

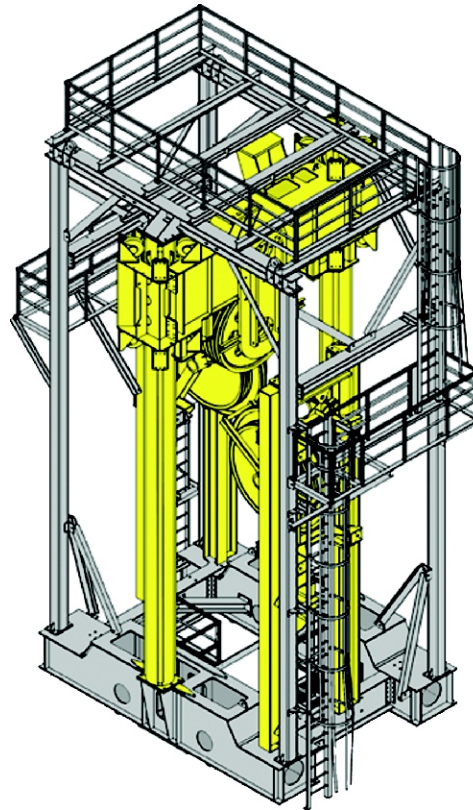
Shaffer™ Crown Mounted Compensator

National Oilwell Varco's line of Shaffer™ Crown Mounted Compensators (CMC) are designed for new-build or retrofit applications. These Rucker™ brand compensators are available at working load ratings of 2000K, 1000K, 800K, and 600K pounds.

The 1000K and 800K versions (photo at right) allow for optional transverse mounting. This gives more flexibility to design a retract system providing more room for the pipe handling system to operate.

Shaffer™ crown mounted compensators, like our drill string compensators, are well known for their efficiency and dependability. They feature superior heave reduction, improved drill line life, and lower overall weight requirements.

An example of our 600k CMC compared to that manufactured by competitors can be seen in the Comparison Table below (based on 16 drill lines and 170' derrick).



Shaffer™ Crown Mounted Compensator

Comparison Table

	NOV Shaffer™	Other
Residual Motion	<3%	11.8%
Idler sheaves per side	1	2~3
Bending Cycles per heave cycle	2	4~6
Drill Line Efficiency	0.728	0.623~0.673
Tension on Fast Line	137300	148520~160640
APV weight differential	0	88,750
Piping weight (standpipe)	10,307	12,884
Total weight (CMC/gin pole)	172,000	227,012

In summary, the design of NOV's Shaffer™ CMC, with the direct acting cylinders and avoidance of the additional sheaves found on the other design, results in dramatic performance advantages. The residual motion advantage means that the CMC does a better job of reducing weight on bit variation. Reducing the number of bending cycles and increasing the drill line efficiency result in significant savings in drill line wear. The Air Pressure Vessel (APV) and piping weight advantages come from the use of Shaffer's new APVs, and the fact that the unit operates at a lower pressure.

The enhanced design, currently being manufactured, also builds on the other advantages, offering the following advanced features:

Cylinder spread is increased, allowing for larger top drives.

The traveling block can be retracted in either X or Y direction.

The main beam and water table can be integrated to reduce weight.

The retrofit version can be easily connected onto the existing water table.

The system is set up for easy installation of the active heave compensation system.

ASSOCIATED PRODUCTS:

Air Pressure Vessels (APVs)

We have enhanced our APV offering. Features include the following:

Weight reduced from 7,800 lbs per bottle to 4,350 lbs.

Capacity improved from 275 gallons to 312 gallons.

24" OD

1/8" corrosion tolerance

Traveling Blocks

NOV supplies Shaffer™ traveling blocks of various ratings (up to 1MM lbs capacity). When the traveling block is supplied in conjunction with NOV's Shaffer™ CMC, the same sheaves, bearing and bearing seals for the crown block and traveling block are used for both.

Active Drive

NOV supplies a Shaffer™ active heave compensation upgrade that can be supplied either on a new or retrofit basis.

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 **NATIONAL OILWELL VARCO**