SPURS®

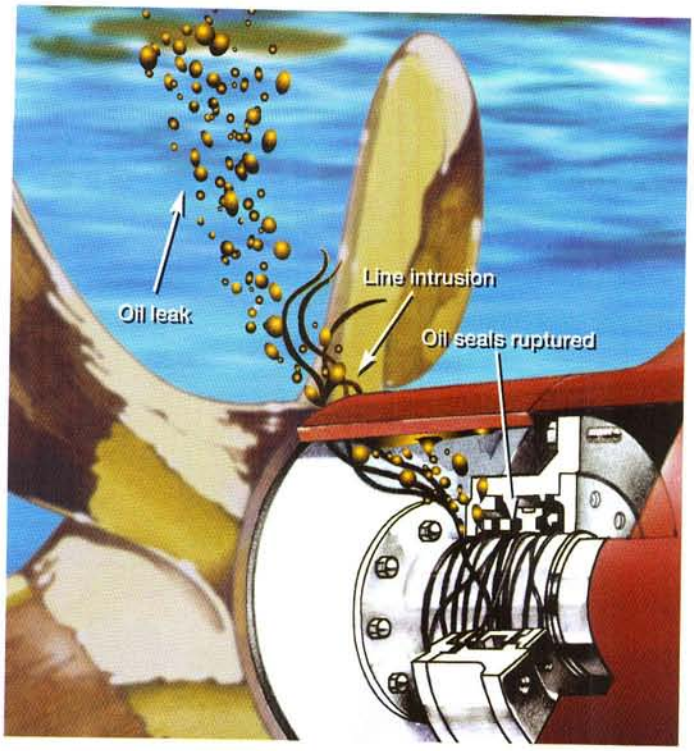
LINE & NET CUTTERS

Protection for the Shipping Industry!

ABS Type Approval Program

Spurs Marine Mfg, Inc. * 201 S.W. 33rd Street * Ft. Lauderdale, FL 33315
Visit Our Website at: www.spursmarine.com * E-mail: spurs@spursmarine.com
Phone #: 954-463-2707 Fax #: 954-525-0239

Environmentally Responsible



Damaged oil seals due to line intrusion. When seals are ruptured, oil pressure must be maintained forcing oil into water.

The Oil Pollution Act of 1990 imposes heavy penalties for oil leaks. It also orders the Coast Guard to advise vessels to immediately secure the source of the leak. Protect your bottom line with Spurs.

SPURS® the only answer to:

- Preventing oil leaks and operating in an environmentally responsible way.
- Avoiding costly fines for polluting waterways.
- Avoiding expensive unscheduled dry docking and diver charges.
- Eliminating dives to cut prop fouling lines and nets in freezing or high seas.
- Minimizing down time for repairs.
- Preventing expensive towing charges.

Waterways contain more than just water. Fishing lines, drift nets, trap lines, discarded floating tow lines and hawsers lie in wait for passing vessels. These hazards can cause seal damage, and result in costly, unscheduled haulouts.

Simple in concept, yet sophisticated in design, Spurs Line Entanglement Clearance Systems can save you both time and money. Spurs are used on thousands of Navy, Coast Guard and commercial vessels worldwide, from coastal tugs and fishing boats to supertankers. Spurs have provided millions of miles of protection from unseen entanglement hazards.

What Are Spurs?

SPURS consists of two main assemblies. One or more rotating cutting blades are attached to a vessel's propeller hub. A stationary cutting blade is attached to the rope guard or strut. When lines or debris are caught by the propeller, they are instantly cut free with each revolution of the shaft.

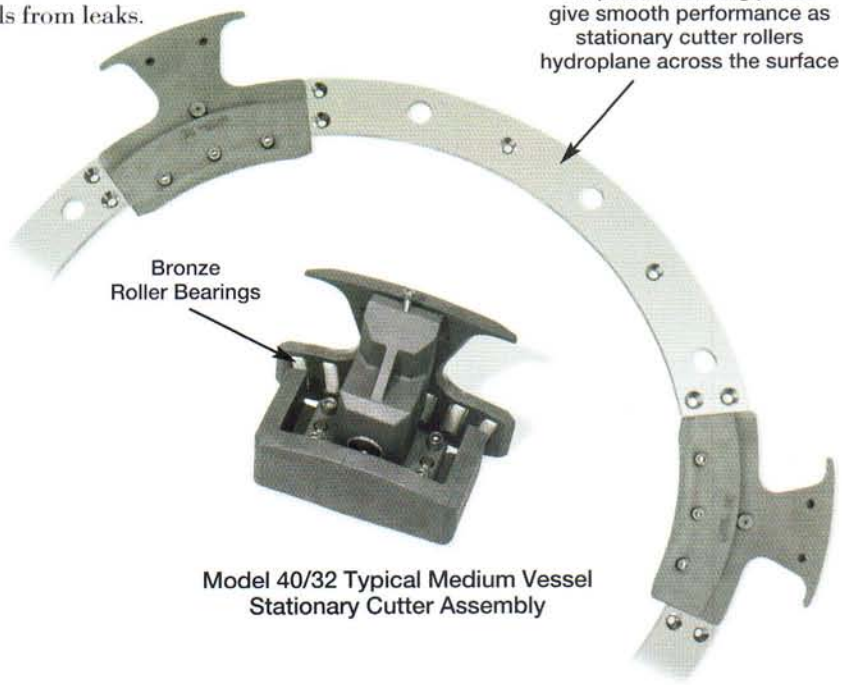
While the concept of Spurs – cutting lines – is simple, the technology involved in making them perform dependably over millions of miles is extremely sophisticated in terms of design, materials, and precision manufacturing. Years of research and testing have resulted in a patented system that is as reliable and durable as it is effective.

Precision machined, heat treated and hardened stainless steel metals, high tech hydrophilic and bronze bearings, and ingenious corrosion control engineering are used to make the parts of the Spurs system. However perhaps the most important feature is Factory Technical Support. With every Spurs installation you can count on step by step assistance – on site if needed – to ensure that your entanglement clearance system is properly installed. Every new installation draws on the experience of numerous successful installations.

