

# Shockwave Adjustable Driven Clutch Helix

**W**ith a twist of the wrist, you can dial-in the ideal helix angle on the Shockwave Adjustable-Ramp Helix to get the optimal shifting performance in a wide range of riding conditions.

As I discovered, the hand-adjustable helix makes finding the right shift characteristics a snap for hard pack, ice, or loose snow and every combination of the above. You don't have to remove the driven clutch from the sled and disassemble it to drop in a helix with the desired angle. You simply loosen an Allen locking screw, turn the adjustable collar to the ideal angle and voila! You have the correct ratio for whatever conditions you are riding in.

It's a shame many trail riders don't ever take the time to adjust their sled's clutch setup. Often, riders put up with what can be mediocre performance, especially on a used sled, when better performance could be easily attained.

If you always rode on the same trail or in the same area, in the same snow conditions, and at the same temperature, you may only need one helix and spring setup. That's far from reality though.

We all ride in a variety of conditions, so a single helix is rarely the best solution. You need a helix that can adjust to handle daily changes.

## How Shockwave works

The Shockwave started with Jeff Fisher (watercross racer and owner of Motorsports Plus) and Kent Lee (Shockwave Performance Owner) on a winter trail ride in northern Wisconsin in 1999. They were aboard a couple of Yamaha SRXs when it hit them.

"We were riding one day and it was cold and the sleds were running well, Fisher said, "but the next day, it warmed up to about 45 degrees and the sleds were way down on speed. I tore apart my [driven] clutch and put in a different helix and the sled ran much stronger. It took a while to put in the new helix, and we kept saying, there's got to be a bet-

ter way. So, that's how the whole thing started."

The Shockwave is a simple, but good design.

The smartly crafted helix is made of 6061 aluminum and its adjustable ramps pivot on pins, which are anchored on the helix posts. The locking collar contacts the top of the ramps, limits how far the ramps can open, and establishes the desired angle.

To adjust it, one Allen set screw must be loosened, and then with minimal effort the locking collar can be rotated into the desired position to set the helix angle. Then you re-tighten the Allen screw and the collar is secured. The collar can be turned clockwise to decrease the helix angle and counterclockwise to increase its angle. Hence, you raise rpm by turning the adjuster ring clockwise and lower it by turning it counterclockwise. The helix is adjustable from 42 to 58 degrees for a 16-degree range of adjustability. One full turn changes the helix angle 3.5 degrees.

We don't have space here to discuss the CVT drive system in detail. But, in a nutshell, the drive clutch is rpm sensing and the driven is load sensing. To get the most out of any CVT clutch system, the drive clutch needs ramps with the ideal ramp angle and spring weight to hold engine rpm where it's producing maximum horsepower. The driven clutch must efficiently transmit the power and quickly react to the loads from varying snow conditions. Trail riders need adequate side pressure on the belt, and precise shifting for maximum efficiency and for the belts to last.

With the driven clutch, a quick backshift is essential so the transmission is in a low ratio and ready for quick acceleration out of turns. Essentially, the driven clutch balances the transmission



**GOOD COMBO** – The Ski-Doo TRA drive clutch and Shockwave Adjustable Ramp Helix proved to be a potent combination. The Shockwave's collar is easily adjusted without removing the belt guard and makes clutch tuning hassle-free.



**RAMP ADJUSTMENT** – The position of the adjuster collar sets the angle for the two adjustable ramps, which pivot on the helix's posts.



**EASY TO USE** – Even when you're wearing gloves the Shockwave is easy to adjust. Simply loosen the Allen set screw on the adjuster, with the provided Allen wrench, and turn the helix clockwise to decrease the helix angle, or counterclockwise to increase its angle.



**SET FOR ACTION** – This installed shot of the Shockwave shows the adjuster set toward the upper range of the helix. No other helix on the market provides the same range of adjustability. In this shot, the helix is set at about 44 degrees of angle.

## SHOCKWAVE INSTALL

**REPLACING THE** helix on a reverse cam secondary Ski-Doo QRS clutch is not a quick task. To do the job, you need a helix compressor like those made by Tyler Olson and the crew at Olson Power Equipment, my local Ski-Doo dealer in North Branch, Minn.

First, you must remove the entire jackshaft/driven clutch assembly and place the clutch in a vice to make the swap. To install the helix in the QRS clutch, first, remove the clutch guard and then use the belt deflection tool to loosen the driven, so you can remove the belt. Next, remove the upper chaincase fill cap and breather. Thread in the upper gear-retaining tool and tap the puller to drive the jackshaft out of the top gear in the chaincase.

