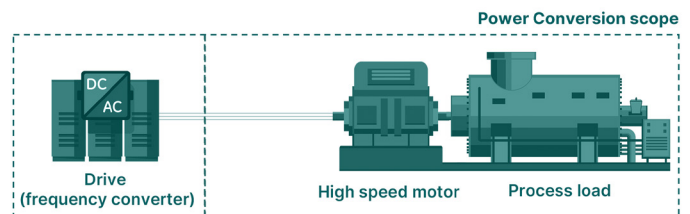
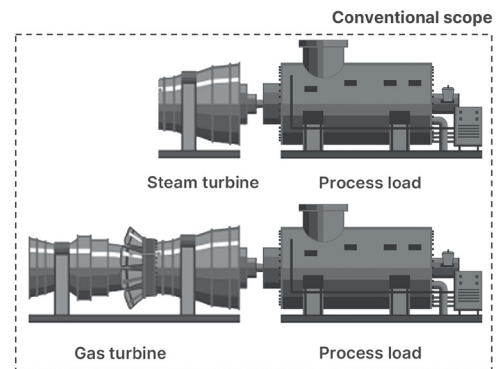


STEAM/GAS TURBINE REPLACEMENT

with electric motors and drive systems for decarbonization, GHG emission reduction and increased efficiency

Replacing turbines with electric systems can help save costs and improve performance

Energy companies are tightening their grip on costs, and evaluating new ways to improve efficiency. In the oil and gas industry - refineries, petrochemical and LNG plants - rotating machines process trains (such as compressors, blowers or pumps) are an important area for achieving potential process optimization. Previously, these process trains could be driven by steam or gas turbines. Today electrification represents most likely the best solution by replacing old turbines with electric systems without compromising on reliability.



Enhanced efficiency and increased plant performance

GE Vernova's Variable Speed Drive Systems (VSDS) feature a unique combination of Voltage Source Inverter (VSI) and a high-speed motor to help increase reliability and availability of VSD systems. Thanks to the compactness of our high-speed motors, our solution offers a smaller footprint and preserves the plant layout in constrained environments, allowing a smooth plant integration.

ELECTRIFICATION CONSULTING

Our experts can help you make informed decisions from the feasibility study phase till the execution of your project.

Support in the **economic evaluation**: high level estimations of value in technology selection (CAPEX, OPEX and CO₂ savings)

Site survey: existing field data capture & hardware audit, to understand the technical and environmental constraints

Documentation analysis: current operating profile review and analysis (existing compressor, consumption, operating costs, etc.)

Replacement studies: configuration proposals

RAMS : availability and reliability studies with a staircase of redundancy options

VARIABLE FREQUENCY DRIVE (VSI)

MV7 range: reliable, scalable and modular

Features

- 1 to 100 MW, up to 13.8 kV
- Standard drive with high performance control
- Grid power factor >0.95

Benefits

- Very low torque pulsation on the shaft line
- No harmonics filter needed
- Reduced noise and vibrations on the motor, allowing longer life cycle and reduced maintenance

HIGH SPEED INDUCTION MOTOR

Efficient, compact, cost-effective

Features

- Variable frequency motor directly coupled to a compressor without gearbox
- 2 poles, up to 18,000 rpm
- Water to air cooled motor or TEPV motor
- Magnetic or oil sleeve bearings
- Copper cage
- Certified Exp according to ATEX
- Shaftless rotor (patented)

Benefits

- No critical speed: reduced vibrations
- Laminated rotor reduces Eddy currents
- IEC 60034 & IEC 60079 compliant
- Proven track record: 200+ high speed motors installed globally



GE VERNOVA

TECHNOLOGY COMPARAISON

	GAS TURBINE	STEAM TURBINE	ELECTRIC VSDS	BENEFITS OF THE ELECTRIC SOLUTION
DRIVER EFFICIENCY	25-35%	50-80%	>95%	High efficiency
SPEED RANGE	50-105%	50-105%	0-105%	Full flexibility
DYNAMIC RESPONSE	0-100% in 10 minutes max load step 50%	Load step capability depends on temperature	Almost immediate	Full flexibility in terms of power demand
STARTING TIME	> 15 minutes	> 15 minutes and de- pends on temperature	< 1 minute	Minimum startup time requirement/Very high starting and operating reliability and availability
ENVIRONMENTAL IMPACT	CO ₂ /NOX emissions (exhaust)	CO ₂ /NOX emissions (boiler)	Not applicable	Emission-free/Meets with environmental restrictions
NOISE LEVEL	Usually >105 dB(A) Require noise enclosure	Usually >100 dB(A) May require noise enclosure	Usually between 85 and 90 dB(A)	Lower noise
FOOTPRINT	Large (lube oil coolers, ventilation ducts, exhaust silencers, noise enclosure)	Large (lube oil coolers, ventilation ducts, exhaust silencers, noise enclosure if any)	Small in hazardous area, medium in electrical room	Minimum space requirement
INSTALLATION & COMMISSIONING	Complex auxiliary pipework and electrical & instrumentation tie-in	Complex auxiliary pipework and electrical & instrumentation tie-in	Limited to electrical & instrumentation tie-in	Reduced pipework requirement
REQUIRED MAINTENANCE	1-yearly periodic inspection (1 week shutdown) - Dry gas seal	1-yearly periodic inspection (few days without shutdown) + shutdown every 5 years	1-yearly periodic inspection (few days without shutdown) + shutdown every 5-6 years	Minimum maintenance period over life cycle
MAINTENANCE COST	Compulsory periodic maintenance and parts replacement	Minimal parts replacement required	Minimal parts replacement required	Minimum maintenance cost
POWER REQUIREMENTS	Low voltage (415 V)	Low voltage (415 V)	High voltage (>3 kV)	Suitable for most areas, including with limited power availability

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