Routine maintenance during regularly scheduled drydocking is simple and straight forward. Spurs are designed to withstand the rigors of constant service year in and year out. Spur's **self-centering cutter** position control prevents surface to surface contact under normal operating conditions. Cutter blades are forced together with a built-in wedge only when in contact with foreign objects. They return immediately to stand-by position after the obstruction has been cut and cleared away.

Spurs is approved by the American Bureau of Shipping (ABS). It is the standard line entanglement clearance system for thousands of vessels around the world. Avoid the expense of delay and repair by installing genuine Spurs cutters on every vessel in your fleet. They are the most cost effective way to protect a ship's propeller shaft oil seals from leaks.

Model 60/48 Typical Large Vessel Cutter



Model 40/32 Typical Medium Vessel Stationary Cutter Assembly

How Do Spurs Work?

SPURS® use the propeller's rotation and its inertial force to power the cutting action. As a line enters the propeller vortex, it is wound toward the propeller hub. Without Spurs installed, the line would continue to wind itself tighter and tighter, eventually entering into the space between propeller hub and rope guard, where it can cause damage to the oil seals. With Spurs, the line is engaged by the rotating cutter blades and delivered to the stationary cutter blade. The sudden resistance sensed by the stationary cutter wedge forces a cam action that causes the rotary blade to be pushed aft, meeting the rotating blade and instantly severing the obstruction.

The cutting force increases in direct proportion to the resistance sensed by the stationary cutter wedge assembly. This shearing action means that the line is cut and washes away before entanglement occurs. After the line or net has been cut, the stationary cutter blade returns to a neutral position awaiting the next cutting event.

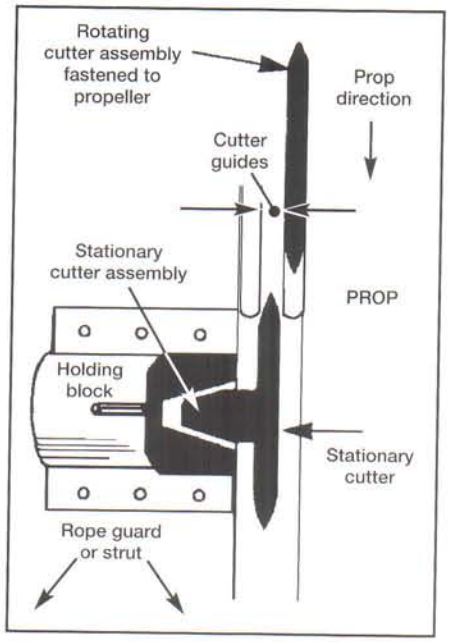
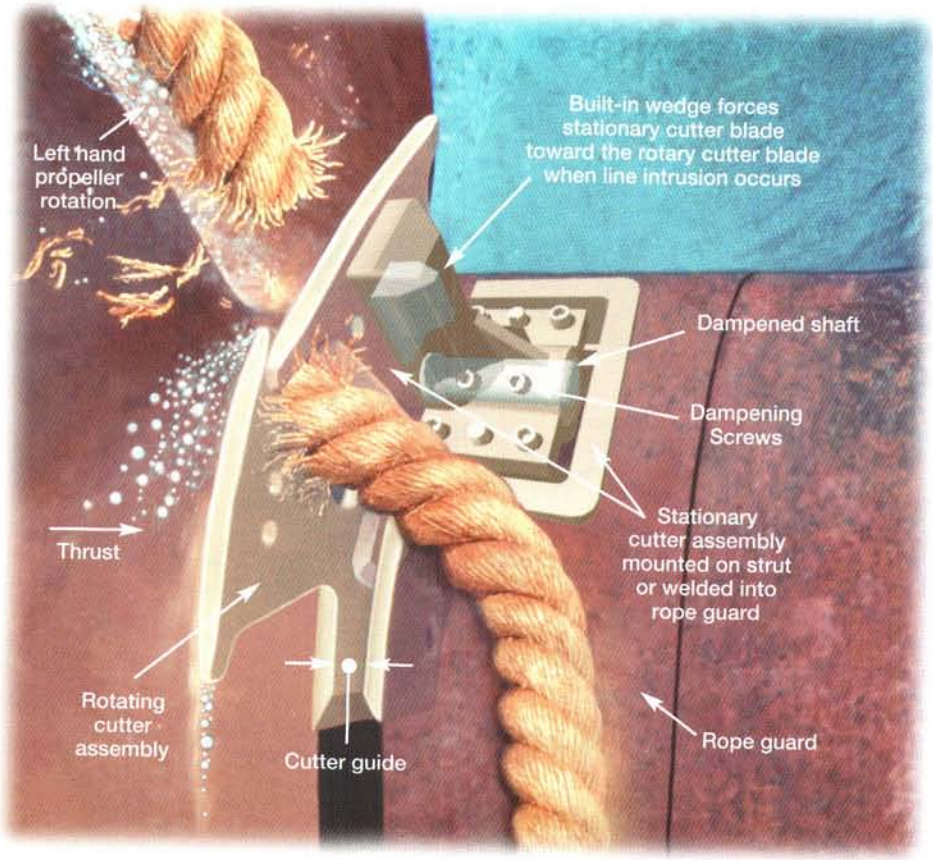


Fig. 1 Stationary cutter centers itself in the cutter guides as it passes through with each revolution of the prop.



