111	20	467	36.5	16.0	737.7	
4	9.5	90.1	124	21.3	528	36.5	14.2	763	
4.4/0	11.6	101.6	100	24.5	584	36.5	12.9	950.3	
4-1/2	12.6		136	26				1025.1	
5	15	112.0	149	30	646	36.5	11.7	1245.8	
5-1/2	17	124.3	162	34	707	36.5	10.7	1413.1	
6-5/8	24	150.4	192	45	839	36.5	9.1	1975.4	
7	26	159.4	202	50	886	36.5	8.6	2149.8	

#### Notes:

1. The recommended engineering safety factor multiply 0.6 based on the table data.

2.Other specification products are available.





# CMS-Slim Screen

CMS-Slim is one type of metal mesh screen which has smaller OD than CMS by strengthened filter media. CMS-Slim can be employed in wells where restricted ID and special OD tool is preferred.

#### **Key Features**

- One layer strengthened 316L stainless steel filter media, high reliability and good antidamaging performance.
- Smaller OD, easy to operate, benefits to lower the completion costs, and increase the rate of success in installation.
- High permeability and porosity, large open area.
- Easy to run in the long horizontal wells.
- Anti-acid and alkaline, anti-high temperature, long service life.
- Remaining sand control performance even the radial deformation up to 40%.
- Aperture size ranges from  $60 \,\mu$  m to  $500 \,\mu$  m.

#### **Applications**

- Reservoir with  $d_{10}/d_{95} \le 10 \& d_{40}/d_{90} \le 5 \& \text{ sub } 44 \ \mu m \le 5\%$ .
- Wells where special requirements on screen OD.
- Stand-alone, open hole especially, gravel pack and frac-pack application also.
- High production rate well with electric submerged pump; water producer.
- High temperature/high pressure well and corrosive well.
- Workover and thermal stimulation wells.

#### **Specifications**

Base	Pipe					Lowest Anti	Minimum Internal	
Standard(in)	Base Pipe Weight(lb/ft)	ID (mm)	OD (mm)	Screen Weight (±2kg/m)	Effective Flow Area (cm²/m)	External Differential Pressure (MPa)	Differential Pressure (MPa)	Minimum Tensile Load (kN)
2-3/8	4.6	50.6	75	10.5	330	28	22.2	371.1
2-7/8	6.4	62.0	88	13	391	28	18.9	516.1
3-1/2	9.2	76.0	105	18	467	28	16.0	737.7
4	9.5	90.1	118	19	528	28	14.2	763
4-1/2	11.6	101.6	130	22	584	28	12.9	950.3
4-1/2	12.6	100.5	130	24	J04	20	12.9	1025.1
5	15	112.0	142	27	646	28	11.7	1245.8
5-1/2	17	124.3	156	31	707	28	10.7	1413.1
6-5/8	24	150.4	187	42	839	28	9.1	1975.4
7	26	159.4	196	46	886	28	8.6	2149.8

#### Notes:

1. The recommended engineering safety factor multiply 0.6 based on the table data.

2. Other specification products are available.



### Sand Screen

## CDWS Screen

CDWS is a combination of CMS and WWS. The jacket of CDWS consists of wire-wrapped jacket and metal-mesh jacket. The wire-wrapped jacket is maybe outside of the metal-mesh jacket or vice versa, which depends on completion design and producing requirement. CDWS is a special thermal stimulation well (steam huff-puff/injection/production well), high rate well, high temperature/high pressure well, and other harsh conditions.

#### **Key Features**

- Wire-wrapped jacket and shrouded metal-mesh jacket provide double filtration systems, longer service life.
- 316L stainless steel filter media, high reliability and good anti-damaging performance.
- Drainage layer between the filter media layers improves the flow properties.
- High permeability and porosity, large open area.
- Anti-acid and alkaline, anti-high temperature.
- Easy to operation, benefits to lower the construction expense, and increase the rate of success in installation.
- Remaining sand control performance even the radial deformation up to 40%.
- Aperture size ranges from  $60 \mu$  m to  $500 \mu$  m.

