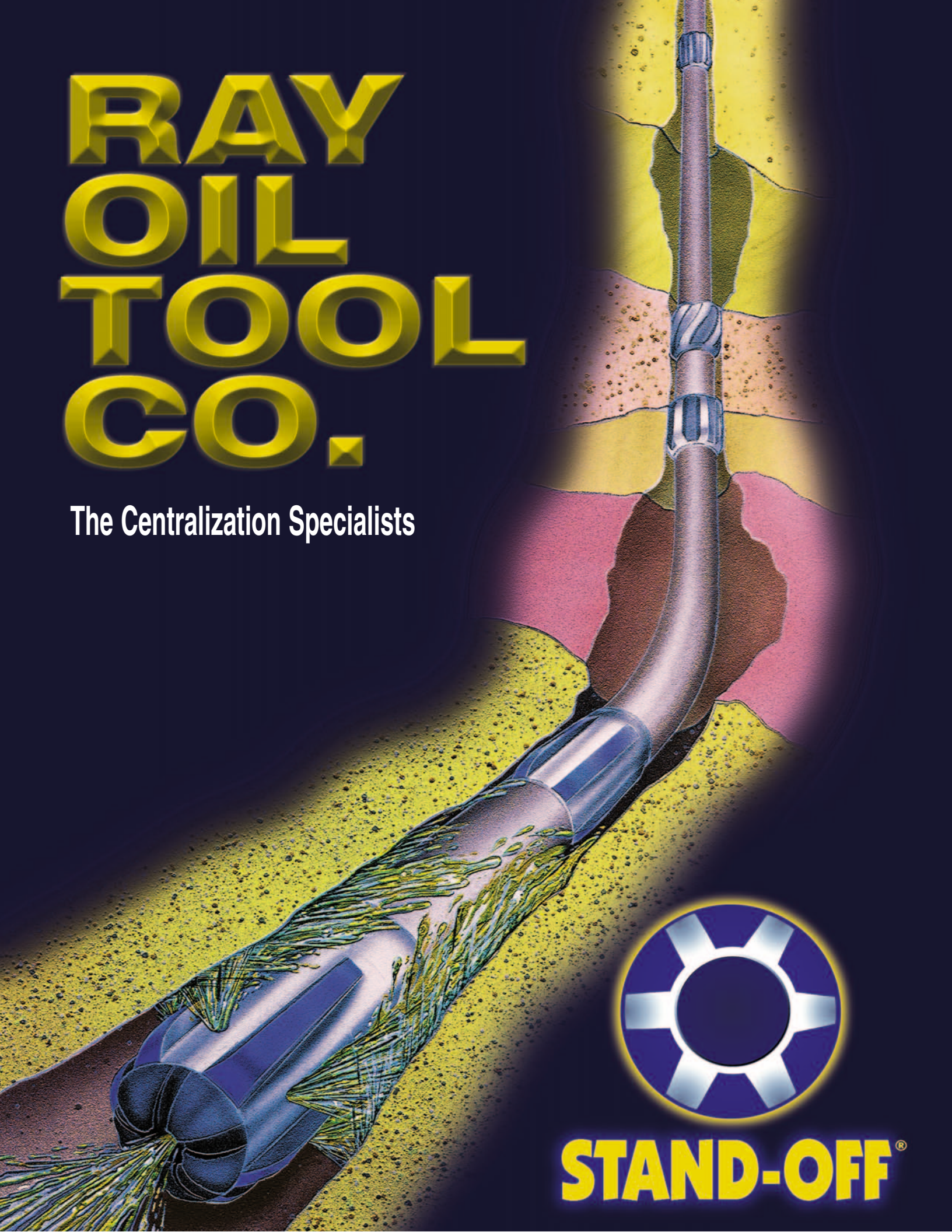


RAY OIL TOOL CO.

The Centralization Specialists



STAND-OFF[®]

“One Stop Shop”

Ray Oil Tool Company (ROTCO), the “No Squeeze System” people would like to introduce you to our complete line of **CENTRALIZATION PRODUCTS** along with **CENTRALIZED UP-JET FLOAT SHOES**.

WE OFFER THE FOLLOWING:

I. CENTRALIZERS

- Solid Slip-on Straight Blade (Aluminum - Bronze - Zinc)
- Solid Slip-on Spiral Blade (Aluminum - Bronze - Zinc)
- Intercasing (Inline)
- Bi-Centered Intercasing
- Bows (All Types)
- Stop Rings

II. CENTRALIZED FLOAT EQUIPMENT

- Up-Jet Float Shoes
- Float Collars
- Bi-Centered Float Shoes and Collars
- Non-Rotating Cementing Plugs
- Silver Bullet Float Shoes
- Tornado Reamer Assist Shoes

III. STANDARD EQUIPMENT

- Up-Jet Float Shoes (Non-Centralized)
- Float Collars (Non-Centralized)
- Cementing Plugs
- Silver Bullet Float Shoes (Non-Centralized)
- Tornado Reamer Assist Shoes (Non-Centralized)

Ray Oil Tool Company (ROTCO) is the **ORIGINATOR** of the Solid Casing Centralizers and the 360° Up-Jet Centralized Float Shoes. ROTCO has become the World **LEADER** in Quality, Design and Service for achieving successful primary cement jobs. We are recognized Worldwide and have Agent Distributors Worldwide to serve you with “**ONE STOP SHOPPING**”

We offer a **COMPUTERIZED CENTRALIZER PLACEMENT PROGRAM** to aid you in achieving a good **PRIMARY** Cement Job for Casing Shoe Seats and in, above, and below Productive Zones.



STAND-OFF®
Ray Oil Tool Company

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The No-Squeeze System™

From
RAY
Oil Tool Co.

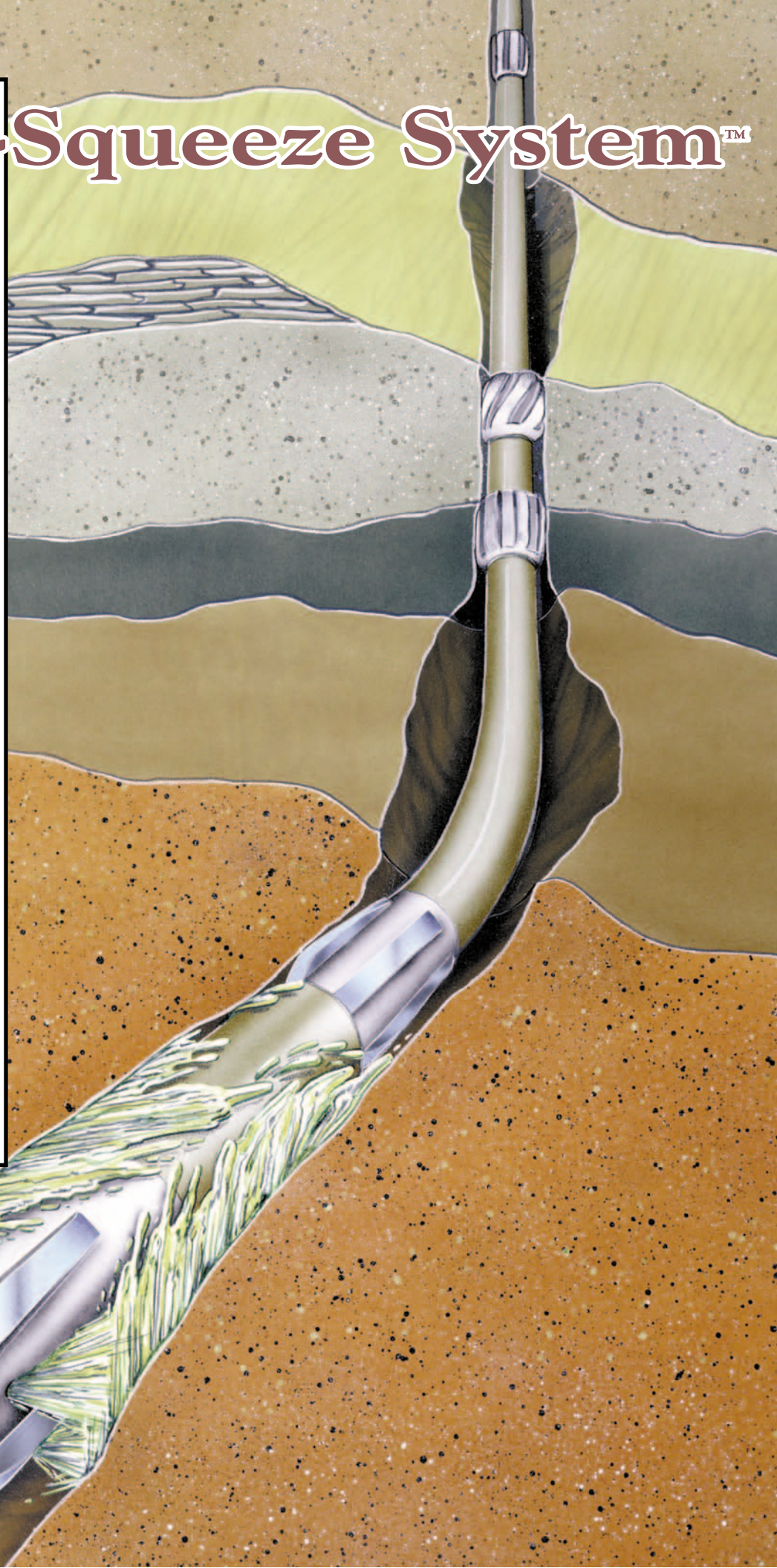
The Primary Source for Successful Cementing.

