

# SHELL TURBO

## INDUSTRIAL TURBINE OILS

### A RANGE OF TURBINE OILS TO MEET YOUR NEEDS

To meet the challenges of a wide range of equipment designs and applications, Shell has designed a portfolio of oils that helps you to choose a product to match your technical and operational needs.

#### PRODUCT-NAME SUFFIX KEY

- GT** = Gas turbines
- CC** = Combined-cycle turbines
- T** = Steam, hydro turbines

#### APPLICATION ICON KEY

-  Turbine
-  Power station
-  High temperature
-  Turbo compressor
-  Enclosed gear

**HEAVY-DUTY GAS TURBINES AND TURBOCOMPRESSORS.**

**INDUSTRIAL STEAM, HEAVY-DUTY GAS AND COMBINED-CYCLE TURBINES, INCLUDING GEARED SYSTEMS.**

**INDUSTRIAL STEAM AND LIGHT-DUTY GAS TURBINES AND TURBOCOMPRESSORS.**

INCREASINGLY EFFICIENT PROTECTION >>>>

ADVANCED  
TIER 4

PREMIUM  
TIER 3

MAIN LINE  
TIER 2

#### Shell Turbo GT

##### SYNTHETIC

- Extra long life
- High temperature operation



#### Shell Turbo CC

- Extra long life
- Extra protection



#### Shell Turbo T

- Reliable performance
- Reliable protection



# SHELL TURBO OILS T

## HIGH QUALITY INDUSTRIAL STEAM AND GAS TURBINE OIL

### DESIGNED TO MEET CHALLENGES

Shell Turbo Oils T have long been regarded as the industry standard turbine oil. Building on this reputation, Shell Turbo Oils T have been developed to meet the demands of the most modern non-geared steam turbine systems and light duty gas turbines. Shell Turbo Oils T are formulated from high quality hydrotreated base oils and a combination of zinc-free additives that provide excellent oxidative stability, protection against rust and corrosion, low foaming and excellent demulsibility.

### PERFORMANCE FEATURES

#### STRONG CONTROL OF OXIDATION

- The use of inherently oxidatively stable base oils together with an effective inhibitor package provides high resistance to oxidative degradation. The result is extended oil life, minimising the formation of aggressive corrosive acids, deposits and sludge, helping to reduce your operating costs.

#### HIGH RESISTANCE TO FOAMING AND RAPID AIR RELEASE

- The oils are formulated with a non-silicone anti-foam additive, which generally controls foam formation. This feature coupled with fast air-release from the lubricant reduces the possibility of problems such as pump cavitation, excessive wear and premature oil oxidation, helping to give you increased system reliability.

#### POSITIVE WATER-SHEDDING PROPERTIES

- Robust demulsibility control such that excess water, common-place in steam turbines, can be drained easily from the lubrication system, minimising corrosion and premature wear and lowering the risk of unplanned maintenance.

#### EXCELLENT RUST AND CORROSION PROTECTION

- Helps prevent the formation of rust and guards against onset of corrosion ensuring protection for equipment following exposure to humidity or water during operation and during shut-downs, minimising maintenance.

#### RESISTANT TO REACTION WITH AMMONIA

- The use of highly refined base oils and specific additives, resistant to attack by ammonia, minimises the possibility of damaging oil soluble/insoluble ammonia compounds being formed in the lubricant. Shell Turbo Oils T mitigate the formation of these deposits, which could impair the reliable operation of bearings and seal oil systems.

### APPLICATIONS

Shell Turbo Oils T are available in ISO grades 32, 46, 68 and 100 suited for application in the following areas:

- Non-geared industrial steam turbines.
- Non-geared light duty gas turbines.
- Water turbine lubrication.
- Compressor applications.
- Numerous applications where strong control over rust and oxidation is required.

### SPECIFICATIONS, APPROVALS AND RECOMMENDATIONS

#### MEETS OR EXCEEDS SPECIFICATIONS OF:

- General Electric: GEK 28143b – Type I (ISO 32), GEK 28143b – Type II (ISO 46), 46506E
- Siemens-Westinghouse: 21T0591 and PD-55125Z3
- DIN: 51515 part 1 and 2
- ISO: 8068
- Solar: ES 9-224W, Class II
- GEC: Alstom NBA P50001
- JIS: K2213 Type 2
- BS: 489-1999
- ASTM: D 4304, Type I
- Siemens/Mannesmann Demag: 800037 98.