#### **Applications**

- Stand-alone if reservoir with  $d_{10}/d_{15} \le 10 \& d_{40}/d_{10} \le 5 \& sub 44 \ \mu m \le 5\%$ .
- Coupled with gravel-pack/ frac-pack, if  $d_1/d_{15}>10$  or  $d_4/d_{10}>5$  or sub 44  $\mu$ m>5%.
- Cased hole or open hole, coupled with gravel pack/ fracturing pack will gain a better performance.
- High temperature high pressure well, thermal stimulation wells and corrosive well.
- Other harsh conditions.

#### **Specifications**

E	Base Pipe		OD	Screen Weight	Effective Flow	Lowest Anti External Differential Pressure2	Minimum Internal Differential	Minimum Tensile Load
Standard(in)	Base Pipe Weight(lb/ft)	(mm)	(mm)	(±2kg/m)	(±2kg/m) Area(cm²/m)		Pressure(MPa)	(kN)
2-3/8	4.6	50.6	90	16.5	330	36.5	22.2	371.1
2-7/8	6.4	62.0	103	21	391	36.5	18.9	516.1
3-1/2	9.2	76.0	119	26	467	36.5	16.0	737.7
4	9.5	90.1	132	28	528	36.5	14.2	763
4-1/2	11.6	101.6		31.5	584	36.5	12.9	950.3
4-1/2	12.6	100.5	144	33				1025.1
5	15	112.0	157	37.5	646	36.5	11.7	1245.8
5-1/2	17	124.3	170	42	707	36.5	10.7	1413.1
6-5/8	24	150.4	198	54	839	36.5	9.1	1975.4
7	26	159.4	208	60	886	36.5	8.6	2149.8

#### Notes:

1. The recommended engineering safety factor multiply 0.6 based on the table data.

2.Other specification products are available.





# Wire-Wrapped Screen

Wire-Wrapped screen is a traditional sand control screen. Wire-Wrapped jacket and base pipe are main components. It is widely used in both onshore and offshore oil & gas wells. The longevity and sand control performance are very well if incorporate with gravel-pack.

#### **Key features**

- "T" shape slot, never plugging in the slot.
- Anticorrosion, long service life.
- All welded structure, high mechanical strength.
- Minimum slot opening: 0.006 inch.
- High open ratio, up to 15%.
- Gravel-pack & frac-pack are mature techniques.
- Good adaptability and sand control performance.

#### Applications

- Thickness of pay zone lager than 3m, both single layer and multi-layer.
- Stand-alone completion, if  $d_{10}/d_{95} < 10 \& d_{40}/d_{90} < 3 \& sub 44 \ \mu m < 2\%$ .
- Incorporated with gravel-pack/frac-pack, if  $d_{10}/d_{10}>10 \text{ ord}_{40}/d_{10}>5 \text{ or sub } 44 \ \mu \text{ m}>5\%$ .
- High production rate oil & gas well &water source well with middle or low reservoir pressure.
- Thermal production well, heavy oil well and corrosive well.

APIBase Pipe		APIBase Pipe ID 0		Base Pipe Perforation	Base Pipe Hole		Screen	Minimum Tensile	
Standard(in)	Base Pipe Weight(lb/ft)	(mm)	(mm)	Diameter(mm)	Density (Hole/m)	Number	Weight(kg/m)	Load(kN)	
2-3/8	4.6	50.6	78.0	10	160	11.3	371.1	371.1	
2-7/8	6.4	62.0	91.0	10	200	14.4	516.1	516.1	
3-1/2	9.2	76.0	107.0	10	240	19.0	737.7	737.7	
4	9.5	90.1	119.5	10	280	20.3	763	763	
4-1/2	11.6	101.6	132.5	10	280	23.6	950.3	950.3	
4-1/2	12.6	100.5	132.5		10	200	23.0	25.1	1025.1
5	15	112.0	145.0	10	320	29.0	1245.8	1245.8	
5-1/2	17	124.3	158.0	10	360	32.6	1413.1	1413.1	
6-5/8	24	150.4	186.0	10	440	43.6	1975.4	1975.4	
7	26	159.4	196.0	10	440	47	2149.8	2149.8	

#### **Specifications**

#### Notes:

1. The OD of centralizer fins depends on the outer casing ID.

2. Other specification products are available.



### Sand Screen

# Punched Screen

Punched screen consists of stainless punched jacket and base pipe. Punched screen is an ideal substitute of slotted liner due to better anti-corrosion performance and relative small OD.