Complete coverage around the casing is the key to a successful primary cementing job. That's what you get with the NO-Squeeze System™ from Ray Oil Tool.

The No-Squeeze System™ combines Ray Oil Tool's patented Stand-Off solid centralizers and the unique centralized 360° Up-Jet Tornado Float Shoe and collar. This provides positive casing/wellbore standoff for positive mud displacement and cement coverage.

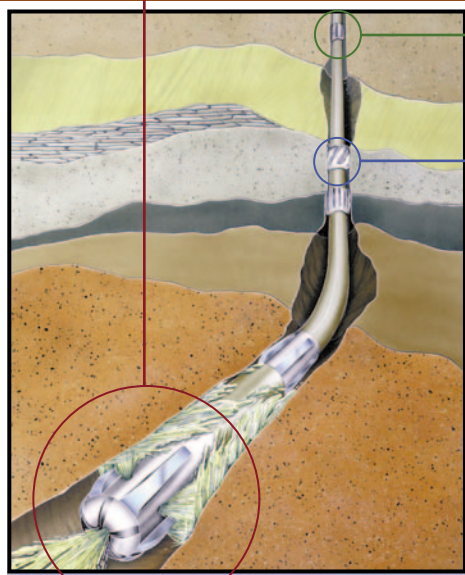
The Up-Jet Tornado Float Shoe is the first casing shoe designed to ensure 360° cement coverage.

With standoff and good fluid movement around the casing, channeling is avoided, hole cleaning is enhanced and 100 percent cement coverage can be obtained. *That means no remedial work. No remedial work means the job was done correct the first time.*



THE “NO-SQUEEZE” SYSTEM™

The Up-Jet Tornado™ Float Shoe



NO-SQUEEZE SYSTEM™ SAVES \$1 MILLION ON DEEPWATER PROJECT

For one operator, the use of the Ray Oil Tool No-Squeeze™ System eliminated a casing string, resulting in cost savings of more than \$1 Million.

The Up-jet Tornado™ Float Shoe provided a pumping rate of 11 bbl/min for this Gulf of Mexico deepwater (5,400') exploratory well in Mississippi Canyon. The operator was able to run 13 3/8" casing in a 17 1/2" hole to a casing depth of 7,800, a greater depth than anticipated.

All float equipment was centralized and results were excellent with the Tornado float shoe and float collar. The float collar, 50' of cement and the float shoe were drilled out in less than three hours. Shoe test pressure exceeded the required pressure.

This is just one of more than 4,100 No-Squeeze System™ success stories worldwide. If you are squeezing more than 1 in 50 shoes, Ray Oil Tool can save you money!

With standoff and the tornado up-jet effect, the Tornado up-jet washes past ledges and wellbore restriction, enhancing fluid circulation and gives you 360° cement coverage around the casing. The Tornado directs fluid circulation to the area of the wellbore where it is also needed – the narrow side of the casing.

The Tornado has demonstrated excellent results in historically difficult well cementing areas, horizontal wells and wells where differential pressures may be critical.

The solid straight blades of the Tornado not only guide the casing into the wellbore (sliding by ledges), but also reduce drag, eliminate scrapping, clogging between blades and provide proper standoff for primary cementing. The cemented centralized float shoe anchors the casing which will in turn minimize casing back-offs.

In conjunction with ROTCO Stand-Off® solid casing centralizers, the Tornado float shoe virtually eliminates the expensive shoe squeeze.

Stand-Off® Solid Straight Blade Centralizer

The original “wellbore friendly” Ray Oil Tool Stand-Off straight blade design provides easy wellbore entry, clean fluid passage and maximum standoff between casing and wellbore. The Ray Oil Tool straight blade centralizer has eliminated squeeze jobs on thousands of wells worldwide – a track record second to none.

ROTCO solid centralizers provide maximum standoff even in horizontal wells plus allows rotation and reciprocation simultaneously. The ROTCO solid centralizers were the first centralizers to overcome wellbore lateral forces and give proper casing/wellbore standoff in any drilled wellbore.

The solid straight blade design promotes self-cleaning in the wellbore with less fluid restrictions and drag than bow centralizers and allows pipe to rotate and reciprocate freely inside the centralizer.

Ray Oil Tool centralizers are cast of a high grade metallic alloy with one-piece construction. This design features the lowest drag and wear and fluid restrictions and has high impact and shock resistance, high tensile and yield strengths and corrosion resistance.

The high grade metallic alloy centralizer can now be placed across the productive intervals allowing clean perforations without shot distortion. Casing deterioration due to electrolysis between dissimilar metals is non-existent because the metallic alloy is the softer sacrificial metal reducing casing collapse.

The centralizers are designed to slip easily on the pipe's pin end. They can run free on the joint or between stop rings, or can be secured to the casing with set screws.

Stand-Off® Solid Spiral Blade Centralizer

The key to Ray Oil Tool's Stand-Off solid spiral centralizer is the smooth spiral 360° overlapping solid-vane design. It provides maximum wall contact and fluid swirl providing 360° cement coverage around the pipe.

The innovative design of the centralizer blades reduces balling between the blades, resulting in complete utilization of the spiral centralizer in swirling the cement. The

The successful record of the centralized 360° Up-Jet Float Shoe allow us to make the statement:

“If the cement has set up, there will be no need to squeeze.”

RAY
OIL TOOL CO.

The Centralization Specialists



THE SOLID DIFFERENCE

DIFFERENCE

The **Ray Oil Tool Company's** Solid Casing Centralizers DO make a difference. The 90% casing/wellbore stand-off that they support has been the needed characteristic for getting a good primary cement job EVERY TIME.

With cement coverage completely around the casing YOU GET:

