

GE Oil & Gas

# High Pressure Ratio Compression

Innovative HPRC technology in a  
lightweight, compact and  
cost-efficient package

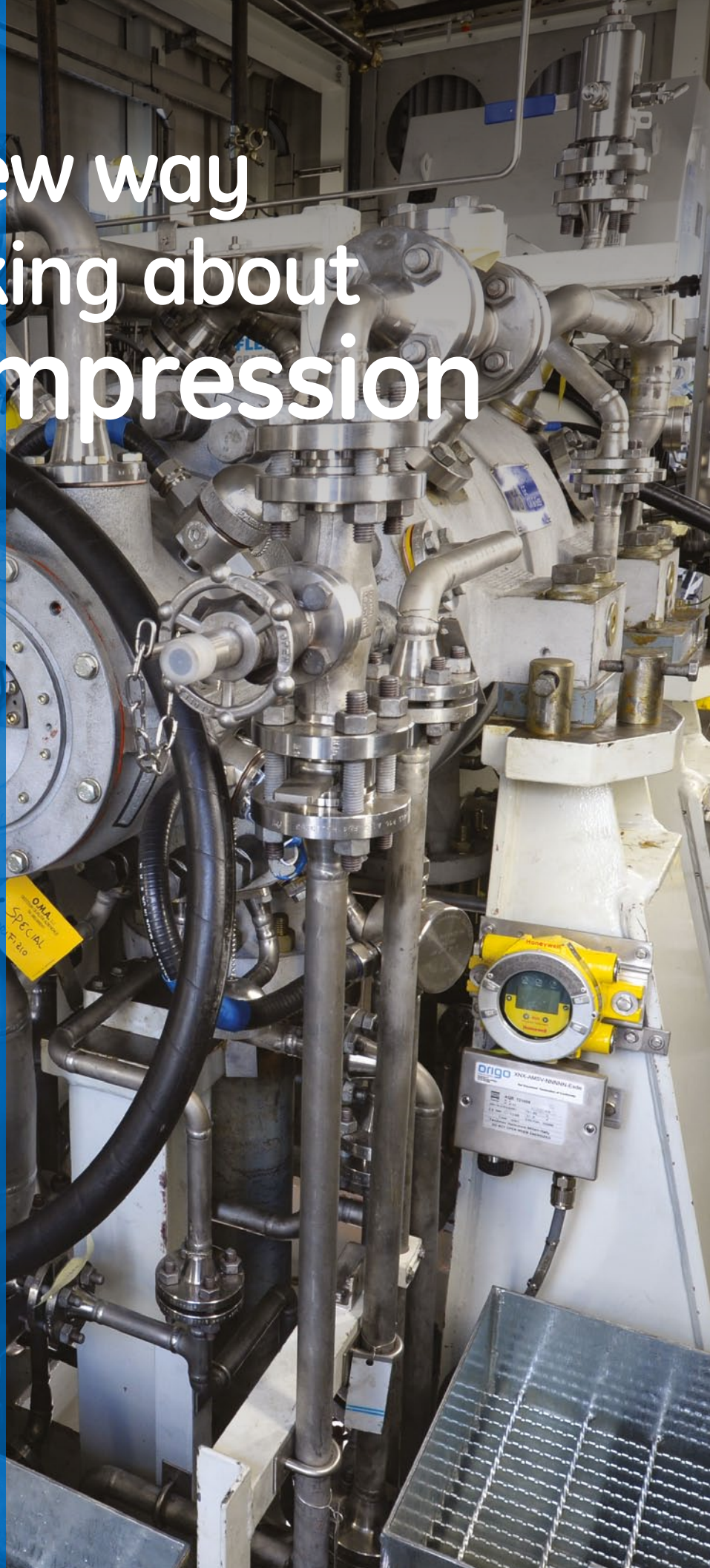


# A whole new way of thinking about compression

GE's HPRC technology is based on an innovative architecture that combines unshrouded and shrouded impellers on a single high-speed shaft to achieve pressure ratios and efficiency levels higher than other available technologies.

As result of the increased head per stage, HPRC units have a shorter bearing span that reduces the number of casings required. Applications that would typically require multiple compressor bodies will only need one with HPRC.

Individual HPRC units are already smaller and lighter than traditional compressors, and the elimination of units per train is another giant improvement in overall plant footprint, reliability, availability and weight.