#### **Key features**

- Optimized design for perforation on base pipe, high mechanical properties.
- Easy RIH due to relative small OD. The OD of jacket is no larger than that of coupling.
- Slot width: 0.15–2.0mm.
- High precision of slot, tolerance of the slot width is  $\pm 0.05$ mm.
- Good performance of anti-corrosion, long service life.
- Open ratio: 4~8%.
- Side slot, good anti-plugging ability.

#### **Applications**

- Single pay zone, multi-layer with almost same pressure & lithology, commingled producing multi-layer well; no limitation of thickness of pay zone.
- Cased hole and Open hole completion.
- Loose reservoir with middle & coarse sand.
- Oil & gas well or water source well with high production rate.
- Thermal recovery production well, heavy oil well and corrosive well.

#### **Specifications**

Bas	Base Pipe		00	Base Pipe		Screen	N Alto forman Theory II.
Standard(in)	Base Pipe Weight(lb/ft)	ID (mm)	OD (mm)	Perforation Diameter (/m)	Base Pipe Hole Density(mm)	Weight (kg/m)	Minimum Tensile Load(kN)
2-3/8	4.6	50.6	70.3	10	160	8.5	371.1
2-7/8	6.4	62.0	83	10	200	11.5	516.1
3-1/2	9.2	76.0	98.9	10	240	16.1	737.7
4	9.5	90.1	111.6	10	280	16.8	763
4-1/2	11.6	101.6	124.3	3 10	280	20.4	950.3
4-1/2	12.6	100.5				21.9	1025.1
5	15	112.0	137	10	320	25.7	1245.8
5-1/2	17	124.3	149.7	10	360	28.9	1413.1
6-5/8	24	150.4	178.3	10	440	40.1	1975.4
7	26	159.4	187.8	10	440	43.3	2149.8

Notes: Other specification products are available.





# Slotted Liner

Slotted liner is a traditional mechanical sand control device. Slotted liner is cut by high energy laser. The slot length, distribution and slot density are optimized to ensure maximum open ratio while maintaining the required strength and slot width.

#### **Key features**

- Slots and base pipe are integrate, large ID/OD ratio.
- High mechanical strength, high flexibility and allow adequate bending.
- Supporting wellbore and sand control functions.
- Low cost in manufacture and installations.
- Minimum slot width: 0.15mm.
- Open ratio: 1%-6%.
- Optimized slot distribution.

#### **Applications**

- Single payzone or multi-zone with almost same pressure & lithology, commingled producing in multi-zone well; thickness of payzone no larger than 30m.
- Cased hole and openhole completion.
- Loose reservoir with middle & coarse sand.
- Oil & gas well or water source well with low production rate.

#### **Specifications**

APIBase Pipe		ID	OD	Fracture Length	Fracture Width	Minimum Tensile	
Standard(in)	Base Pipe Weight(lb/ft)	(mm)	(mm)	(mm)	(mm)	Load(kN)	
2-3/8	4.6	50.6	60.3	0.1—2.0	80	371.1	
2-7/8	6.4	62	73.0	0.1—2.0	80	516.1	
3-1/2	9.2	76	88.9	0.1—2.0	80	737.7	
4	9.5	90.1	101.6	0.1—2.0	80	763	
4-1/2	12.6	100.5	114.3	0.1—2.0	80	1025.1	
5	15.0	112.0	127.0	0.1—2.0	80	1245.8	
5-1/2	17	124.3	139.7	0.1—2.0	80	1413.1	
6-5/8	24	150.4	168.3	0.1—2.0	80	1975.4	
7	26	159.4	177.8	0.1—2.0	80	2149.8	
7	26	159.4	187.8	354	12.7	43.3	

Notes: Other specification products are available.





# 我们步次做得更好 ALWAYS DO BETTER



Address: 450 Huashan Road, Tanggu, Tianjin City, P.R.China Post Code: 300459 Tel: (86) 022 25212863 (86) 13820873406 E-mail: lilq7@cosl.com.cn