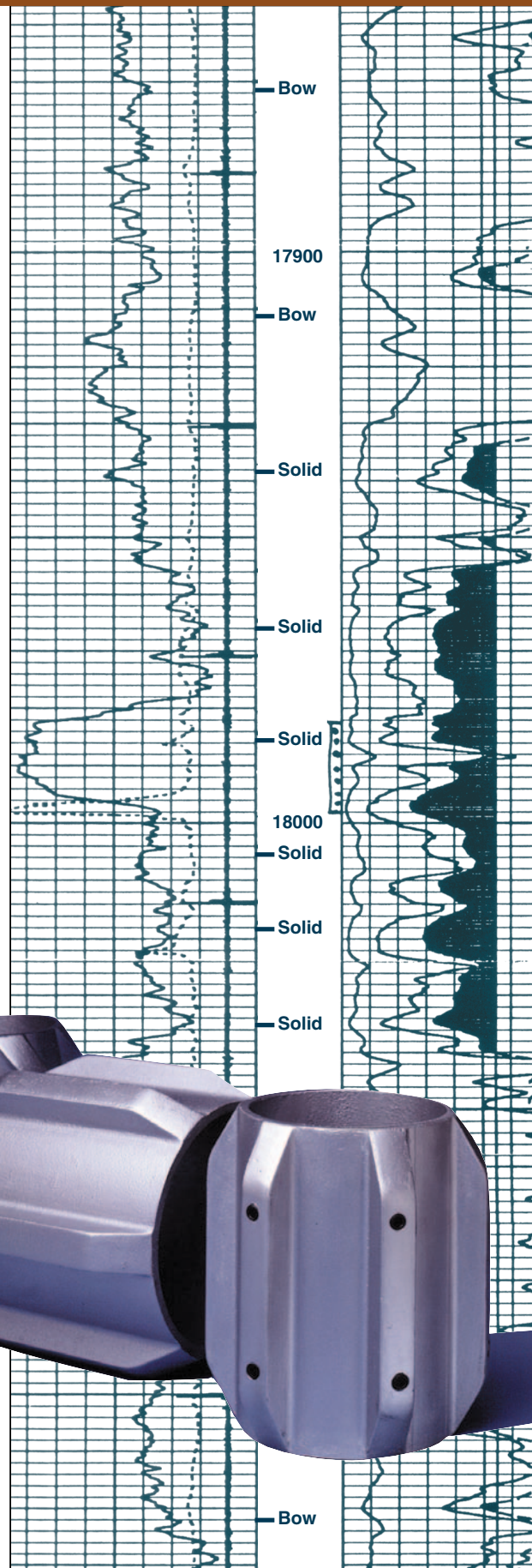
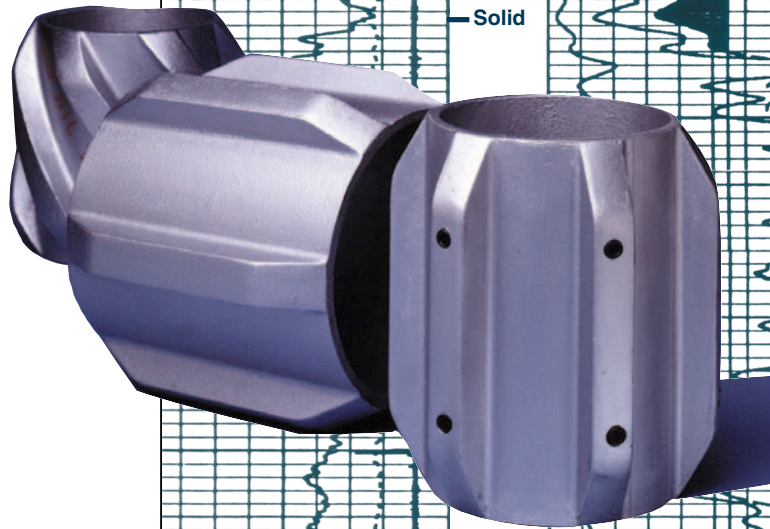
- **Better Perforation Performance**
- **No Premature Saltwater**
- **No Sand (sand is produced only with saltwater in most wells)**
- **No Remedial Workovers**
- **No Lost Reserves**
- **The BEST Investment Ever!**

PROFITS

Since **Ray Oil Tool Company** introduced Solid Casing Centralizers in 1984, they have become the most profitable well equipment run in the wellbore today. Profits which are realized from achieving a good primary cement job every time.



Centralized
"Tornado"
Up-Jet Action



Leading Independent Completion
in Morrow Sands, Roger Mills County, Oklahoma



The American
Petroleum Institute
(API) has no
specifications for
the necessary
wellbore/casing
standoff for
obtaining a radial
primary cement job.

The API study group teams did develop an API SPECIFICATION 10D to set a standard for testing the restoring force of bow centralizers. After testing, the standard restoring force of the bow spring should retain 67% of the original strength of the bow. API did not intend to imply that the required standoff should be 67%. (Stated in Appendix A, Paragraph D, Page 15 in 1991 API SPECIFICATION 10D.)

“67% standoff may or may not give adequate centralization of casing in field application! 67% of standoff is used merely for the purpose of specifying minimum performance standards which (bow) centralizers must meet.”

In recent years the industry has run fluid tests, computerized programs on fluid graphics, and through actual well applications studying fluid flow around drill pipe and casing in wellbore simulations. The results all indicate that to achieve good radial flow the standoff (or narrow side) should be at least 80%.

SOLID CASING CENTRALIZERS



Straight Blade

Solid Straight Blade Stand-Off® Centralizers

The Revelation of Successful Cementing



Ray Oil Tool Co., Inc. is the innovator of the Stand-Off Solid Straight Blade Centralizer because of discovering the need to improve casing/wellbore standoff.

Poor primary cementing had been a costly incurable oilfield problem unbeknownst to inadequate casing/wellbore Stand-Off®.

Centralizer designs and placements were weak with regard to the reality of wellbore conditions, even in imagined straight holes. The inability to see the casing down hole envisioned the casing in the center of the wellbore with a stubborn mud channel hanging on one side.

This mythical mud channel created pipe movements, mud sweeps, increased pump rates, thousands of casing hardware gimmicks and even casing cleaning and/or coatings. The channel existed only because the casing was laying against the wellbore. Without the usage and placement of the proper casing centralizers for achieving the required casing/wellbore standoff, a successful completion is impossible.

The key to successful centralization of casing is to understand the reality of the wellbore and how the casing contours and lies in the wellbore. **A computerized solid casing centralizer program is available from Ray Oil Tool Co. to achieve the best primary cementing for casing shoes seats and productive formations.**

Specification Guide

Long "Straight Blade" Solid Slip-On Casing Centralizers (Stock Items)

Model Number	SIZES			Length	Holesize	Weight In lbs.
	Casing	x	Blade O.D.			
4830-17	4 1/2"	x	7 5/8"	24"	7 7/8"	34
4830-11	5 1/2"	x	7 5/8"	24"	7 7/8"	26
4830-18	5 1/2"	x	8 1/4"	24"	8 1/2"	33
4830-5	5 1/2"	x	8 1/2"	24"	8 3/4"	37
4830-4	5 1/2"	x	9 5/8"	24"	9 3/4"	50
4830-1	7"	x	8 3/8"	24"	8 1/2"	19
4830-2	7"	x	9 5/8"	27"	9 7/8"	45
4830-9	7 5/8"	x	9 5/8"	28"	9 7/8"	40
4830-7	8 5/8"	x	12"	28"	12 1/4"	79
4830-16	9 5/8"	x	12"	30"	12 1/4"	65
4830-6	10 3/4"	x	14 1/2"	30"	14 3/4"	109
4830-15	11 3/4"	x	14 1/2"	30"	14 3/4"	92
4830-8	13 3/8"	x	17 1/4"	30"	17 1/2"	147
4830-8A	13 5/8"	x	17 1/4"	30"	17 1/2"	145
4830-22	16"	x	21"	24"	22"	147
4830-12	20"	x	25"	20"	26"	145

QUALITY ASSURANCE:

The vane O.D.'s are gauge ring O.D. size.

RETURNS:

No restocking fee charges for stock items returned for ROTCO warehouse in the same condition as delivered.

ALTERATIONS:

Any alterations of stock items will be charges to the customer and then is the property of the customer.

Short "Straight Blade" Solid Slip-On Casing Centralizers (Stock Items)

Model Number	SIZES			Length	Holesize	Weight In lbs.
	Casing	x	Blade O.D.			
4830-19s	4 1/2"	x	6"	9"	6 1/8"	4 1/2
4830-32s	4 1/2"	x	6 1/4"	8"	6 1/2"	4 3/4
4830-17s	4 1/2"	x	7 5/8"	9"	7 7/8"	7 1/2
4830-31s	4 1/2"	x	8 1/8"	9"	8"	8
4830-1M	5"	x	6"	8"	6 1/8"	7 1/2
4830-20s	5"	x	6 3/8"	9"	6 1/8"	5
4830-21s	5"	x	8 1/4"	9"	8 1/2"	10 1/2
4830-2 M	5 1/2"	x	6 3/8"	8"	6 1/2"	9 1/2
4830-23s	5 1/2"	x	6 5/8"	9"	6 3/4"	4
4830-11s	5 1/2"	x	7 5/8"	9"	7 7/8"	7 1/2
4830-18s	5 1/2"	x	8 1/4"	9"	8 1/2"	8 3/4
4830-1s	7"	x	8 3/8"	12"	8 1/2"	9
4830-2s	7"	x	9 3/4"	9"	9 7/8"	12
4830-9s	7 5/8"	x	9 5/8"	9"	9 7/8"	11 1/4
4830-9M	7 5/8"	x	8 3/8"	10"	8 1/2"	13
4830-16M	9 5/8"	x	10 1/2"	10"	10 3/4"	18
4830-16s	9 5/8"	x	12"	12"	12 1/4"	22
4830-6s	10 3/4"	x	14 1/2"	15"	14 3/4"	54
4830-6Ms	10 3/4"	x	13 1/4"	10"	13 1/2"	40
4830-15s	11 3/4"	x	14 1/2"	15"	14 3/4"	45
4830-8s	13 3/8"	x	17 1/4"	10"	17 1/2"	71
4830-22	16"	x	21"	24"	22"	147
4830-12	20"	x	25"	20"	26"	145

QUALITY ASSURANCE:

The vane O.D.'s are gauge ring O.D. size.

