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MOTION & CONTROL
NSK

High Durability NSK Water Pump Bearings

- High durability for powerful engines
- High reliability through a newly developed water resistant seal
- Improved grease

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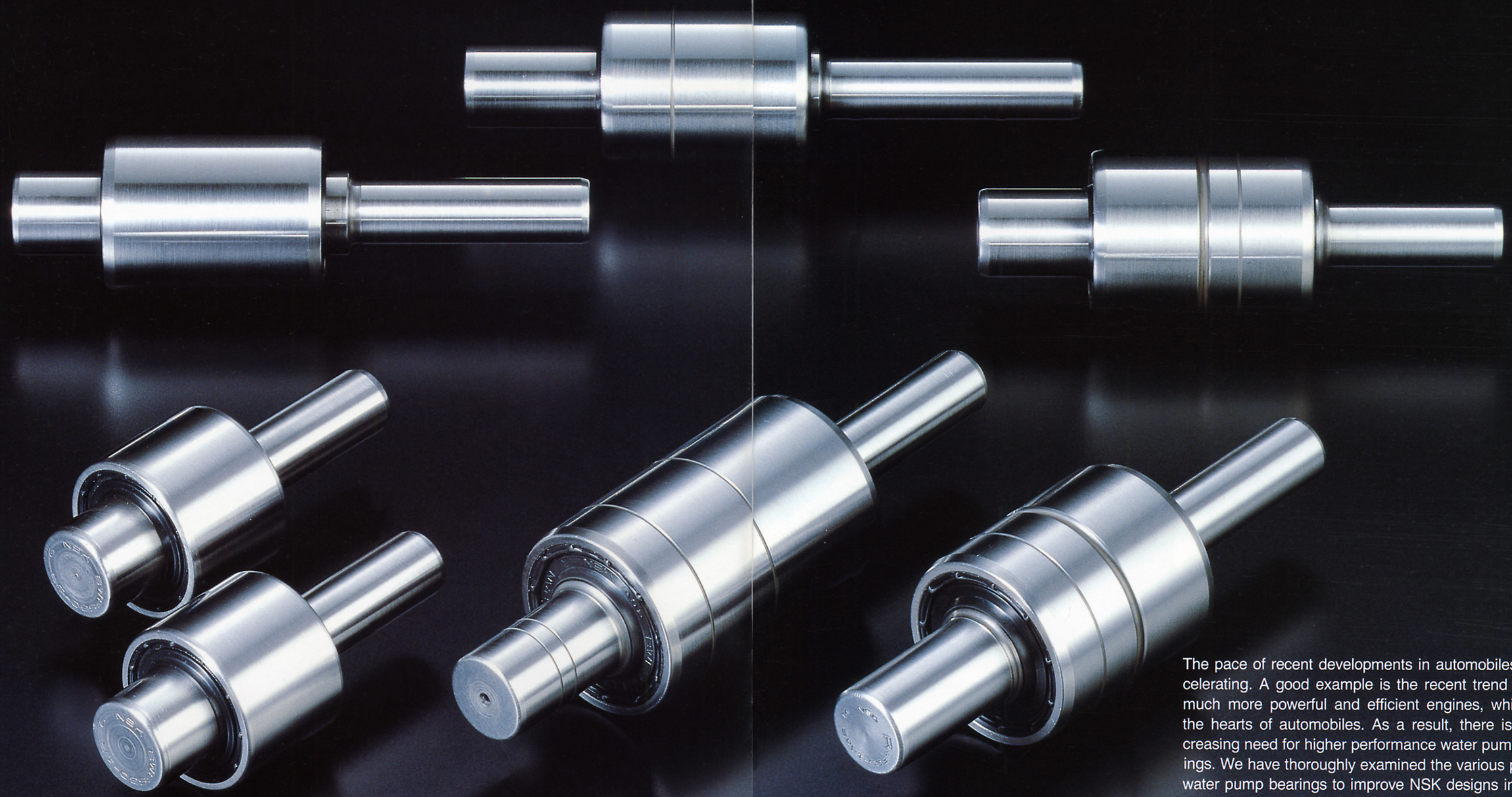
High durability NSK water pump bearings support the advancement of engines. These reliable bearings have three times greater durability than previous bearings.



The pace of recent developments in automobiles is accelerating. A good example is the recent trend toward much more powerful and efficient engines, which are the hearts of automobiles. As a result, there is an increasing need for higher performance water pump bearings. We have thoroughly examined the various parts of water pump bearings to improve NSK designs in terms of high load durability as well as high resistance to heat, load and water. As a result, NSK has developed water pump bearings with higher performance. These improved bearings are the NSK high durability water pump bearings. We would like to introduce you to the outstanding features of these bearings, such as their newly developed water resistant seals, and the adoption of improved grease and materials.