# Smaller package Bigger results



## Comprehensive testing

The rigorous validation program comprised a variety of tests on machine integrity, compressor performance, operability and response to upset conditions:

- Full load compressor performance
- Extensive rotor-dynamic test campaign
- Aeromechanical test at different suction pressure levels
- Test of upset conditions such as emergency shut-down and exploration of surge region



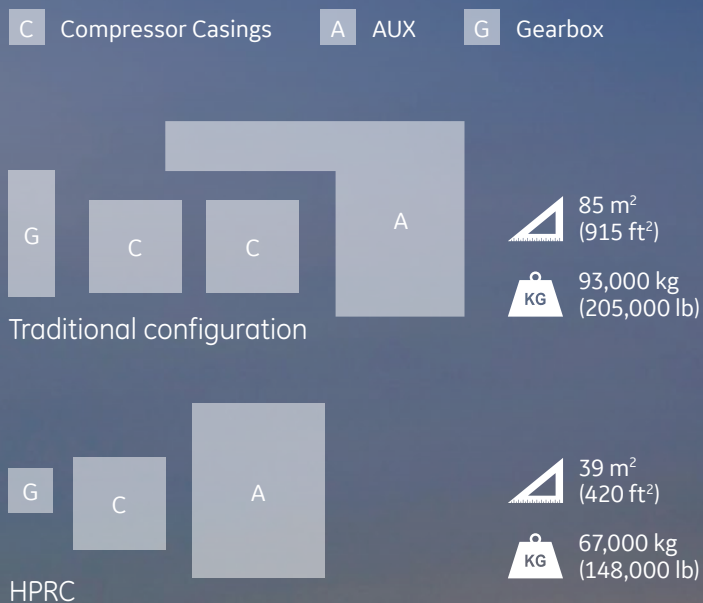
HPRC technology is applicable to many gas processes and is well suited to both low and medium molecular weight mixtures. It delivers high reliability and efficiency: from reduced weight and easier installation, to minimized footprint, lower power consumption and reduced maintenance.

## HPRC advantages

- Up to 50% smaller train footprint than traditional configuration
- Up to 30% lighter weight
- Up to 5% less power consumption
- Simplified installation
- Higher reliability & availability due to auxiliary equipment reduction (eg: DGS, lubrication)
- Lower downtime and easier maintenance
- Wide revamping flexibility

## Highly compact

HPRC has up to 50% smaller footprint and 30% lighter weight than traditional train configurations.



## Key features

Centrifugal compressor	Up to 3 sections (@ 2 intercooler) in 1 casing
Max. operating pressure	400 bar (5,800 PSI)
Pressure ratio	Up to 30:1 (with natural gas mol. weight 20)
Max flow	300,000 Am <sup>3</sup> /h (254 MMSCF/D)
Arrangement	Between bearings
Gear selection	Parallel shaft for Gear ratio < 9 Epicyclic gear ratio > 9 & power < 35 MW
Driver types	All
Dry gas seal	Standard
Bearings	Standard
Availability	+0.3% vs. standard machine
Reliability	+0.2% vs. standard machine