RETURNS:

No restocking fee charges for stock items returned for ROTCO warehouse in the same condition as delivered.

ALTERATIONS:

Any alterations of stock items will be charges to the customer and then is the property of the customer.



Features

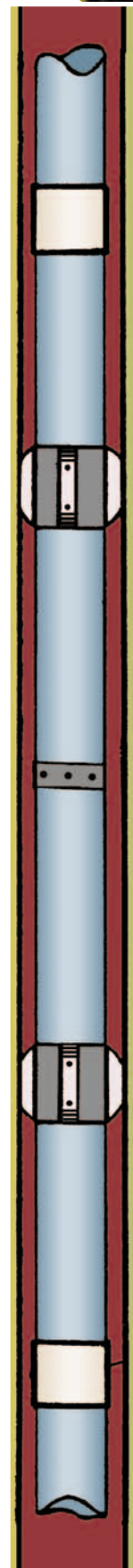
The ROTCO Solid Straight Blade Centralizer provides optimum features towards getting the first requirement of a good primary cement job - maximum casing/wellbore Stand-Off.

- 1 Positive Stand-Off®:** The innovative solid design ensures a fixed maximum stand-off regardless of lateral loads.
- 2 Optimum Length:** The blade length and width give optimum casing support for maximum standoff and a smooth bob sled ride into the wellbore.
- 3 Flow Enhancement:** The Solid Straight Blades are not only self-cleaning going into the wellbore, but the restriction of flow is less than most all other centralizers.
- 4 Metal Cast One Piece Construction:** Cast of high grade metallic alloy that has high impact and shock resistance combined with high tensile and high yield strengths, as well as resists corrosion, and is a non-sparking material.
- 5 Simple Installation:** The Solid Casing Centralizers are designed to slip easily onto the pipe's pin end and then allowed to run free on the joint or between stop rings. Solid Centralizers may also be secured to the casing with set screws.
- 6 Withstands Wellbore Temperatures** up to 500°F.
- 7 Low Friction Factor** of 0.133.
- 8 Friendly:** The solid straight blade centralizer is the most wellbore friendly centralizer ever run.

Advantages

The ROTCO Solid Straight Blade Centralizer design provides many distinct advantages to ensure easy wellbore entry, clean fluid passage and maximum casing/wellbore Stand-Off.

- 1 Proven Success:** Thousands of successful jobs around the world with a "No-Squeeze" record second to none.
- 2 Better Economics:** Nothing in the oilfield pays off better than a good primary cement job.
- 3 Maximum Horizontal Stand-Off®:** Smooth design and reduced drag while running a horizontal or extended reach liner assure greater success in reaching T.D.
- 4 Reduced Drag and Gouging:** The casing gets a smooth bob sled ride into the wellbore reducing casing wall contact and differential sticking.
- 5 Maximum Stand-Off®:** Solid Centralizers are designed for 90% plus stand-off allowing fluid velocities to be almost equal around the pipe.
- 6 Withstands Lateral Forces:** Unlike the bow centralizers, ROTCO Solid Centralizers will ensure a fixed standoff regardless of lateral forces.
- 7 No Wellhead Damage:** The cast aluminum alloy centralizers are wellhead friendly.



SOLID CASING CENTRALIZERS



Spiral Blade



“Spiral” Solid Stand-Off® Centralizers

Engineers Choice for a *Smoother* Spiral



The smooth spiral 360° overlapping solid vane cast design of the ROTCO “Spiral” Solid Stand-Off Centralizers provide maximum wall contact and fluid swirl.

The 30° slope of the vane ends reduce drag and aids the casing in reaching TD. This gentle slope from the body to the height of the vane will eliminate scraping, gouging, or digging into the formation and consequently reduce balling between the vanes. Clean vanes allow complete utilization of the spiral centralizer in swirling the fluids, rather than just splashing the fluid.

The solid cast aluminum ROTCO Stand-Off® Centralizers will not damage wellhead equipment, has high impact and shock resistance combined with high tensile and yield strengths, as well as resists corrosion. Casting not only makes a well designed tough tool, but reduces manufacturing costs.

The reality of fluid turbulence and swirl around drill pipe and casing in the wellbore

is a very short lived condition. Tests have been performed in the wellbore with monitors to record fluid turbulence. The results indicated fluid turbulence existed less than two (2) feet below and above the turbulator and the fluids then went back into laminar flow.

There are two (2) reasons that fluids in the wellbore can not remain in turbulence for a long distance:

- 1 ***Casing and drill pipes are basically never concentric with the wellbore which deters fluid velocity circumferential around the pipe, and***
- 2 ***The only force exerted to the fluid is from one direction longitudinal with the pipe.***

Therefore a fluid with solids is forced back into laminar flow in the direction of least resistance.

Fluid flow in the annulus of concentric pipes is radically equal because the areas are equal therefore the drag around the annulus is equal. Once the annulus becomes eccentric the drag on the narrow side increases very rapidly. An example would be that when the narrow side (standoff) was reduced from 100% being concentric to 65%, the fluid flow was reduced down to 2% on the narrow side and 98% on the large side annulus.

Specification Guide

Spiral Slip-On Casing Centralizers (Stock Items)

Model Number	SIZES Casing x Blade O.D.			Length	Holesize	Weight In lbs.
S-4830-25	2 7/8"	X	4 1/4"	6"	4 1/2"	2 1/4
S-4830-24	3 1/2"	X	4 1/4"	6"	4 1/2"	1 3/4
S-4830-19	4 1/2"	X	6"	8"	6 1/8"	4 1/4
S-4830-17	4 1/2"	X	7 5/8"	8"	7 7/8"	7 1/4
S-4830-3	5"	X	6"	8"	6 1/8"	4 1/4
S-4830-20	5"	X	6 3/8"	8"	6 1/2"	4 1/2
S-4830-21	5"	X	8 1/4"	8"	8 1/2"	7
S-4830-29	5 1/2"	X	6 3/8"	8"	6 1/2"	4
S-4830-23	5 1/2"	X	6 5/8"	8"	6 3/4"	5
S-4830-11	5 1/2"	X	7 5/8"	8"	7 7/8"	8
S-4830-18	5 1/2"	X	8 1/4"	8"	8 1/2"	9
S-4830-1M	7"	X	8 1/8"	8"	8 1/2"	5
S-4830-1	7"	X	8 3/8"	8"	8 1/2"	6
S-4830-2	7"	X	9 3/4"	8"	9 7/8"	11
S-4830-9M	7 5/8"	X	8 3/8"	10"	8 1/2"	10
S-4830-9	7 5/8"	X	9 3/4"	8"	9 7/8"	13
S-4830-16M	9 5/8"	X	10 1/2"	10"	10 3/4"	18
S-4830-16	9 5/8"	X	12 1/8"	10"	12 1/4"	19
S-4830-6	10 3/4"	X	14 1/2"	10"	14 3/4"	28
S-4830-15	11 3/4"	X	14 1/2"	10"	14 3/4"	25
S-4830-8	13 3/8"	X	17 1/4"	10"	14 3/4"	32

QUALITY ASSURANCE:
The vane O.D.'s are gauge ring O.D. size.

RETURNS:
No restocking fee charges for stock items returned for ROTCO warehouse in the same condition as delivered.