#### APPROVED BY OEM AGAINST:

- Siemens Power Generator: TLV 9013 04 and TLV 9013 05
- Alstom Power Turbo-Systems: HTGD 90-117
- Man Turbo: SP 079984 D0000 E99
- Cincinnati Approvals: P-38 Turbo T32; P-55 Turbo T46; P-54 Turbo T68.

### TYPICAL PHYSICAL CHARACTERISTICS

CHARACTERISTICS	32	46	68	100
Kinematic Viscosity @ 40°C mm <sup>2</sup> /s (ASTM D 445)	32	46	68	100
@ 100°C mm <sup>2</sup> /s	5.2	6.6	8.5	11.1
Colour	10.5	10.5	10.5	<1.0
Flash Point °C (COC)	>215	220	240	250
Pour Point °C	≤-12	≤-12	-9	≤-9
Total Acid Number mg KOH/g	0.05	0.05	0.05	0.05
Foaming ml/ml (ASTM D 892)				
Sequence I	30/Nil	30/Nil	30/Nil	30/Nil
Sequence II	20/Nil	20/Nil	20/Nil	20/Nil
Sequence III	30/Nil	30/Nil	30/Nil	30/Nil
Air Release min.	2	4	6	10
Water Demulsibility min.	15	15	20	20
Steam Demulsibility secs.	150	153	183	210
Copper Corrosion 100°C/3hrs	1b	1b	1b	1b
Rust Control after water washing	Pass	Pass	Pass	Pass
FZG, Fail Load Stage	6	7	7	7
Oxidation Control Tests				
a) TOST life modified hr	>10,000	>1,000	>1,000	>10,000
b) TOST 1,000hr sludge mg	30	3	3	30
c) RPVOT min.	>950	>90	>80	>700

# SHELL TURBO OIL GT

## HIGH PERFORMANCE INDUSTRIAL GAS TURBINE LUBRICANT



### DESIGNED TO MEET CHALLENGES

Shell Turbo Oil GT has been developed for the most severe operating conditions imposed by modern, heavy-duty industrial gas turbines.

## PERFORMANCE FEATURES

### OUTSTANDING OXIDATION STABILITY

- The lubricant's service life depends, to a great extent, on its oxidative stability. Excellent results in both the 'hot oxidation test' (FTM5308) and the 'TOST' life test (ASTM-D943) clearly demonstrates Shell Turbo Oil GT potential for extended service life compared to conventional mineral oil technology.

### EXCELLENT THERMAL STABILITY

- Higher bearing temperatures which are particularly severe during stop/start cycling conditions, may lead to bearing deposits and the formation of harmful sludge in the system which subsequently may result in expensive 'downtime' and reduce service life of system components. Shell Turbo Oil GT is formulated to give greater protection against thermal degradation and hence may significantly contribute to lower operating and maintenance costs.

### EXCELLENT AIR RELEASE CHARACTERISTICS

- Effective air release with a minimum of foaming tendency as required by modern gas turbines.

## APPLICATIONS

### POWER AND INDUSTRIAL HEAVY-DUTY GAS TURBINES

- Shell Turbo Oil GT is used as lubricating oil for main shaft bearings and mechanical gears as well as governor oil in the turbine control valves in modern gas turbines.

### FURTHER INDUSTRIAL APPLICATIONS

- Shell Turbo Oil GT may also be used for other industrial applications requiring a high performance gas turbine oil, like lubrication of turbo compressors.

## SPECIFICATIONS, APPROVALS AND RECOMMENDATIONS

### EXCEEDS SPECIFICATIONS OF:

- DIN: 51515-1, 51515-2
- SIEMENS: TLV 9013 04
- GEK: 32568F, GEK 107395a, GEK 28143B – Type I (ISO 32), GEK 28143B – Type II (ISO 46)
- ALSTOM: HTGD 90-117, ASTM 4304-06A Type III
- ALSTOM/ABB: HTGD 90-117T
- SOLAR: ES 9-224 W Class II.