## Optimized design

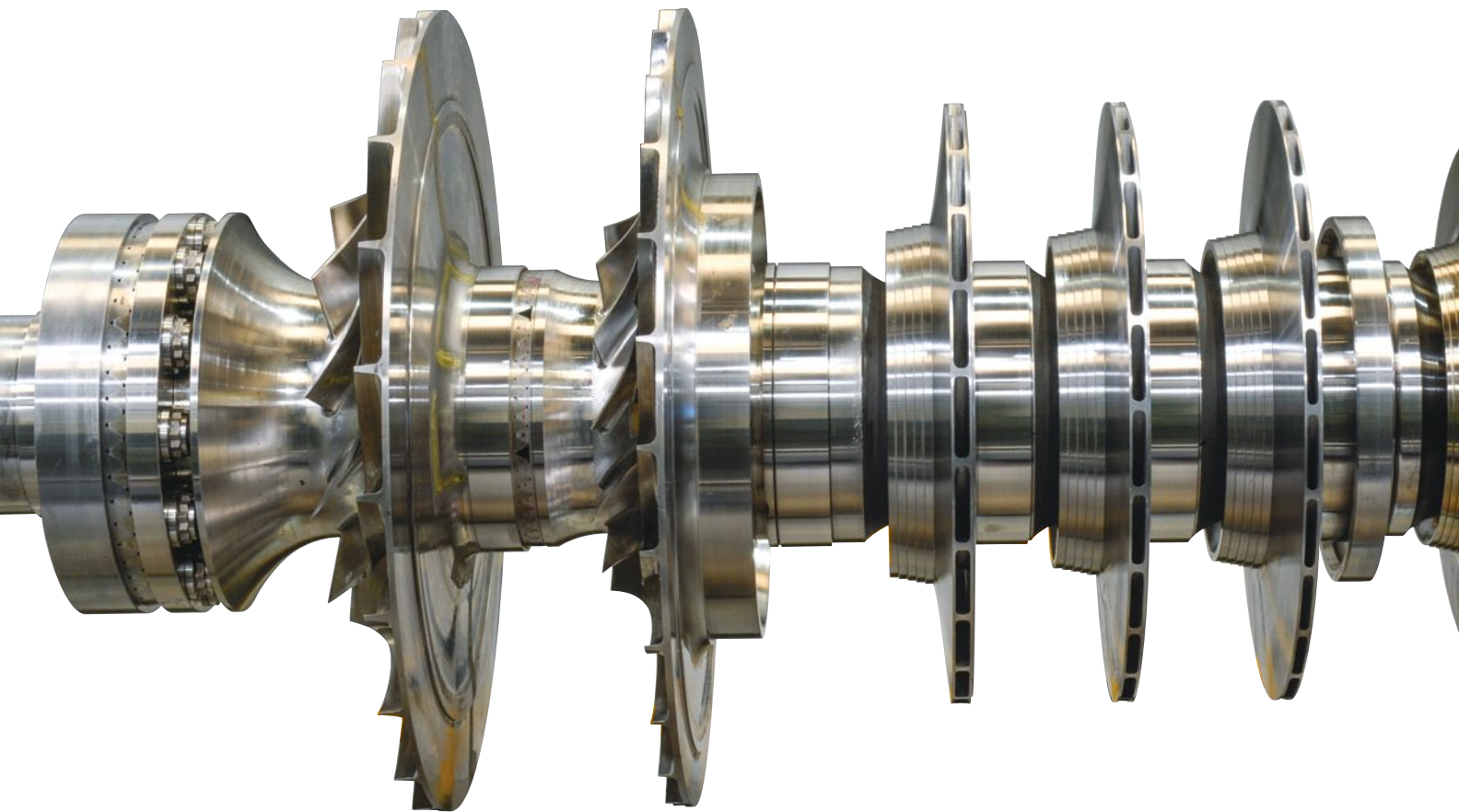
The use of both unshrouded and shrouded impellers on a stacked rotor with hirth teeth allows high tip speed and eliminates the shrink-fit limitation typical of other centrifugal compressors. Head per stage has been increased and the number of stages reduced by about 50%. The result is a higher total pressure ratio with fewer impellers.

Fewer stages allows rotating speed to be increased with sound rotordynamics, which in turn increases flow coefficient of the stages and provides a high compression efficiency.

The parallel shaft gear can be replaced by an epicyclical gear for higher speed requirements. It has a higher ratio and significantly lower losses than an

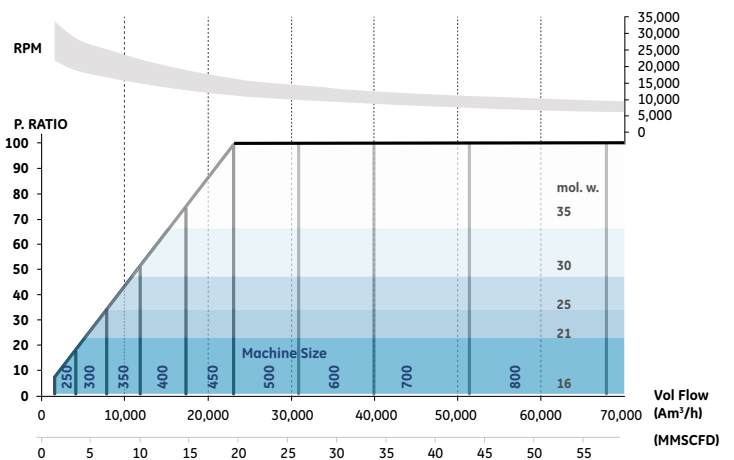
equivalent parallel shaft gear. With co-axial input and output shaft lines, the epicyclical has no need for shaft offsets between driver and driven machinery – so it is also a much more compact and lightweight solution.

Combining multiple bodies into one increases the number of inlet and outlet flanges.



## Wide operating range in all applications

HPRC is well suited to a wide range of applications. The new technology is best suited to gas with low-to-medium molecular weight, where head per stage is a limiting factor – and the greatest benefits can be realized in natural gas, petrochemical and LNG.





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