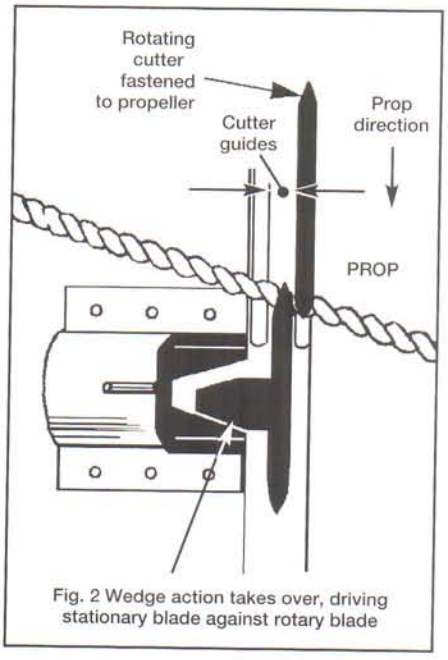


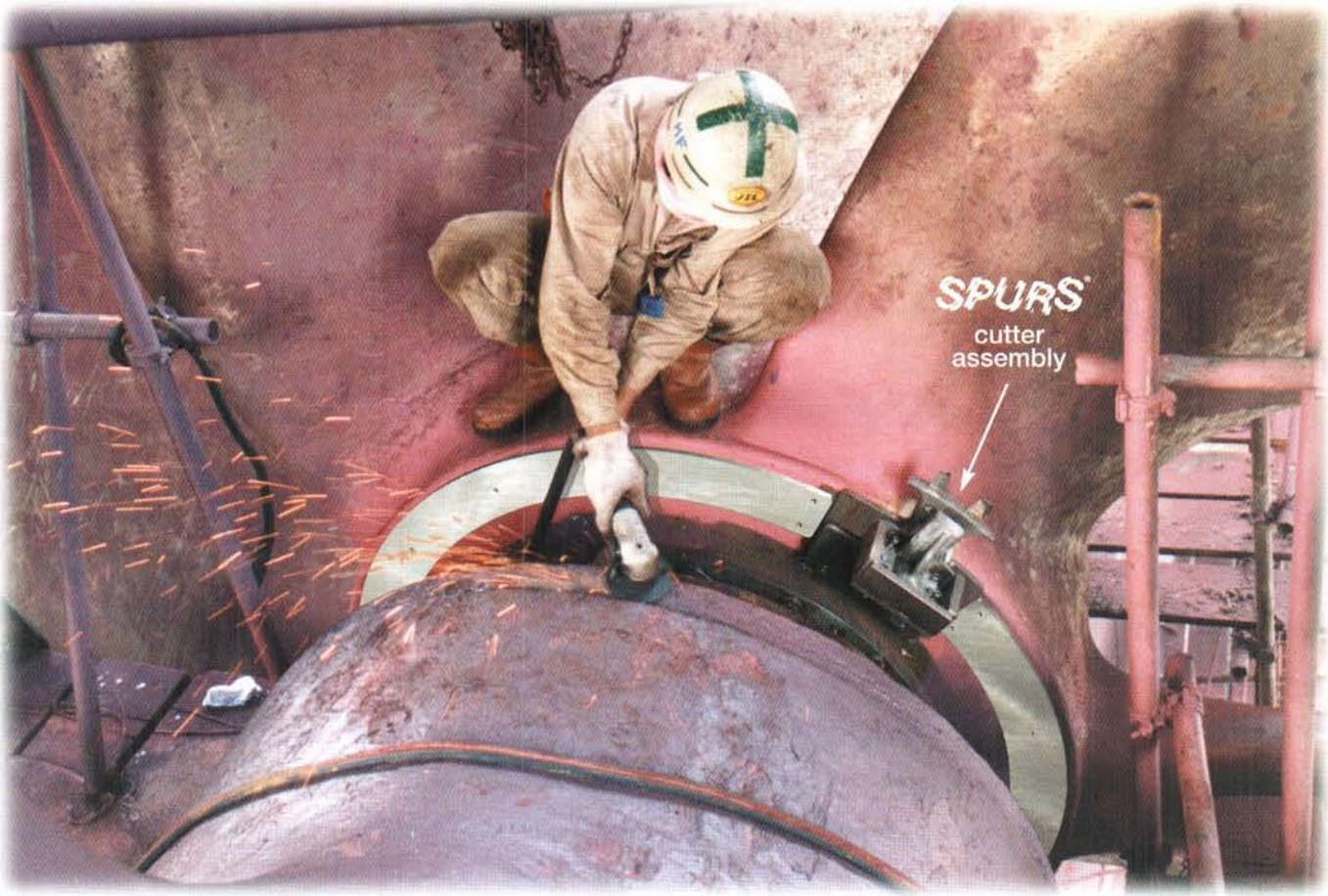
Fig. 2 Wedge action takes over, driving stationary blade against rotary blade