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Types and Features

Types

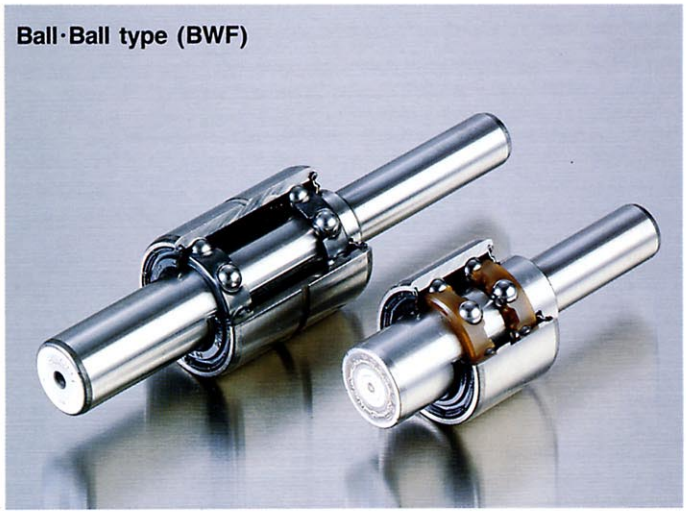
Water pump bearings come in two types. One is a Ball·Ball type (BWF) and the other is a Ball·Roller type (RWF). The Ball·Roller type design offers a much higher radial load capability of the roller row, which is particularly important when supporting either a fan or a relatively high off-set belt load.

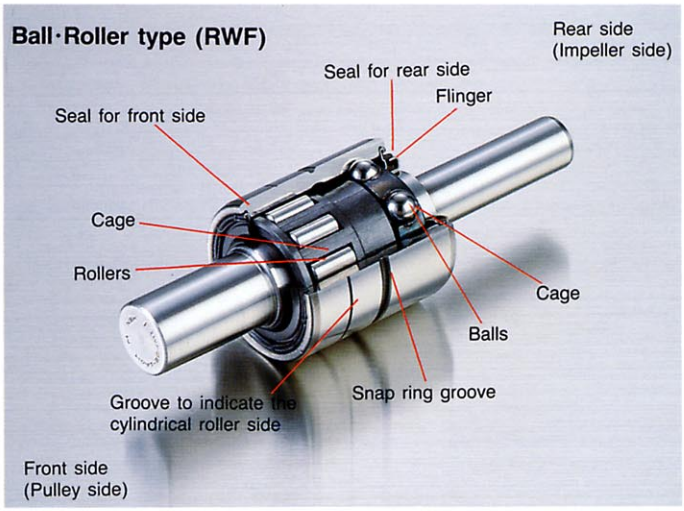
Features

•Newly developed water resistant seals offer five times greater durability.
NSK has developed brand-new water resistant seals. As a result, the durability under wet conditions is increased over five times.

•A better grease <WPH> was developed.
NSK has developed an improved grease for water pumps. It is superior in terms of resistance to water, heat, and rust.

•Longer life is achieved by adoption of a new steel material.
The new steel is a low oxygen and high cleanliness steel which has a life three times longer than common bearing steels. Also, the steel is carburized to achieve a much longer life.





Properties

Any water (or water + coolant) entering through the mechanical seal may adversely affects the water pump bearing's effectiveness. If water enters into the bearing, surface fatigue occurs more rapidly due to insufficient oil film formation. Consequently, the bearing life decreases sharply. Therefore, it is very important to prevent water penetration to achieve full bearing life. <High durability water pump bearings> are so named for their high durability and reliability.