ALTERATIONS:
Any alterations of stock items will be charges to the customer and then is the property of the customer.

Usage

The ROTCO "Spiral" Stand-Off Centralizers are recommended to be used on:

- 1 *Shoe Joints*
- 2 *Through Production Zones*
- 3 *Liner Overlaps*
- 4 *Anyplace Cement Bond Is Essential*

To obtain maximum stand off, the ROTCO "Spiral" Solid Stand-Off[®] Centralizers can also be run in conjunction with the ROTCO Solid Straight Blade Stand-Off[®] Centralizers.

Spacing of the ROTCO "Spiral" Solid Stand-Off[®] Centralizer through productive intervals is 2 per joint (20 feet apart), utilizing the left and right hand spiral design in an every other space sequence. ROTCO recommends installation of the ROTCO spiral between two stop rings or between a collar and a stop ring. This allows the ROTCO spiral to move freely during running into the wellbore and during rotation or reciprocation of the casing. Positively fixed spiral models will gouge into the wellbore during casing movement, deteriorating the stand off feature. Stand-Off[®] is the key, without standoff you don't stand a chance.

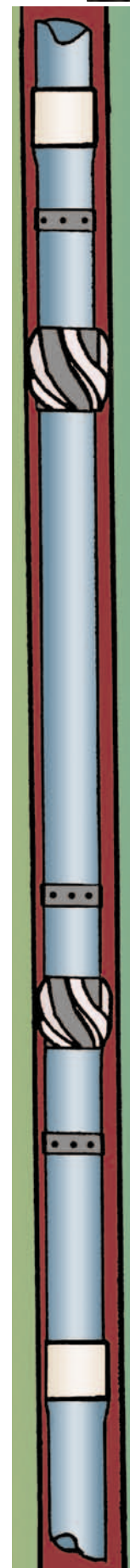
Stop Rings

One-Piece Design



The stop ring design is a one-piece model that slips over the pin end of the pipe and secured in place with set screws. The stop rings have a superior holding force and are especially applicable in close tolerance situations.

The stop collars are manufactured from tubular steel or high grade alloys to allow the centralizers a flat service to contact. The flat surface allows the centralizers a smooth bearing surface for rotational applications. The stop rings are available in a full range of sizes from 2 7/8" thru 20".



INTERCASING CENTRALIZERS



Intercasing Centralizers

Inline Centralizers

Usage

The Intercasing Centralizers are always recommended to be run on casing liners that will be run below a drilling liner. The reason being is because the drilling liner top has historically been very difficult on slip-on (bow or solid) casing centralizers. The slip-on centralizers are either broken, stopping the liner from going in, or on flush joint casing being shoved up the liner to the liner hanger. The intercasing centralizer blades are tapered on a 30° angle that allows for a nice smooth entry into the drilling liner with no problems.



Through a window cut for a side track. The main reason for running intercasing centralizers is because of the possibility of having to pull the casing back out. Casing going down through the window is in the **most relaxed position** with the wellbore. Once the casing is pulled up the casing is put in much more tension especially at the window. Casing tension tries to straighten the casing which increases lateral forces. These lateral forces are subjected also to the centralizers. Slip-on centralizers can break possibly sticking the casing.

On Premium thread casing in narrow casing/wellbore annulus.

The intercasing centralizer in reality is a casing pup joint with blades. This means there is no restriction from a centralizer body. These now allow standoff in the least annular space without fear of casing wedging with slip-on centralizers or having to run casing slick. If casing is run slick in close annular space there is a genuine possibility of costly cement squeezing and/or lost production. Casing run slick in a close annulus space (examples: 11³/₄" in 12¹/₂"; 9⁵/₈" in 10⁵/₈"; 7⁵/₈" in 8¹/₂") can experience in excess of 40% no cement channeling along the casing.

Lengths

In regards to costs, manufacturing time, and engineers' preference, intercasing centralizers are manufactured and available in a variety of lengths.

Model Number	SIZES			Length
	Casing	x	Blade O.D.	
IC 5000SS	5"	X	6"	18"
IC 5500SS	5 1/2"	X	6 3/8"	18"
IC 7000SS	7"	X	8 3/8"	18"
IC 7625SS	7 5/8"	X	8 3/8"	18"
IC 9625SS	9 5/8"	X	10 1/4"	18"
IC 3500S	3 1/4"	X	4"	25"
IC 5000S	5"	X	6"	25"
IC 5500S	5 1/4"	X	6 3/8"	25"
IC 7000S	7"	X	8 3/8"	25"
IC 7625S	7 5/8"	X	8 3/8"	25"
IC 9625S	9 5/8"	X	10 1/4"	25"
IC 5000	5"	X	6"	30"
IC 5500	5 1/4"	X	6 3/8"	30"
IC 7000	7"	X	8 3/8"	36"
IC 7625	7 5/8"	X	8 3/8"	36"
IC 9625	9 5/8"	X	10 1/4"	36"

1 18" Intercasing: Low cost; 8" blade; No recuts; No tong area.

2 25" Intercasing: Approximately 30% more cost than 18"; 15" blade length; No tong area; Recut to same weight or lighter, similar thread with 8" blades.

3 30" Intercasing: Approximately 85% more cost than 18"; 15" blade length; Tong area; Recut to same weight or lighter, similar threads, no tong area.

CENTRALIZED FLOAT EQUIPMENT



Float Shoe and
Float Collar



The “No Squeeze” Solid Stand-Off® Float Shoe & Float Collar



Centralized
“Tornado”
Up-Jet Action

Design

The new patented solid blade Stand-Off Float Shoe and Float Collar have been designed and developed to completely eliminate secondary cement squeezing of the casing shoe seats. The solid straight blades of the float equipment will give

the casing a bob sled ride into the wellbore: no turning, no dragging, no scraping, and no clogging between blades. The unique tornado design of the jets between each set of blades in the float shoe plus a downward jet will assure complete cement coverage around the shoe, even on the narrow side. Forcing cement up the narrow side of the pipe is the solution to getting 100% cement coverage.

Drillable Materials

A Superior back-pressure valve assembly is totally made of recommended PDC bit drillable phenolic material bonded to the U-type grooves in the steel housing with special high-strength concrete.

Tests

ROTCO Stand-Off Float Equipment design and material have successfully endured the maximum API RP10F 24-hour flow durability test and 5000 psi differential pressure tests.

Usage

The ROTCO Stand-Off Float Equipment is recommended on all casing shoe joints where rock solid shoe seats are essential. That is, these new deep water wells where rig time is very expensive, horizontal wells with open hole completions, exploratory wells with heavy mud programs, and close tolerance drilling liners where casing centralization and successful cementing has been a problem.

Success

This unique Float Shoe made the “No Squeeze System™” possible and our phrase, “If the cement has set up, there will be no reason to squeeze.”

Mud or Cement Spacer

With the usage of the RAY OIL TOOL COMPANY Centralized Up-Jet Float Equipment, a **SAVINGS** can be appreciated by using less mud/cement spacer ahead of the cement and **STILL** achieve a Solid Casing Shoe Seat Test.

The Reason for using less mud/cement spacer is because the Solid Centralized Float Equipment assures better casing/wellbore StandOff and the unique up-jetting system removes the mud from around the casing shoe joints.

How much less mud/cement spacer?

1/2 less for starters. If you want **JUST** a good shoe test, there is no need for expensive mud/cement spacer, use a few barrels of fresh water instead.

Mud/cement spacers were first developed because of the large number of poor primary cement jobs around casing shoe joints and productive zones. The poor cement jobs were blamed on poor mud removal and not poor casing centralization. With positive casing/wellbore standoff, the mud is easy to be replaced with cement completely around the casing.



The Silver Bullet Reamer Float Shoes & Collars

A New Generation of Tools

The **Silver Bullet Float Shoe** first developed by **RAY OIL TOOL CO.** for pounding the casing into wellbores in Colombia, SA., is now being used to pound and ream their casing in other parts of the world. Ray Oil Tools patented Centralized Float Shoes have incorporated the **Silver Bullet Nose** to create a new generation of **Reamer Float Shoes and Collars** to again help the casing reach total depth.

For reaming, the centralizing blades are covered with tungsten carbide to increase blade life. The blade configuration can be the operator's choice, straight, spiral left or right, and tapered.