Typical Spurs Installation

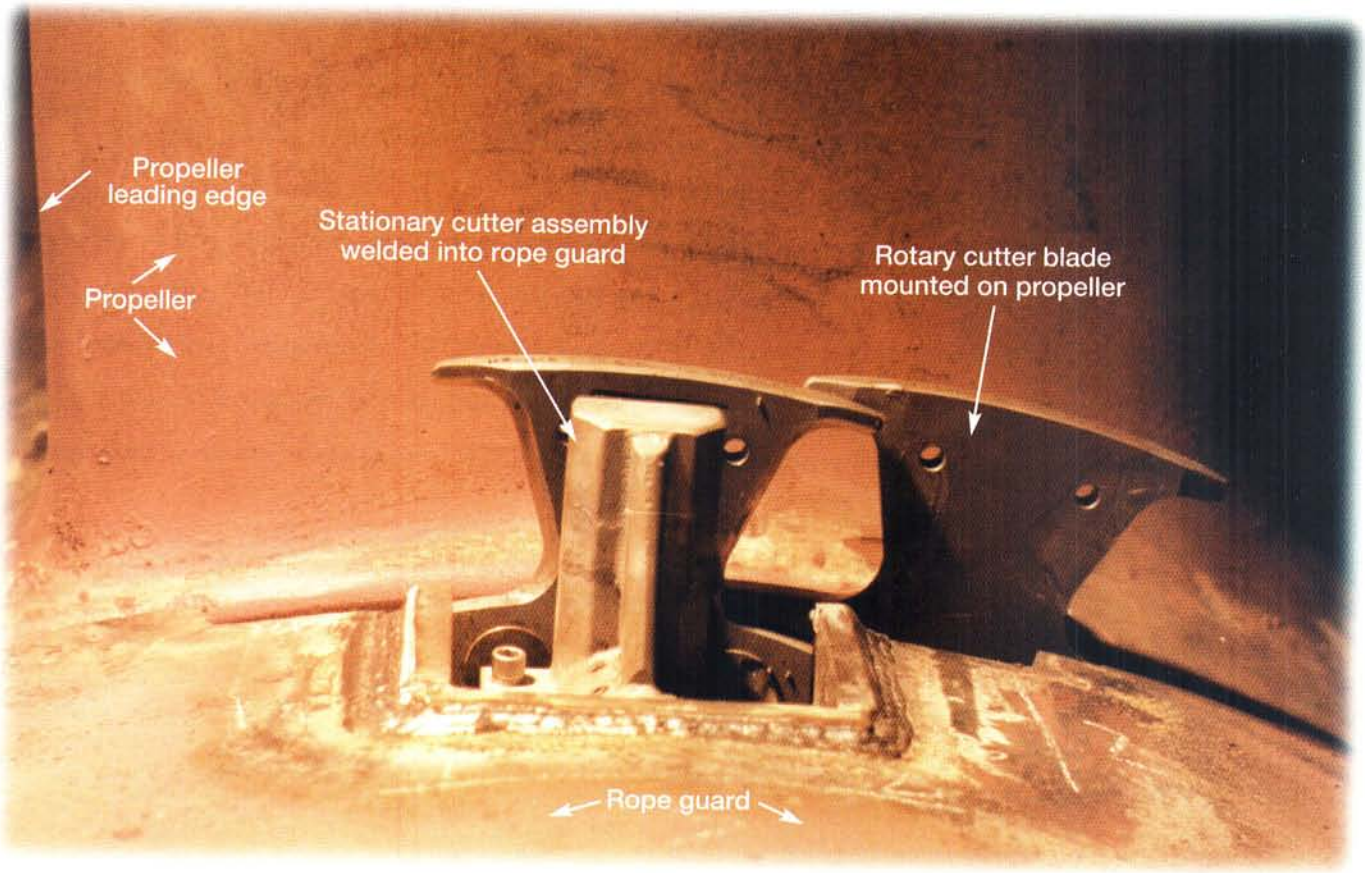
The photo below shows a SPURS® Line Cutter Model LV-60/48 complete and mounted to the propeller hub. The cutter is made up of two separate assemblies: the rotary cutter assembly, typically with 2 blades mounted 180° apart; and the stationary cutter assembly mounted into the rope guard. The propeller hub is drilled and tapped, then the rotary cutter assembly is fastened with stainless steel screws. The stationary cutter assembly is married to the rotary cutter assembly with two shoulder bolts and .015 shim spacers between the rotary and stationary cutting blade as shown below.

The workman in the photo is grinding and preparing the strut recess in preparation for the rope guard installation. We recommend a 3/4" thick rope guard to be installed when a line cutter is used. The 3/4" rope guard provides the extra strength needed for cutting a large hawser or heavy nets.

Spurs Large Vessel Line Cutter Mounted On Prop Face



Completed Installation



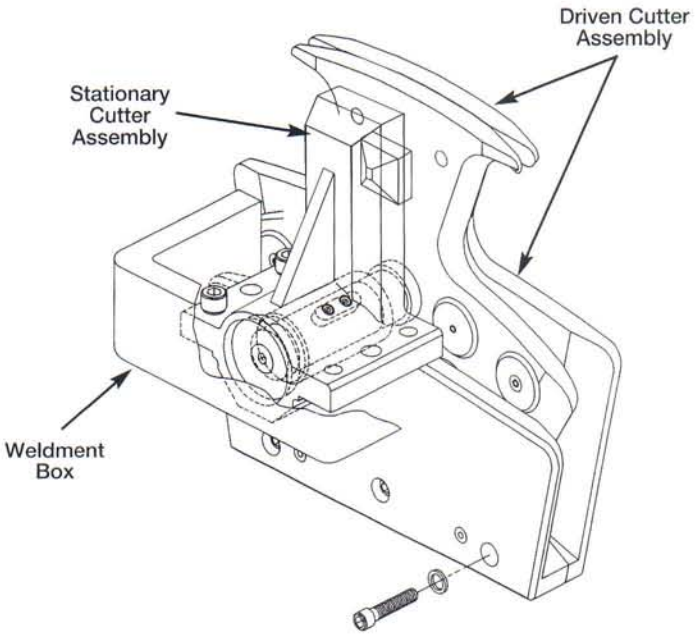
Spurs Large Vessel Line Cutter Installation Complete

The photo above shows a completed installation of SPURS Line Cutter Model LV-60/48. A box to hold the stationary cutter assembly has been welded into the rope guard; the stationary cutter assembly is screwed and dowel pinned into the welded box and is easily removed and replaced for service. The rotary cutter assembly is fastened and mounted to the propeller hub. The cutter blades always remain .010 - .015 apart due to a guide mechanism and a dampened but movable cutter shaft that is built into every cutter. The rotary cutter and stationary cutter assemblies have had the marrying screws and .015 shims removed and now operate independently as opposing blades. The propeller has been rotated to verify clearances between the two opposing blades. As the cutter blades pass during each rotation, there is no contact. This assures no wear and no maintenance. However, when a line is cut or the propeller shaft moves forward or aft (end play), the cutter blades contact, but only for one quick adjustment during a single revolution. The rotary cutter guide automatically centers the stationary cutter block. This centering adjustment will occur either in forward or reverse.

Typical Large & Medium Vessel Cutters

The typical Large Vessel Cutter is easily retrofitted and installed on vessels with oil seal bearings. The cutting blades are made of 17-4 pH stainless steel, the hardest metal known to remain stable under saltwater. They are hardened to approximately 43-45 Rockwell C to maintain the sharpest edge. The remainder of the cutter parts are 316L stainless, suitable where hardness is not required for performance, but also very stable in salt water. The box welded into the rope guard is also made of 316L stainless steel. The compatibility of the metals allows the stainless steel box and rope guard to be easily welded and remain stable against electrolysis.