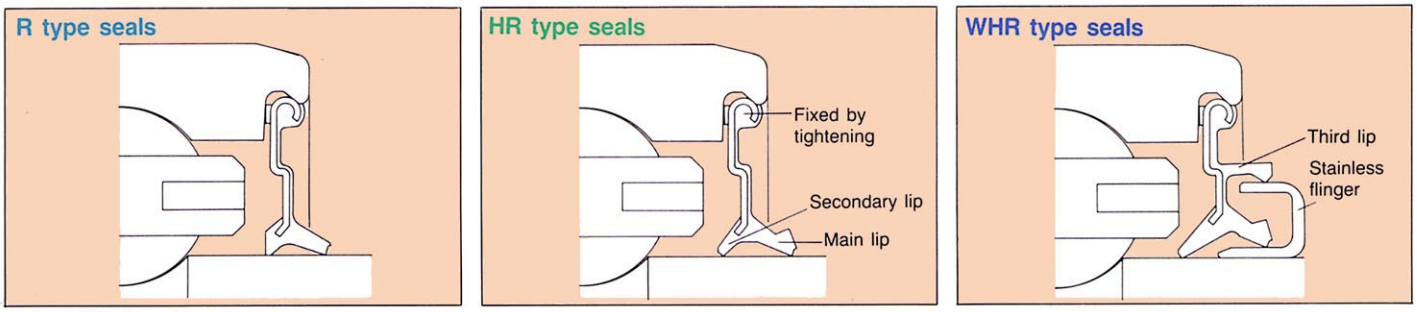


Fig. 1 Kinds of seals

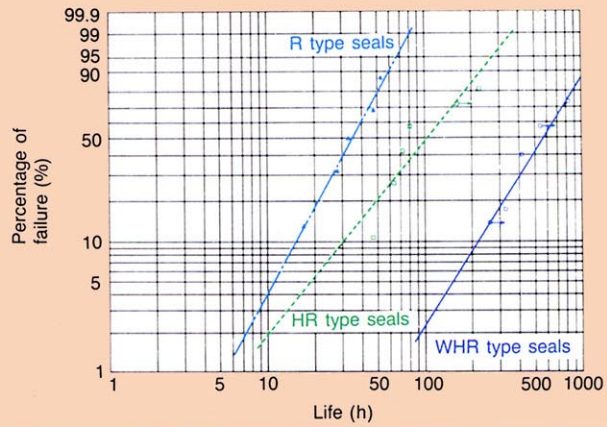
•Seals

<R type seals>
Since rubber seals tightly hug the outer ring recess, water penetration from the outside is prevented completely. A double-lip type seal is adopted, so that water penetration and grease leakage can be minimized.

<HR type seals>
The water resistance of the main lips is increased beyond the degree of R type seals. Also, the HR type seal provides improved sealing in environments of engine vibration and unbalanced runout vibration.

<WHR type seals>
The third lip and flinger prevent water penetration remarkably well. The slinger prevents seal wear generated by a rusty surface, thereby increasing reliability.

Fig. 2 Percentage of failure of seals under NSK's accelerated testing conditions



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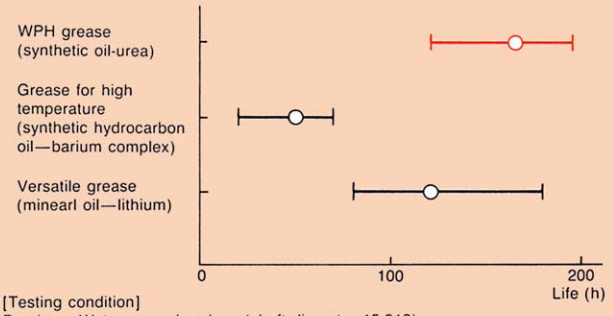
• Grease (WPH grease)

The recent trends toward more powerful and efficient engines require better grease which has higher resistance to heat, load and water. NSK's WPH grease was developed to answer these demands.

1. The thickener is a urea compound, which ensures proper lubrication for long periods because of its resistance to water and temperature effects.
2. The base oil of WPH is poly-alpha-olefin, which has high anti-oxidation capability and high heat stability. These characteristics result in excellent resistance to grease deterioration and bearing seizure at elevated bearing temperatures.
3. WPH has been shown to be excellent for rust prevention.

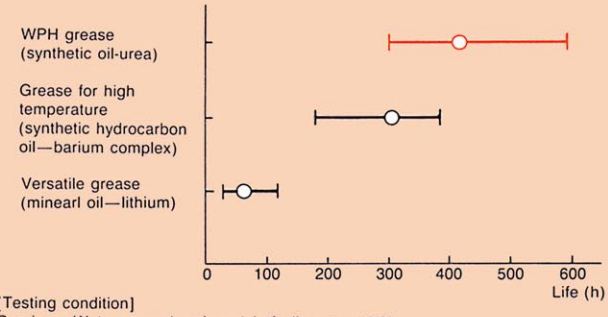
Fig. 3 Water resistance capability of greases



[Testing condition]
Bearings: Water pump bearings (shaft diameter 15.918)
Water injection: Coolant/water equally mixed liquid 0.5ml/day

[80°C, 10000 rpm, 1h] → ← [(Heater OFF), 0 rpm, 10 min]

Fig. 4 Heat resistance capability of greases



[Testing condition]
Bearings: Water pump bearings (shaft diameter 15.9)