The **Silver Bullet Float Shoe Nose** can also be an operators choice: bullet like, mule shoed, round, up or down jets and grooved.

For long periods of pumping, the ball check valve has the better life durability.

Also available is Ray Oil Tool's newly designed poppet valve assembly, which has the latest and most unique auto fill design in the oil field. The valve assembly and closure element are made with a phenolic material. A high strength concrete is the compound that molds the valve in the machined Float Collar and Float Shoe to form a strong unit. All float valve units have proven or exceed API RP 10F Category III C.



STAND-OFF®

ANOTHER PROBLEM SOLVER FROM RAY OIL TOOL CO.

"THE CENTRALIZATION SPECIALIST"

THE SILVER BULLET



Silver Bullet

The “No-Squeeze” System™

Usage The Silver Bullet Float Shoe was designed and developed to guide and assist the casing for by-

passing wellbore formation ledges, boulders, faults, and other obstructions in reaching total depth.

The Silver Bullet is the guiding nose of the float shoe and is constructed of a tough yet drillable aluminum (6061-T6). A down jet and side jets are installed to create a forceful jetting action which will assist in keeping the float shoe in the center of the wellbore. The Silver Bullet Float Shoe can also be constructed with centralizer blades which better keeps the float shoe nose more centered in the wellbore. The success of getting the casings to total depth in areas of historical hard casing running conditions has been extremely good.

The aluminum nose has been manufactured to assist in an easy drill, yet still be a nose that can withstand wellbore obstruction abuse. Another assist in drilling is to run and cement the shoe near bottom to eliminate a void area of cement in the rathole.

Drill-Out Recommendations The aluminum nose can be drilled efficiently with PDC bit only if the bit is allowed to shave the aluminum. This

requires patiently applying bit weights of 0-5000# and a very slow rotary of 50-60 rpm. It is recommended a full gauge drilling stabilizer be used near bit to deburr the nose of the shoe once drilled out and to assist in destroying any remaining aluminum particles.

NOTE: The above drilling procedure for drilling the aluminum nose guide with a PDC bit is recommended by SMITH INTERNATIONAL.



Bi-Centered Centralization

“Up-jet” Float Shoe, Collar and Inline Centralizer

The Bi-Centered Float Shoe has the unique “**Tornado**” **Up-Jet System** that has

The **RAY OIL TOOL COMPANY** Bi-Centered Float Equipment and Inline Centralizers are centralized with an integral bow spring centralizer that fully recesses for close tolerance passage and flexes out in the larger wellbore below.

been most successful with the ROTCO patented Solid Centralized Float Shoe.



The API approved flexible bow centralizers can be recessed to below the outside diameter of the Bi-Centered equipment for easy passage through

subsea wellheads, close tolerance casing internal diameters, and later flexes out for centralization in underreamed or bi-center drilled wellbores. The unique “patent pending” LUG supported flexible bow centralizer system allows the bow centralizer to be drawn through restrictions going in or out of the wellbore, reducing bow spring stresses. In these most difficult conditions, this combination with the ROTCO “Up-Jet” Float Shoe institutes the best possibility for “No Squeeze” results.

Centralized
“Tornado”
Up-Jet Action



Float Shoe

PATENT PENDING



Float Collar
and/or Inline Centralizer

“THE CENTRALIZATION
SPECIALIST”



STAND-OFF™

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Ray Oil Tool Co.

Nine Well Success. As first reported in *The Brief* of December 1996, the RAY OIL TOOL COMPANY innovative 'No Squeeze System' has now proven successful in the first nine Amoco Deepwater Wells (45 strings of cemented casing). The wells are in water depths from 3,000 feet to 7,000 feet in the Mississippi Canyon, Viosca Knoll and Desota Canyon blocks.

Wellbore Friendly Centralizers. The casing strings were equipped with ROTCO's patented Centralized Up-Jet Float Shoes and Centralized Float Collars and patented Solid Straight Blade Casing Centralizers. As experienced before, the straight blade float equipment and solid centralizers were wellbore friendly by eliminating scrapping and reducing drag, plus giving the proper stand-off for primary cementing. The cemented centralized Float Shoe anchors the casing, minimizing casing back-off.

Cost Savings. The cost savings of a No-Squeeze well can very well be appreciated and credited to Amoco's superb well planning and their use of the latest innovative combined technologies and equipment. The 'No Squeeze System' combines the first ever designed and patented Ray Oil Tool Solid Casing Centralizers and the Centralized 360° Up-Jet Float Shoe (which ensures complete cement coverage). A single squeeze job on most drilling wells costs approximately 24 hours of rig delay and operational costs. A Deepwater Rig's total operational cost can easily exceed \$200,000 per day.

Amoco Eliminates Cement Squeezing. Because of Amoco's excellent advance planning and execution, Amoco has been able to eliminate cement squeezing on their Deepwater wells. Other Deepwater Operators that are using the Ray Oil Tool Company 'No Squeeze System' are experiencing the same results as Amoco. This unique System is also being used in non-Deepwater areas by operators worldwide, all with No-Squeeze results. By eliminating costly and time consuming remedial cementing, Amoco has been able to complete their wells under their estimated expenditures. This is something of which to be very proud.

The Centralization Leader. Ray Oil Tool Company has long been recognized as the world leader in the field of Solid Casing Centralization. We are grateful to Amoco for allowing us the opportunity to prove out our 'No Squeeze System.'



Ray Oil Tool Company, Incorporated
The Centralization Specialists

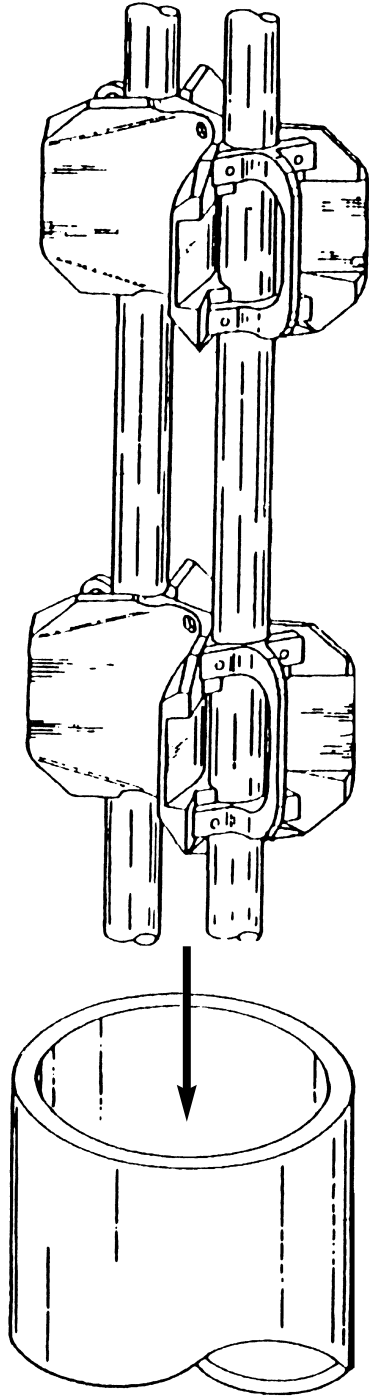
DEEPWATER REPORT: RAY OIL TOOL COMPANY, INC. 'NO SQUEEZE SYSTEM'™

Location	Gulf of Mexico
Water Depth	3,000 – 7,000 feet
Operator	AMOCO
Number of Wells	9
Block Location	Mississippi Canyon Viosca Knoll Desota Canyon
Number of Casing Strings per Well	5
Total Primary Cementing Jobs	45
Success Percent	100%



The Downhole Casing Guide

Maximizing Your Advantage



The **Ray Oil Tool Company** has designed, developed and patented a downhole casing guide member that is being used to **double** the wellbore **slots** of a fixed offshore drilling platform. A **12-well platform** can now become as much as a **24-well platform** if the need arises. The guide members are designed to conjunct with a world wide major wellhead manufacturer.



STAND-OFF®

"THE CENTRALIZATION SPECIALIST"

**Another downhole innovative tool by
RAY OIL TOOL COMPANY**





Preparations, Installations and Usage

The Solid Centralizer Wellbore Preparations

The Solid Centralizer has no flexibility so the installations are not always the same as installations have been for the flexible bow centralizers. Solid Centralizers will stiffen the casing string much more than the bow centralizer.