The typical Medium Vessel Cutter Series are designed to fit all vessels with propeller hub diameters 12" - 40"; and the Large Vessel Cutter from 40" - 70" diameter. The cutter can easily be installed on new vessels or retrofitted to existing vessels with fixed or variable pitch propellers, thrusters, Z-Drives, etc. See page 9 for further Thruster and Z-Drive information



Typical Large Vessel Cutter Model 60/48
Range from 40"- 70" Propeller Hub Diameter

Typical Medium Vessel Cutter - Model Range
from 12"- 40" Propeller Hub Diameters

Prop-Mounted Cutter Series

purs Cutter Systems are designed to track and follow the ships' axial shaft movement 1/4" forward and 1/4" aft for a full 1/2". This allows the Cutter System to constantly maintain a space of .010-.015 between blades!

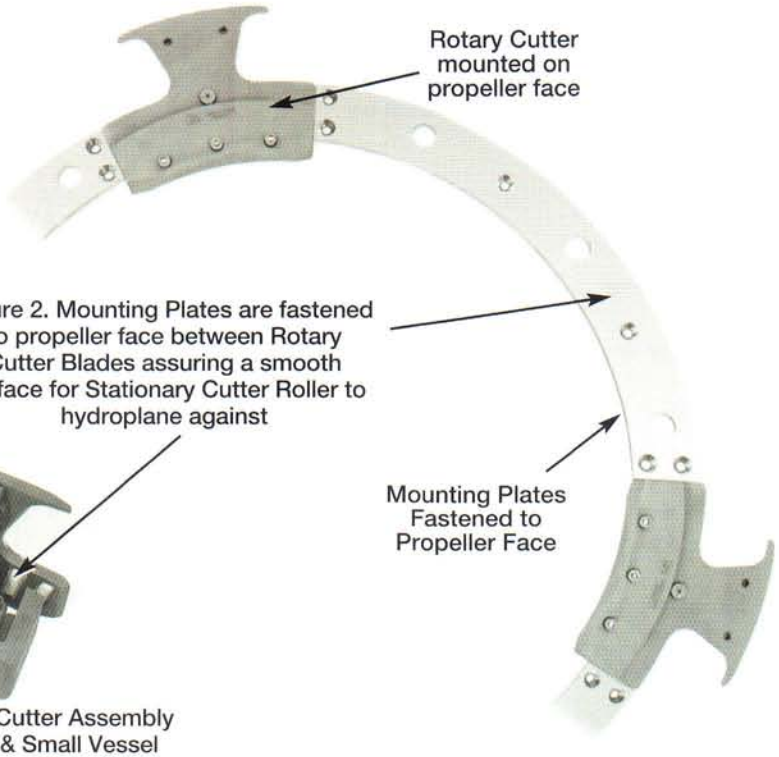


Figure 2. Mounting Plates are fastened to propeller face between Rotary Cutter Blades assuring a smooth surface for Stationary Cutter Roller to hydroplane against

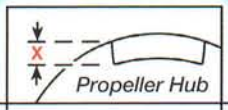
Figure 1. Stationary Cutter Assembly for Medium Vessel & Small Vessel Installation

Figure 3. Large Vessel Cutter Assembly complete; Rotary Cutter & Stationary Cutter married together

Optional Installation

Rotary Cutter can be inserted into a pre-milled pocket in propeller face eliminating the need for the Mounting Plates

*** Minimum dimensions necessary for Cutter Installation. Call for sizing and quotes for any size vessel*



Standard Models Available in Stock	Minimum space between props & stern tube	X=Mounting surface height	Minimum space between rope guard & prop
LV 60/48	NA	7.305" (185.55mm)	*.250" (5.35mm)
MV 40/32	** 1.750" (44.45mm)	3.875" (98.43mm)	"
MV 32/24	"	3.875" (98.43mm)	"
MV 24/19	"	3.620" (91.95mm)	"
MV 19/15	"	3.250" (82.55mm)	"
SV 15/12	"	2.50" (63.5mm)	"

*To achieve minimum space between Propeller and Rope Guard (1) the Rotary Cutter must be set into the Propeller (mill pocketed) .500" or (2) .500" Mounting Plates must be fastened to the Propeller Face as in Figure 2 above.

Thrusters, Z-Drives & Special Drives

Thrusters, Z-Drives and other propulsion components need the protection of SPURS®. The most common repair on thrusters is seal damage and gear replacement. This is caused by excessive wear due to water intrusion. Guard against lines damaging thruster oil seals by installing SPURS® Cutter Systems.

Figure 4. Seal failure due to line and net intrusion on typical thruster unit *Without* a SPURS® Cutter System installed