Once the jackshaft has separated from the gear, carefully pull the jackshaft/driven assembly through the subframe bracket. Place the driven in a vice and then thread the cam compressor onto the driven clutch. First an internal sleeve is threaded in and an external sleeve slides over the puller. Then the spring compressor screw is inserted into the QRS secondary and tightened

until the helix is fully compressed. Next, the cam retention screws must be removed from the back of the driven clutch. If necessary, heat can be applied to get the screws to break loose. The helix, spring, and stopper washer should then slide off of the secondary clutch.

The procedure is essentially reversed for installation of the Shockwave helix. The helix, spring, and washer slide onto the shaft. The driven spring compressor can then be threaded into the shaft and the spring compressor screw used to compress the assembly. Once fully compressed, align the Shockwave's four posts with the mounting holes and torque the four bolts to 24 ft.-lbs. Simply slip the jackshaft through the subframe, tap the gear onto the jackshaft, and thread the upper chaincase bolt into the jackshaft.

Finally, torque the gear bolt down and replace the chaincase filler cap. Moving to the clutch side, you need to slip the belt over the clutches, tighten the driven clutch swivel ring onto the cam with the suspension adjustment tool and put on the belt guard. Now you're ready to ride.

of power from the drive clutch and load that is a product of the trail conditions transmitted through the drive axle.

The helix angle has a much greater effect on shifting characteristics than the spring. A larger angle cam upshifts faster at a lower engine speed because less side force is placed on the clutch sheaves. However, the larger cam angle produces a slower backshift. As you can guess the opposite is true for smaller helix angles, the upshift is slower but backshift is faster. Shockwave offers quick adjustment to find the right ratio.

Shockwave Adjustable Ramp Helixes have been available for Arctic Cat and Yamaha reverse helix clutches for about five years. Polaris' helix is built into the clutch and therefore a Shockwave helix cannot be used for this setup. Recently, the company unveiled a version for the Ski-Doo QRS driven system.

We were interested to see how the adjustable driven helix would perform compared to the stock driven, and how it worked with Ski-Doo's TRA primary driven clutch. In addition, swapping a stock helix on a Ski-Doo QRS driven clutch is a rather complex and time-consuming process, which requires

removing the clutch and jackshaft from the sled.

### Ski-Doo Shockwave

First and foremost, I am a woods trail rider. After bolting the Shockwave to the secondary of my 2008 Ski-Doo MX Z TNT, I put it through its paces on the wide range of trails surrounding Ely, Minn. To get a baseline impression, I started with the helix tightened all the way down at a 42-degree angle, which is the stock sled's helix angle. On the lake, the sled demonstrated strong acceleration to top-end, and it was very close to stock at the 42-degree angle. I also noticed secondary backshifting was quick and kept the power right on tap. On the trail at the stock angle, the clutch again performed much like the stock setup.

When running tight technical trails, I turned the adjuster ring counterclockwise a half turn at a time and the sled kept getting better. There was noticeable improvement in torque driving out of corners. I eventually turned the ring adjuster 2 1/2 turns for about a 51-degree angle, and the sled was now a rocket, delivering substantially faster corner-to-corner speeds. The upshift was

far better than stock and while backshift was not as crisp as at 42 degrees, it wasn't lazy either. I ventured off trail too and that helix angle provided plenty of torque for maneuvering in tight carving corners and keeping on top of the snow.

After my off-trail excursion, I got back on the trail and headed to a railroad spur line. I discovered I was a good 7 mph down on top end. The quick remedy? I simply pulled over, swung open the side cover, and conveniently turned in the adjuster two full turns and I was right back to where I wanted on top end.

### Conclusions

One helix angle does not work for all riders, and particularly not for every condition. The Shockwave helps you dial-in for different conditions. Also, the Shockwave comes in handy for owners installing other performance products on their sleds. If an owner installs a top-end kit with pipes and a primary clutch kit, the Shockwave, in most cases, can be adjusted to match the different powerband and primary clutch shifting curve of the sled.

At \$249, the Shockwave is cost-effective too. If you were to

## SHOCKWAVE ADJUSTABLE RAMP HELIX

**Fits:** 2008-2010 Ski-Doo's with QRS driven system; most 1995-2009 Yamaha models

**Available Profiles:** 42-58 degrees standard; progressive and reverse multiple angle helixes available.

**Price:** Ski-Doo QRS \$249 USD; Yamaha \$229 USD

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buy the full range of factory Ski-Doo QRS helixes from 42 to 50 degrees and several multi-degree helixes, you would spend in the range of \$700. And of course, it would take you about an hour to swap out one helix for another and you would need all the tools to do the job.

Bottomline: Very few products deliver the real world performance and adjustability as the Shockwave. **More info:** [www.shockwaveperformance.com](http://www.shockwaveperformance.com) 