## TYPICAL PHYSICAL CHARACTERISTICS

CHARACTERISTICS	32
Kinematic Viscosity (ASTM D 445) @ 40°C mm <sup>2</sup> /s	31.4
@ 100°C mm <sup>2</sup> /s	5.78
Viscosity Index (ASTM D 2270)	>125
Density @ 15°C kg/m <sup>3</sup> (IP 365)	844
Flash Point °C (COC) (ASTM D 92)	230
Pour Point °C (ASTM D 97)	-15
Neutralisation Value mg KOH/g (ASTM D 974)	0.10
Air Release Behaviour @ 50°C min. (ASTM D 3427)	2
Copper Corrosion (3h/100°C) (ASTM D 974)	1b
Rust-Preventing Properties (ASTM D 665 A&B)	No Rust
Oxidation Control Tests	
RPVOT minutes (ASTM D 2272)	>1,000
Modified RPVOT %	>95%
TOST lifetime hr (ASTM D 943)	>8,000
TOST 1,000 hrs sludge mg/kg (IP 157)	<40
Oxidation Test 175°C/72hrs (FTM-971b-5308-7)	
Sludge content mg	52
Viscosity change %	+5

# SHELL TURBO OIL CC

PREMIUM QUALITY INDUSTRIAL GAS, STEAM AND COMBINED CYCLE TURBINE OIL

## DESIGNED TO MEET CHALLENGES

Shell Turbo Oil CC has been developed to meet the severe demands imposed by modern, heavy-duty turbine applications, exceeding a number of major gas and steam manufacturers lubricant specifications.

A patented, metal free additive technology, ensures that this product offers substantially improved performance over conventional turbine oils. Its unique combination of excellent oxidative stability, sludge control and surface properties make Turbo CC the first choice lubricant for emerging combined cycle turbine technology, as well as existing gas and steam turbine plants.

## PERFORMANCE FEATURES

### SUPERIOR OXIDATION RESISTANCE

- High temperatures and extended oil drain intervals demand superior oxidation properties of the oil. Shell Turbo Oil CC's excellent oxidative stability helps reduce the formation of sludge and other harmful oxidation products, contributing to extended oil life, less maintenance and less downtime.

### OUTSTANDING THERMAL RESISTANCE

- Modern turbines impose high thermal stress on the oil, increasing the risk of failures. Shell Turbo Oil CC is specially designed to cope with these conditions. Its outstanding thermal stability, coupled with resistance to formation of lacquer, helps reduce the possibility of unplanned outages.

### RAPID AIR RELEASE AND HIGH RESISTANCE TO FOAMING

- High oil flows contribute to the possibility of entrapped air, which can lead to pump cavitation, premature oil oxidation and excessive wear. Shell Turbo Oil CC exhibits excellent surface properties with minimal foam formation and rapid air-release, which minimises air entrapment, reducing these effects of high oil flows to a minimum.

### EXCELLENT WATER-SHEDDING PROPERTIES

- Water contamination is common place in steam turbines, causing corrosion and affecting bearing lubrication. Because of Shell Turbo Oil CC's outstanding demulsibility, water can be drained easily from the lubrication system, protecting the installation against corrosion and premature wear.

### GOOD LOAD CARRYING CAPACITY

- Help to reduce excessive gear tooth and turbine component wear making it suitable for use in turbines with highly loaded gears. Helps minimise downtime and maintenance costs.

## APPLICATIONS

- Power generation combined cycle turbines
- Industrial steam turbines
- Industrial gas turbines.

## SPECIFICATIONS, APPROVALS AND RECOMMENDATIONS

### EXCEEDS SPECIFICATIONS OF:

- General Electric: GEK 28143 A, GEK 32568F, GEK 46506E, GEK101941A, GEK 107395A.

- Siemens-Westinghouse: 21 T0591 and 55125Z3
- Solar: ES 9-224, class II
- DIN: 51515 Part 1 L-TD and Part 2 L-TG
- ISO: 8068 L-TGD and L-TGS
- GEC: Alstom NBA P50001A
- JIS: K-2213 Type 2
- BS: 489-1999
- Siemens/Mannesmann Demag: 800 037 98 TD/32/TD46
- ASTM: D 4304-06A, Type I, II, III.