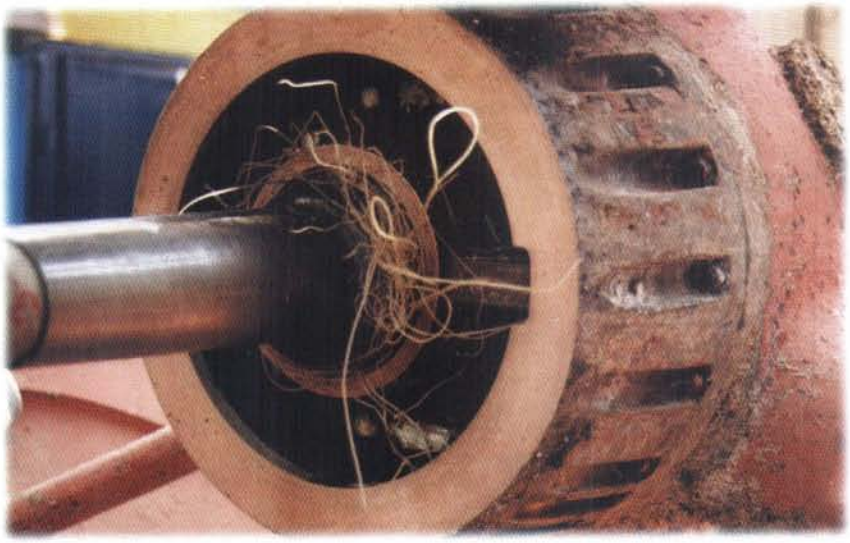
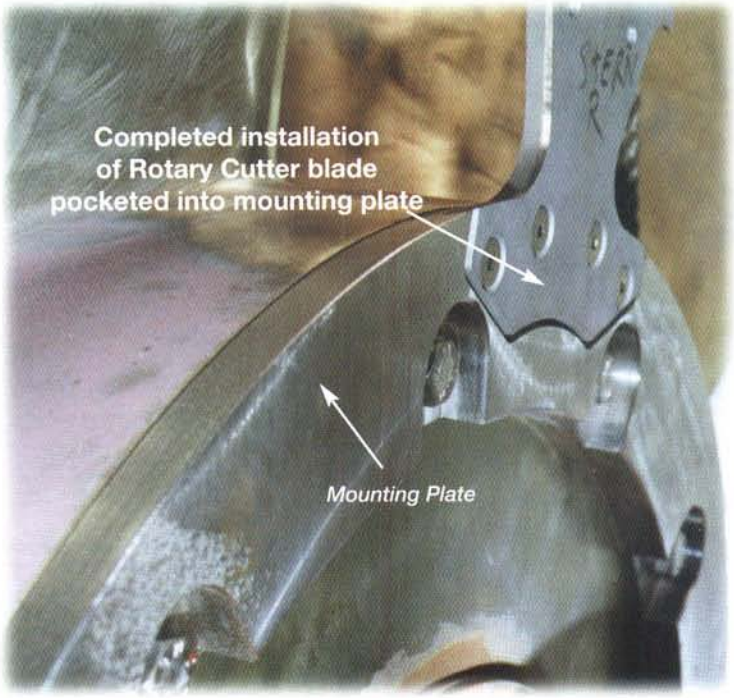


Figure 5. Optional Flush Mounted (FM) Rotary Cutter milled into pocket of mounting plate which is fastened to propeller face. Rotary Cutter Blades can also be mounted into a pre-milled pocket directly on the propeller face.



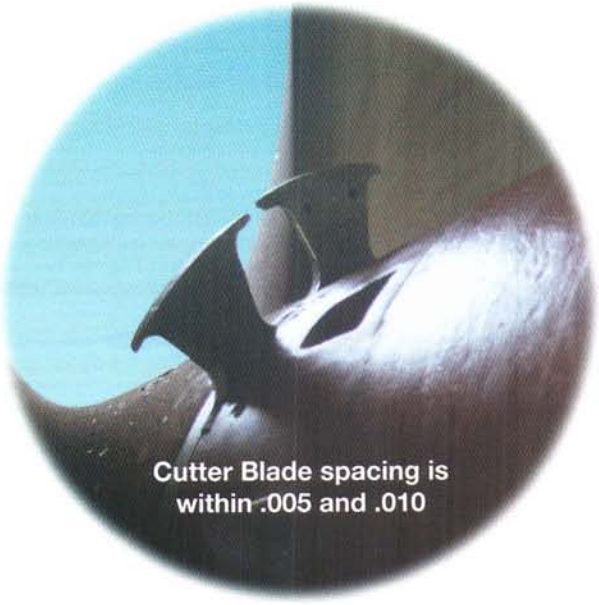
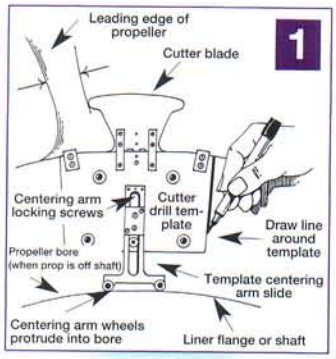


Figure 6. Flush Mounted (FM) Cutter installation complete with Rotary and Stationary Cutters exposed. On Z-Drive thruster unit, space between propeller & rope guard can be as small as .050". The shaft end play on Z-Drive and Thruster units is approximately .001" to .005".

"How Are Spurs Installed?"

Spurs use the propeller's rotation and inertial force to power the cutting action.

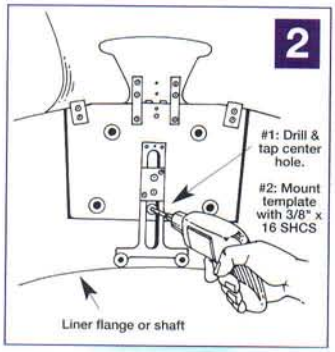
NOTES: Remove rope guard. Flame blow & grind all old weld debris from the welded area where the rope guard will be remounted.



A. Position Cutter Drill Template on propeller face with cutter blade behind the leading edge of the propeller blade. **(see 1)**

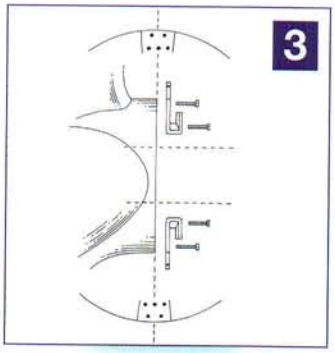
B. Note: All rotating cutters must be equal distance from center! Use template centering arm to locate cutter from shaft to upper edge of prop face, then lock screws on centering arm slide. Use marking pencil or scribe to draw outline of template on propeller face. **(see 1)**

Repeat above procedure for opposite propeller blade. Do not alter centering arm once positioned in place. Move template 180° from first layout for four-blade propellers, (144° for five blade propellers). **(see 3 & 4)**



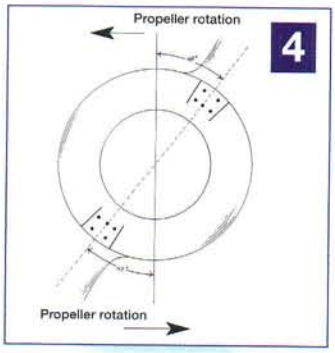
C. Holding template in place, drill through bottom center hole first, using 3/8" spotting drill (provided) approximately 1/8" deep. Then use "P" size drill to complete hole 1" deep. Then tap with 3/8" x 16 tap approximately 3/4" deep. **(see 2 & 3)**