The following procedure for running Solid Centralizers have been established over the last sixteen years after thousands of successful casing runs and cement jobs.

- 1** *Never run a stiffer casing string than the drilling bottom hole assembly used.*
- 2** *Surface hole and deeper wellbores should be drilled with a minimum of 2-full gauge or near full gauge drilling stabilizers within 90 feet of bit. If not drilled with stabilizers, a conditioning trip prior to running casing with stabilizers is advised.*
- 3** *On wellbores with build angles less than 4°/100ft., run two (2) Solid Centralizers per casing joint (20 ft. apart) separated by a stop ring.*
- 4** *On wellbore with build angles 4°/100ft to 20°/100 ft. run no more than one (1) short Solid Centralizer per joint.*
- 5** *Most wells do not need over centralization, therefore Solid Centralizers should only be used where a good 100% circumferential cement job is needed:*
 - (a) Across Production Zones plus 2 - 3 Joints above and below.*
 - (b) Casing Shoe Joints.*
 - (c) Casing and liner overlaps.*
 - (d) Near well heads.*
 - (e) Wellhead cut off abandonment area.*

Most of the casing jobs that have had problems going into the wellbores have been because of trying to run too many Solid Centralizers per joint, or in wellbores not drilled with drilling stabilizers.

In wellbores that are drilled anticipating the usage of Solid Centralizers, casing strings with the Straight Blade Solid Centralizers actually run smoother into the wellbore. Straight Blade Solid Centralizers have one-half (1/2) the fluid restriction and drag as the bow centralizers.

Note: To assist you in centralizer placement, Ray Oil Tool Co. has a computerrized solid centralizer placement program

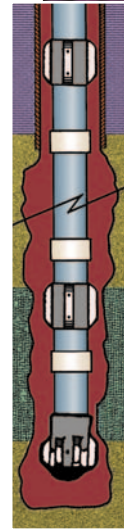
Conductor Casing

Objective

To achieve good cemented shoe joints and good upper cement coverage for load support. Approved centralizers for sub-sea wellhead wells.

Solid Centralizer Placement (1 per joint)

- 1 Place 1 solid slip-on centralizer 5-10ft. from float shoe.
- 2 Place 1 solid slip-on centralizer in middle of 2nd joint from float shoe.
- 3 Place 1 solid slip-on centralizer in drive pipe overlap for wellhead alignment and load distribution, and later for improved cutting on abandonment.
- 4 ROTCO Centralized Up-Jet Float Shoe to assure good cement coverage around the shoe joint.



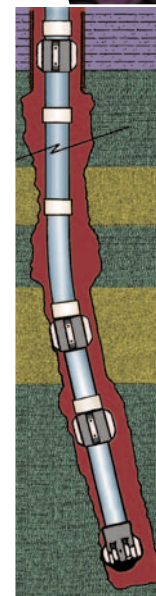
Surface Casing

Objective

To achieve good cemented shoe joints and shoe tests. To get isolated zones of good cement. Sub-sea wellhead approval.

Solid Centralizer Placement

- 1 Place 1 solid slip-on centralizer 20ft. from ROTCO's Centralized Up-Jet Float Shoe.
- 2 Place 2 solid slip-on centralizers per joint separated by a stop ring in the middle of the joint on each of the next 2 or 3 joints from the shoe.
- 3 Place 1 solid slip-on centralizer above and below a cement stage collar.
- 4 Place 1 solid slip-on centralizer in conductor casing overlap for wellhead alignment, good top out cement job for load distribution and better cutting on abandonment.
- 5 Place 1 solid slip-on centralizer per joint from surface fresh water zone to regulated depth for saltwater isolation.
- 6 ROTCO Centralized Up-Jet Float Shoe to assure good cement coverage around the shoe joint.



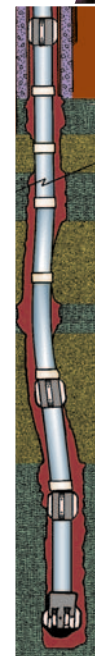
Protection Casing (Intermediate)

Objective

To achieve good cement around the shoe joints. To achieve isolated zones of good cement.

Solid Centralizer Placement

- 1 Place 1 solid slip-on centralizer 20ft. from ROTCO's Centralized Up-Jet Float Shoe.
- 2 Place 2 solid slip-on centralizers per joint separated by a stop ring for 3 to 4 joints above the float collar.
- 3 Place 2 solid slip-on centralizers in the surface casing overlap (near bottom and 1 near casing hanger).
- 4 For production intervals see Production Casing.





Production Casing

Objective

The objective is to achieve casing standoff throughout the productive intervals. Stand-Off® will allow complete mud removal and complete cement coverage. Solid casing centralizers can be perforated through with no deformation or degradation of shot.

Solid Centralizer Placement

- 1 Place 1 solid centralizer on shoe joint above ROTCO Centralized Up-Jet Float Shoe.
- 2 Place 2 solid slip-on centralizer per joint throughout all productive intervals. If casing is to be rotated and/or reciprocated, do not run with set screws. The solid centralizers will then serve as a centralizer bearing while the casing is being worked. The solid centralizer normally will remain stationary while the casing is worked within.



Drilling Liner

Objective

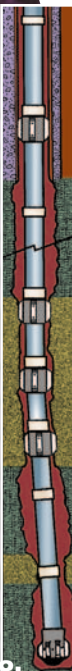
To achieve good cement coverage around the casing shoe joints and liner overlap.

INTERCASING CENTRALIZERS FOR CLOSE TOLERANCE WELLBORES.

- 1 Run a ROTCO Centralized Up-Jet Float Shoe.
- 2 Run a ROTCO Centralized Float Collar.
- 3 Screw 2 inter casing centralizers on the next 2 joints above float collar.
- 4 Screw 2 inter casing centralizers into the liner for casing liner Stand-Off® in the bottom 80ft. of the liner overlap.

SLIP-ON

- 1 Run a ROTCO Centralized Up-Jet Float Shoe.
- 2 Run a ROTCO Centralized Float Collar.
- 3 Run 2 per joint solid slip-on centralizers on next 2 joints above float collar.
- 4 Run 2 per joint solid slip-on centralizers on 2 joints of liner in lower liner overlap.



Production Liner

Objective

To achieve casing stand-off through the productive intervals and liner overlap for complete cement coverage.

Solid Centralizer Placement (slip-on or inter casing)

- 1 Place 1 or 2 solid centralizer per joint through the productive interval. Short productive intervals may require casing pup joints for additional installation of the inter casing centralizers through the productive interval.
- 2 Place 2 solid centralizers in the bottom 80ft. of liner overlap.
- 3 Run a ROTCO centralized Up-Jet Centralized Up-Jet Float Shoe.

4 On close tolerance wellbores run 1 inter casing centralizer per joint throughout the productive intervals.

5 Wellbore permitting, run 2 slip-on solid centralizers per joint separated by a stop collar throughout the productive intervals plus 2 joints above and below.

Placement of the ROTCO Long Solid Casing Centralizer

I. For rotation purposes:

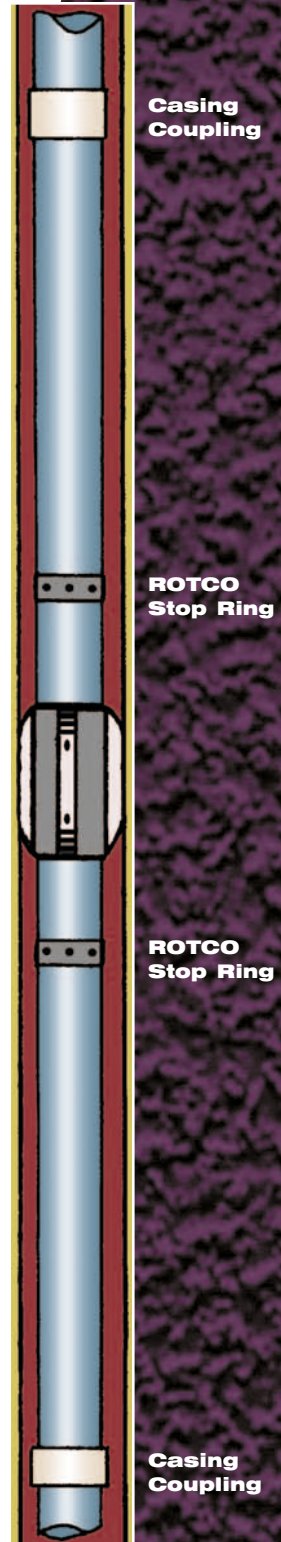
1 Slip onto joint without set screws.