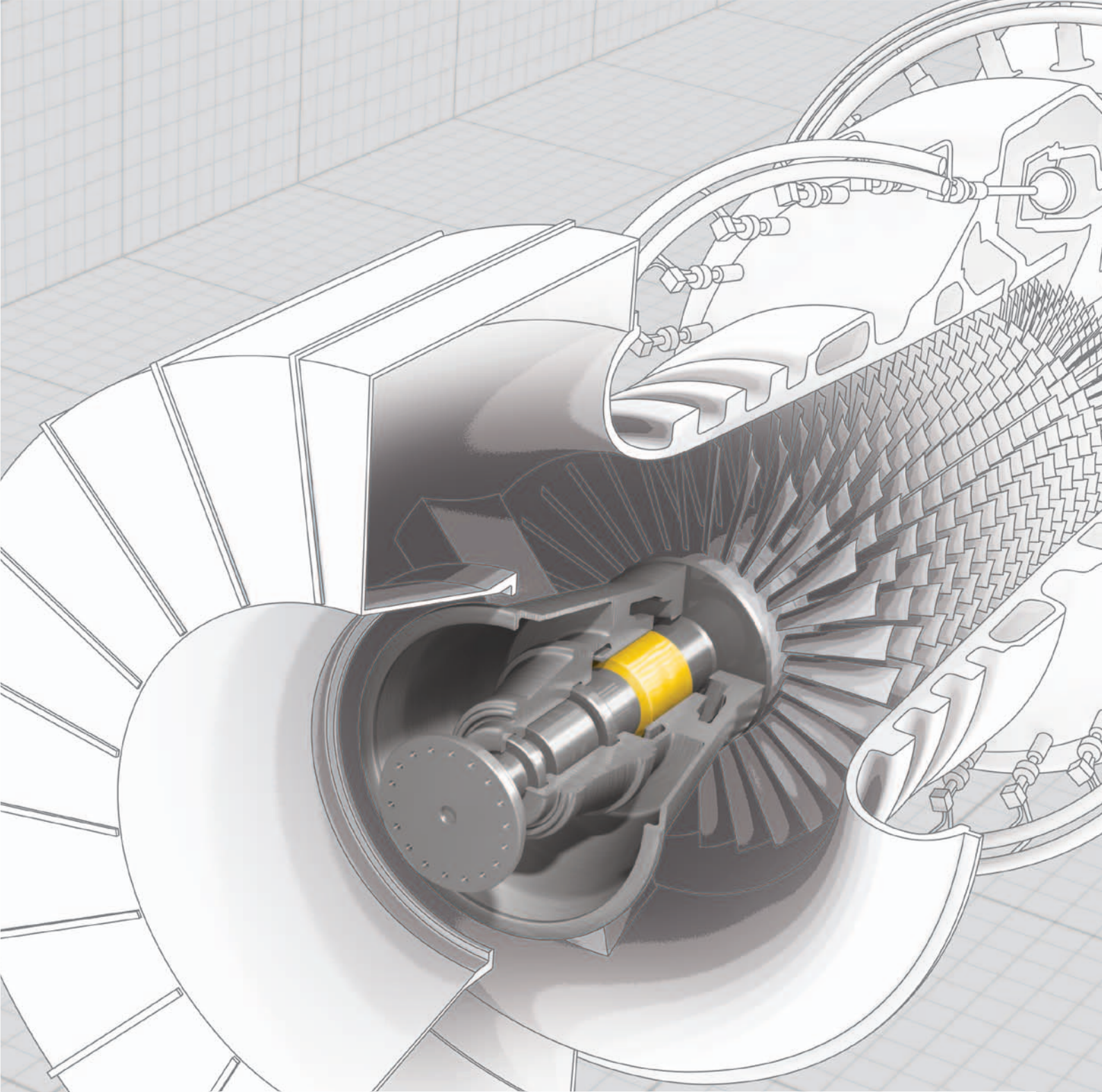
### APPROVED BY OEM AGAINST:

- Siemens TLV 9013 04
- Alstom HTGD 90 117.

## TYPICAL PHYSICAL CHARACTERISTICS

CHARACTERISTICS	32	46
Kinematic Viscosity @ 40°C mm <sup>2</sup> /s	32	46
@ 100°C mm <sup>2</sup> /s	5.4	6.9
Viscosity Index	–	105
Flash Point °C (COC)	218	238
Pour Point °C	–12	–12
Total Acid Number mg KOH/g	0.16	0.16
Foaming ml/ml		
Sequence I	10/Nil	10/Nil
Sequence II	20/Nil	20/Nil
Sequence III	10/Nil	10/Nil
Air Release	4 min.	4 min.
Water Demulsibility	15 min.	15 min.
Rust Control after water washing	Pass	Pass
Load Carrying Capacity (FZG) load stage fail	9 min.	9 min.
Oxidation Control Tests		
a) TOST life	>10,000	>10,000
b) RPVOT	>1,300	>1,300
c) FTM-791b-5308:		
TAN increase mg KOH/g	+0.6	+0.6
Viscosity Increase @ 40°C %	+8.0	+8.0
Sludge formation mg	98	98





**DESIGNED TO DELIVER  
RELIABILITY AND EFFICIENCY.  
JUST LIKE OUR TURBINE OILS  
- SHELL TURBO.**

**DESIGNED TO MEET CHALLENGES**