[140°C, 10000 rpm, 1h] → ← [(Heater OFF), 0 rpm, 10 min]

Design and Manufacturing

- NSK high durability water pump bearings incorporate NSK's technology in their design and manufacturing.
- Rollers in the bearings are crowned, thus avoiding edge loading even under an off-set load which would otherwise cause large misalignment. (See Fig. 5 and Fig. 6)

Fig. 5 Distribution of roller surface pressure for general bearings

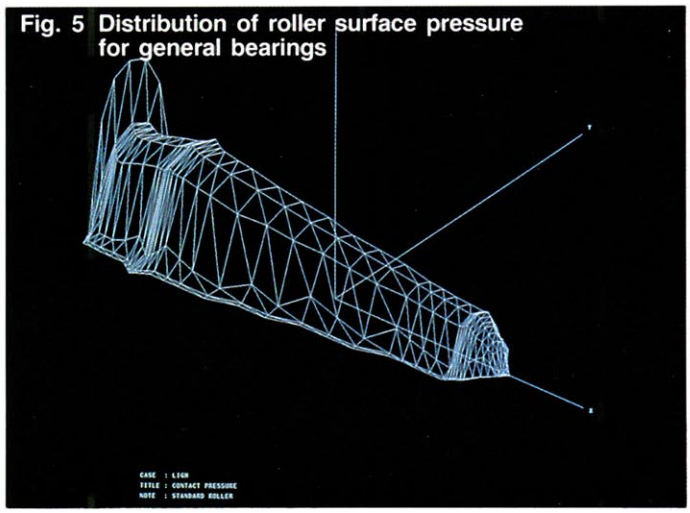
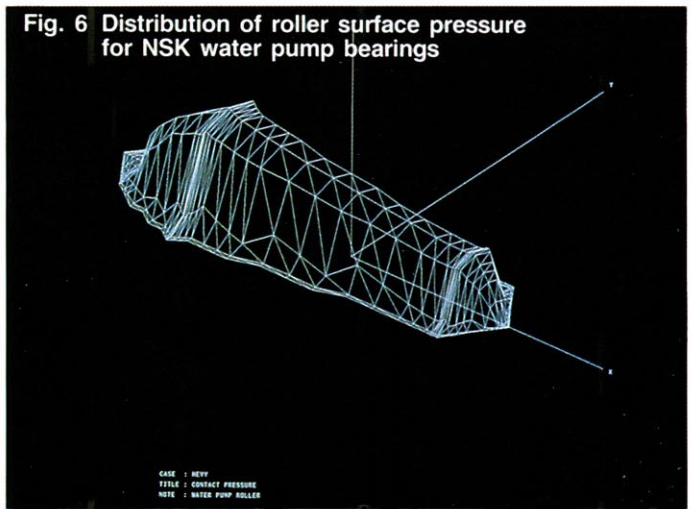
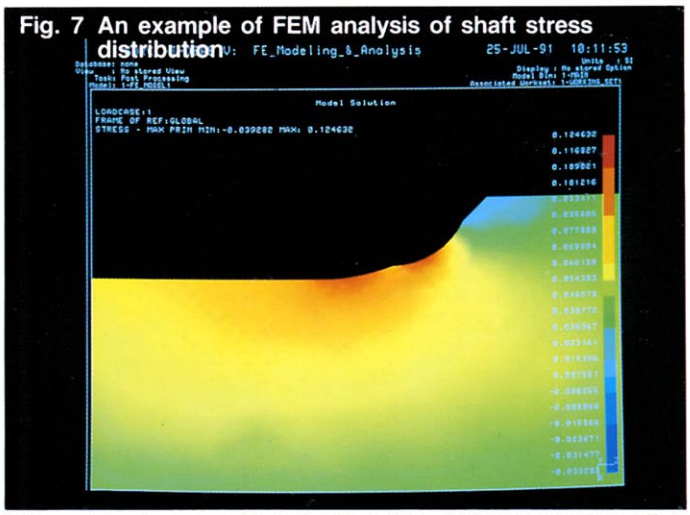


Fig. 6 Distribution of roller surface pressure for NSK water pump bearings



- NSK water pump bearings are designed to minimize stress concentration and are produced without distortion, to maintain the high strength required in certain applications such as those with cooling fan resonance or excessive belt tension. (See Fig. 7)

Fig. 7 An example of FEM analysis of shaft stress distribution



*When using water pumps with cooling fan clutches, NSK recommends the selection of one of the lower resonant bearings which were originally developed by NSK for fan clutches.

- Each chamfer is designed for ease of assembly and to avoid generating an unbalanced load.

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