Use 3/8" x 1 3/4" SHCS in bottom hole. Mount template. Now repeat procedure for drilling & tapping the other four holes. Remove template and repeat procedures on opposite rotating blade location with template. **(see 3)**

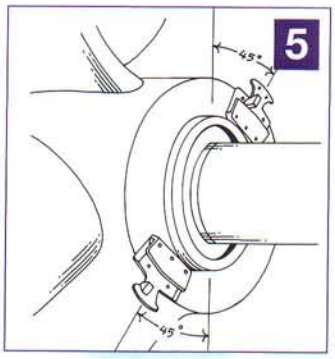


D. Before mounting the rotary cutter blades, qualify two or more surfaces under the cutter mount location: these surfaces MUST be within the same axial plane within .005 in. **(see 4)**

E. IMPORTANT: The cutter mounting holes must be drilled, but do not mount rotary cutter blades onto propeller until propeller is on the shaft and in place. (see 5)

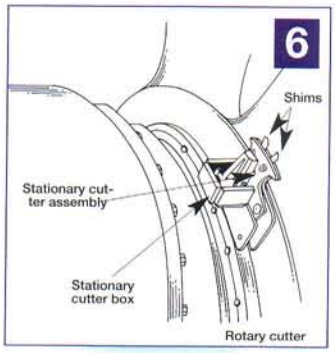


F. With propellers completely mounted, rotate propeller until one set of drilled holes are 45° degrees from top center on "up" (preferred), or "down" side. **(see 3 & 5)**

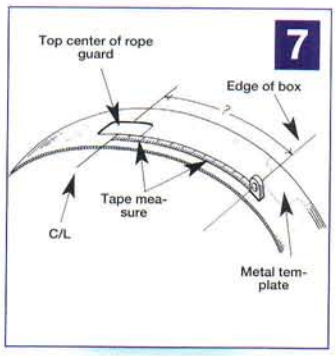


G. Mount rotary cutter blades to prop face ("Leader" rotary cutter blade on top, "Follower" on opposite side). **(see 5)**

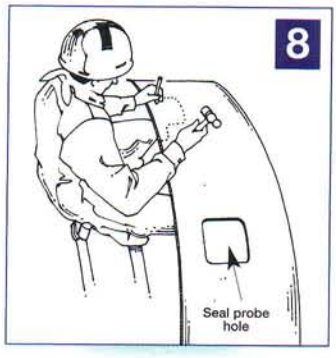
NOTE: The rotary cutter blades are each marked as "LEADER" or "FOLLOWER" ROTARY BLADE. The "LEADER" has a groove which is .015 smaller than the "FOLLOWER" blade. This groove spacing allows for possible axial misalignment of prop face.



H. Marry the stationary cutter assembly to the mounted rotary cutter ("Leader"). There are two 3/8" x 1 3/4" shoulder screws and nuts for this purpose. (NOTE: two shims must be between rotary and stationary blades when marrying the two assemblies). **(see 6)**



I. Using plastic transfer paper, or measuring tape, mark from top center line on propeller to upper edge of cutter box. Transfer this measurement to rope guard. Then, using marking pencil, and Spurs' thin aluminum cutout template (provided), transfer cutout onto upper section of rope guard. The rope guard cutout should clear the stationary cutter box by approximately .125" - .025" on all three sides. **(see 6, 7 & 8)**

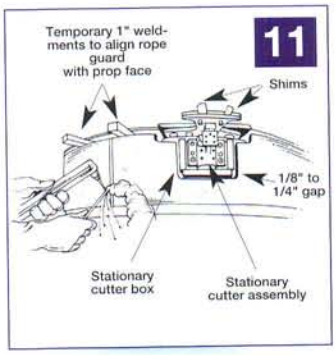


Ia. The Stationary Cutter assembly Rope Guard cut-out should be located at approximately 10:30 looking forward on a right-hand turning propeller and 2:30 on a left-hand turning propeller. NOTE: Only **ONE** Rope Guard cut-out for each propeller!

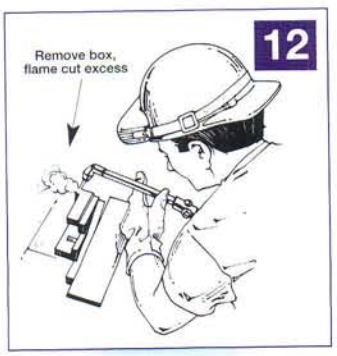
Large Vessel Cutters

J. Flame cut the cutout pattern on upper half of rope guard. NOTE: rope guard must be 1" from propeller face in most cases. **(see 9)**

K. Flame blow and grind all debris from area where rope guard will be mounted. **(see 10)**

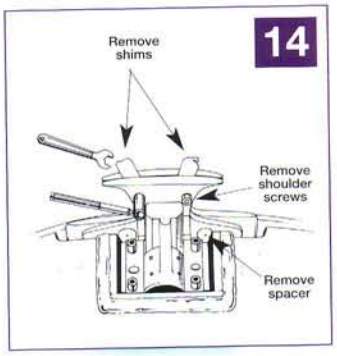


L. Weld both halves of rope guard to strut and weld ends of rope guard together before welding stationary cutter box. Make sure box is approximately 1/8" to 1/4" clear of rope guard on all three sides. **(see 11)**



M. NOTE: Cutter box may protrude above rope guard and need to be trimmed to approximately 1/4" above rope guard. For the best welding results, draw a line around edge of cutter box where it meets rope guard at 1/4" above the rope guard. Remove and flame cut box before it is welded into the rope guard. Stationary cutter must be disassembled, and box trimmed, then reassembled. **(see 12 & 13)**