2 To rotate in the middle of the joint, slip on a ROTCO stop ring, 1 - long solid centralizer, and a ROTCO stop ring (see illustration).

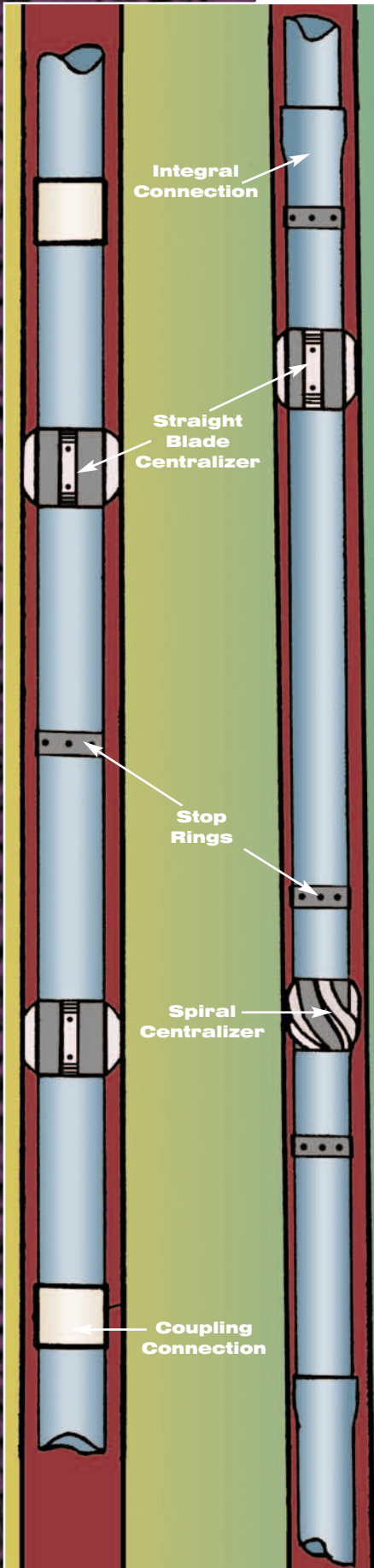
II. For reciprocation and/or rotation the long solid centralizer can be run free on the joint (without set screws).

III. To position the long centralizer on the joint, slip it on and set the set screw.

Note: Do not run more than 1 - long solid centralizer per joint, or only 2 - short solid centralizers per joint, with or without pipe movement.



Placement of the ROTCO Solid short Slip-On Casing Centralizers (Spiral or Straight Blade)



I. For rotation and/or reciprocation purposes: (Run the centralizers without set screws.)

- 1 Space 20 feet apart (2 per joint) between 2 stop rings or a collar and a stop ring.
- 2 Space 2 per joint with a stop ring between in the middle of the coupling joint.

II. When no pipe movement is anticipated with straight blades:

- 1 Space 2 per joint 20 feet apart anchored with the centralizer set screws.
- 2 A stop ring may be placed in between for added no-slippage assurance.
- 3 Spiral centralizers have no set screws and must be run between stop rings. It is recommended that spiral centralizers never be anchored to the casing with set screws because of the scrapping action.

III. To run on integral flush and near-flush liner connection casing, space 2 per joint 20 feet apart each between stop rings.

IV. To run solid centralizers on horizontal wells:

- 1 On wellbores with angle build-up of less than $4^\circ/100$ ft., 2 short solid centralizers per joint between stop rings.
- 2 On wellbores with angle build-up $4^\circ/100$ ft. and above, run only 1 short solid centralizers per joint between stop rings.
- 3 On collared casing, 1 per joint does not need a stop ring, 2 per joint needs a stop ring between the centralizers.

Note: Spiral centralizers should always be allowed to rotate freely on the casing. Straight blade centralizers should not be run with set screws if rotation or reciprocation is anticipated.



Placement of the ROTCO Intercasing Centralizer on Integral Flush Casing

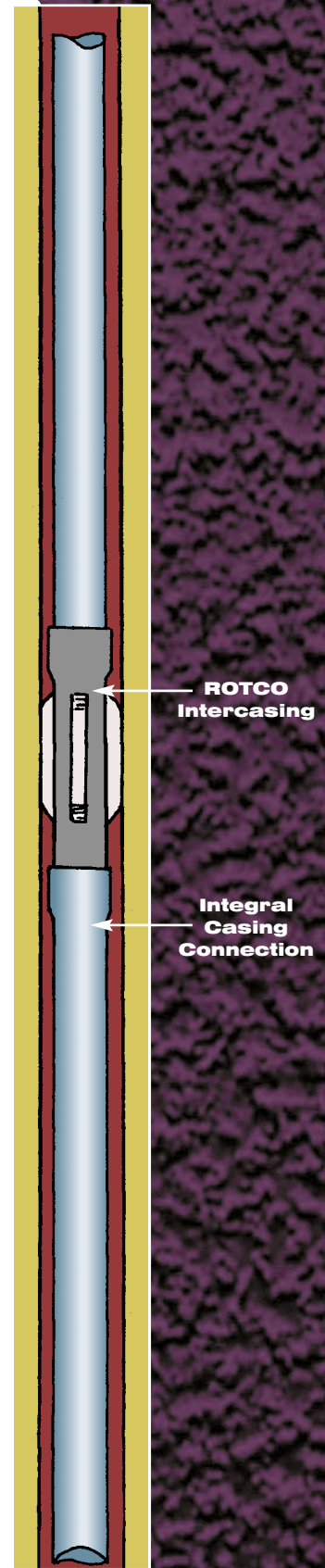
I. For close tolerance wellbore/casing annulus productive zones:

- 1** For long productive zones, screw into casing string 1 intercasing centralizer per joint, 1 joint apart throughout the productive zone.
- 2** For short productive zones (less than 40 feet) use a casing pup joint with an intercasing centralizer on each end of the pup joint.

II. For drilling liners, use ROTCO centralized Up-Jet Float Shoe and centralized float collar, 2 intercasing centralizers above the float collar and 2 in lower liner overlap.

III. For liner overlaps, place 1 intercasing centralizer near the bottom of the overlap and 1 near the liner hanger.

Note: Pipe reciprocation or rotation with any fixed centralizer will deteriorate standoff because of the wear of the centralizer and/or formation.





Suggested placement of ROTCO's solid slip-on centralizers with the ROTCO centralized up-jet float shoe and ROTCO centralized float collar (optional).

On 3rd joint slip a solid centralizer near the upper end of the joint.

3rd joint

On 2nd joint slip a sold centralizer near the upper end of the joint.

2nd joint

ROTCO centralized float collar or slip a solid slip-on centralizer on the 1st joint before putting on the float shoe. Slip the centralizer up near the top of the 1st joint.

1st joint

Keep casing shoe up off bottom enough distance to allow for casing elongation (5-10ft. minimum, depending on depth).

**ROTCO Centralized
Up-Jet Float Shoe**



Experience. Research. Development.

These are three words that have come to signify the philosophy of our company. And while we use these words as an incentive for our own growth, they clearly identify our mission to our most important customer- you.

Our passion began over twenty years ago, during the time of “hands-on” operations. We knew that prioritizing development of new products as well as refining existing ones would firmly place us into the top echelon of oil tool companies. This passion, accompanied by our speed and adeptness in adapting to the ever-changing world markets have allowed us to grow into an international corporation, with agents in over 25 countries as well as 49 states.

We’ve come a long way since our inception. We are reinventing and perfecting our products as well as our team. All of us at Ray Oil Tools take extreme pride in the quality of our tools, our service, and our people.

We see exciting times ahead.



STAND-OFF®
Ray Oil Tool Company



STAND-OFF®

Ray Oil Tool Company

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