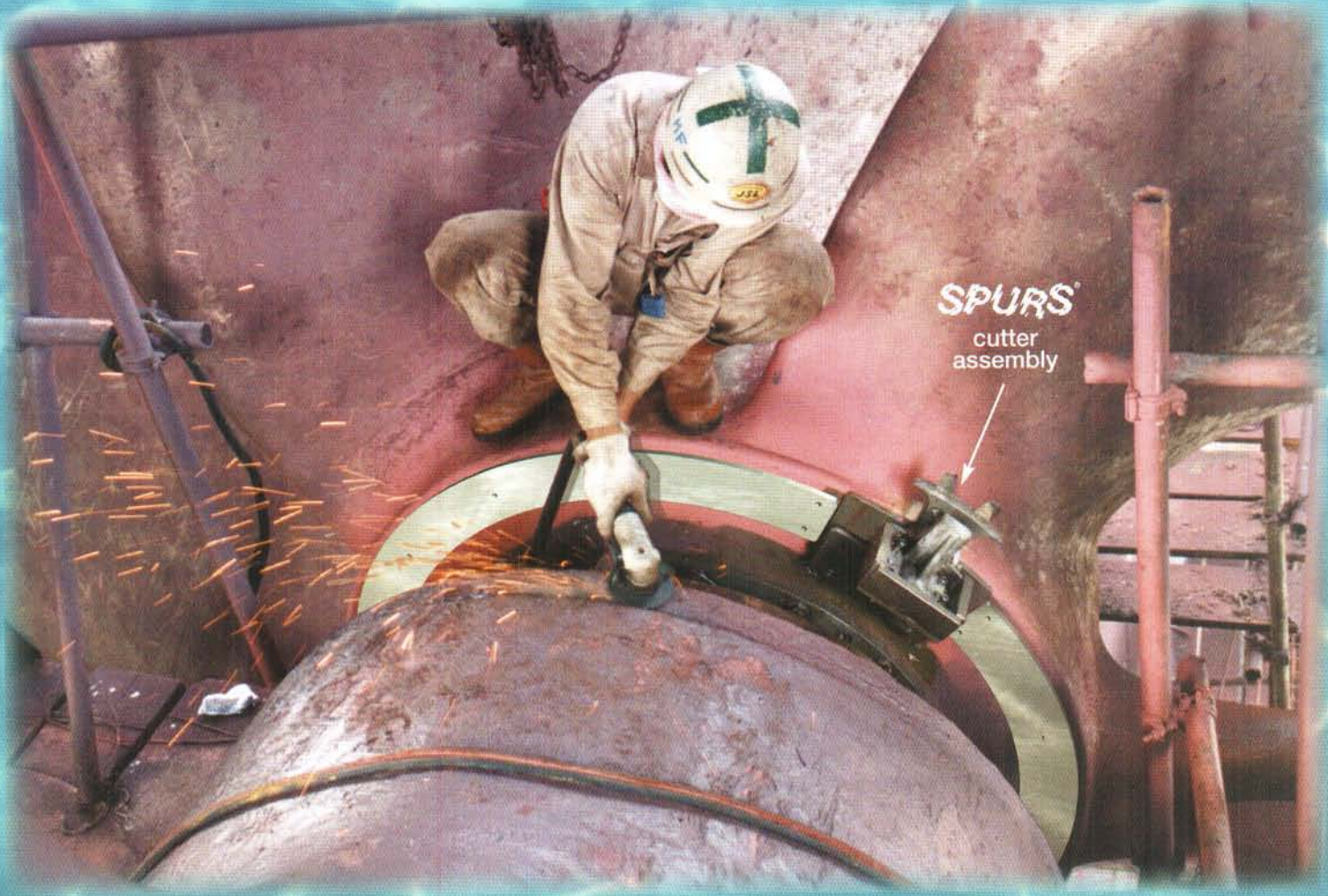
N. With stationary cutter assembly remarried, proceed with welding stationary cutter box to the rope guard. First, tack-weld cutter box as shown, then slowly weld around, keeping excess heat from the stationary cutter. **(see 13)**

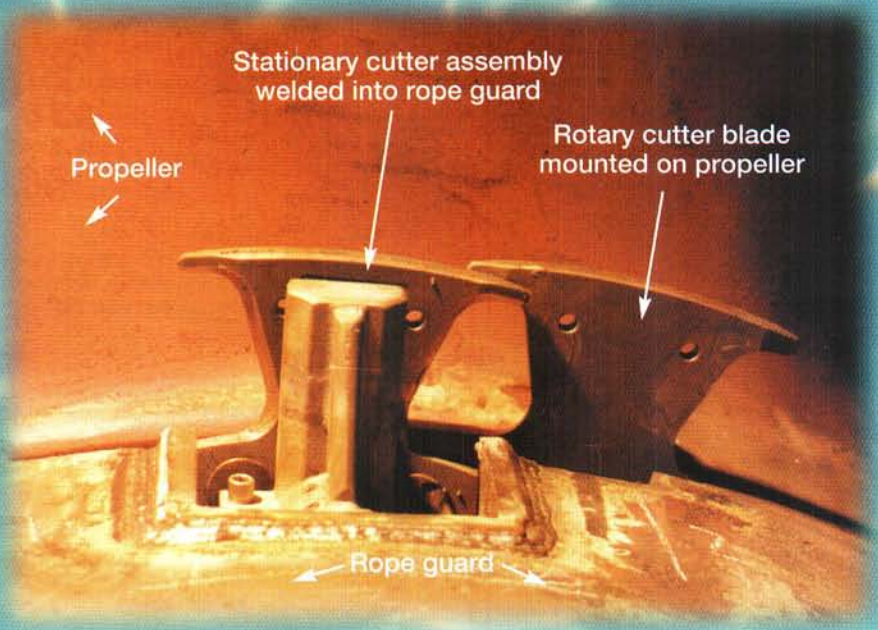


O. Installation is complete. Remove screws, shims and spacer that marry both cutter assemblies. Visually recheck to ensure that removal has been completed. **(see 14)**

P. Rotate propeller to check clearance of cutters as they pass through "follower" rotary assembly groove. **(see 15)**

Medium Vessel Cutters and Z-Drive Units will be supplied with individual installation instructions.





SPURS®

U.S. & Canada - Call Toll Free:
1-800-824-5372

Other Countries Call:
(954) 463-2707

Fax: (954) 525-0239

201 S.W. 33rd Street
Fort Lauderdale, Florida 33315

Website
www.spursmarine.com

E-mail
spurs@spursmarine.com

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