

Ultra Low Friction Sealed Ball Bearing for Transmission

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1. Introduction

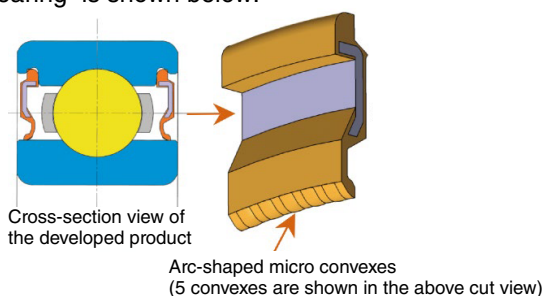
“Ultra low Friction Sealed Ball Bearing for Transmission” was developed. This reduces friction of an application by controlling the fluid lubrication with a new design of a proprietary shaped seal lip.

This product received the Mobility Components Award of the 2018 “CHO” MONODZUKURI Innovative Parts and Components Award sponsored by MONODZUKURI Nippon Conference and Nikkan Kogyo Shimibun, Ltd.

This breakthrough idea achieves both low torque and long operating life simultaneously. The results of this study are based on an unprecedented unique seal philosophy and verified through theory and experiments.

2. Structure

A general structure of the “Ultra Low Friction Sealed Ball Bearing” is shown below:



3. Features

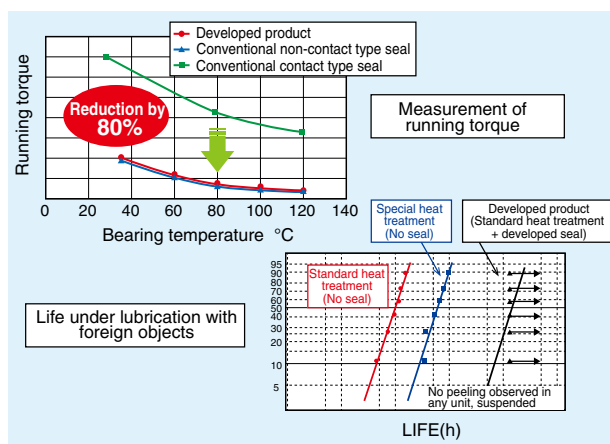
The developed product has the following features:

- (1) Fluid lubrication seal (equivalent to open product)
Reduction of running torque by 80%
(compared to contact type seal)
- (2) Longer operational life in comparison to product with special heat treatment 5 times or longer bearing life
(compared to open product)
- (3) World’s highest seal circumferential speed performance
Seal circumferential speed of 50 m/s or more
- (4) Sealing properties are equivalent to or better than the conventional contact type seal
Prevention of penetration from harmful foreign objects

Note: “Open product” is a designation of open type bearing with no seal

The low torque equivalent to non-contact sealed bearings was verified through analysis and experiment. The optimum seal shape was developed to prevent harmful foreign objects from penetrating into bearing.

This long-life bearing has 5 times or more operating life than a product with special heat treatment.



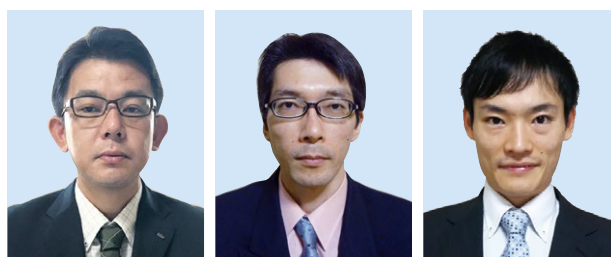
4. Summary

The low torque seal has adopted a new mechanism design to produce a wedge film effect for the seal lip. This creates a low torque equivalent to non-contact type sealed bearings and long operational life that is better than the products with special heat treatment. It exhibits excellent seal durability, even under high rotational speed conditions. This makes this contact type seal suitable for high-speed rotation required by EV/HEV. It is less costly than the bearing with special heat treatment. An active market deployment is planned.

References

- 1) Tomohiro Sugai, Lubrication Mechanism of Low Friction Seal of Ball Bearing for Transmission, NTN TECHNICAL REVIEW 86, (2018) 78-83.
- 2) Takumi Fujita, Strategy of Rolling Contact Fatigue Life Testing and Interpretation of Life Data, NTN TECHNICAL REVIEW 84, (2016) 74-79.

Photo of authors



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Micro Hydro Turbine

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1. Introduction

The Micro Hydro Turbine (**Fig. 1**) received the Award for Excellence of 2018 (28th) Nikkei Global Environmental Technology Awards hosted by Nikkei Inc. The Turbine starts generating power by simply placing it in an existing water channel. It is very friendly to the global environment and is contributing to SDGs on a global scale. Features include a highly efficient blade shape that captures water energy and ability to increase generating power. This was evaluated by placing multiple units in series or parallel in the same water channel.



Fig. 1 Micro Hydro Turbine

2. Configuration

Fig. 2 shows the product configuration. It consists of high efficiency blades which connects to a generator and beams for installation on water channels. There are two types of controllers for power generation, one for charging batteries as an independent power source and the other for connecting to the grid so that generated power can be sold. This makes the product versatile to respond to broad market requirements for power generation.

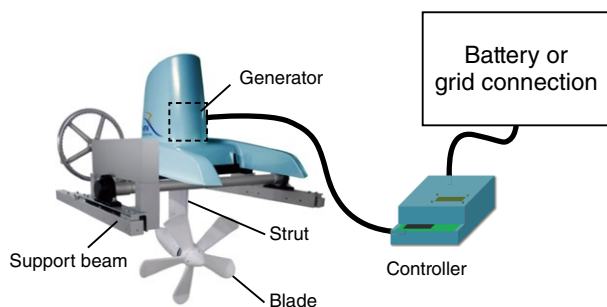


Fig. 2 Configuration of Micro Hydro Turbine

3. Product Specifications of Typical Models

The model with the blade diameter of 90 cm achieves a rated output of 1 kW when the flow rate is 2 m/sec (**Table 1**).

Table 1 Product specifications of typical models

Turbine type	Propeller hydro turbine for small water flow
Generator type	Permanent magnet synchronous generator
Blade diameter	60 cm, 90 cm, 130 cm
Rated power output	1 kW (90 cm model at flow rate of 2 m/s)
Recommended water channel	Width 100 cm or more, depth 100 cm or more
Size/weight	H 190 cm x W 230 cm* x D 170 cm, 170 kg

* Varied depending on the width of water channel

4. Summary

Existing hydro turbines in the market by other manufactures require major construction work to create different water levels. The issue with major construction is its cost and damage to the environment. The **NTN** Micro Hydro Turbine can be installed by simply placing the unit on a water channel with the beams to fit the width of the water channel, which can solve the issue construction causes to the environment. This unit can be expected to be used in many fields by utilizing agricultural and industrial water promoting local generation and consumption of renewable energy.

References

- 1) Tomoya Kawai et al.: Micro Hydro Turbine, NTN TECHNICAL REVIEW No. 84, (2016) 28-33.
- 2) Takashi Itou et al.: Grid Connectable NTN Micro Hydro Turbine, NTN TECHNICAL REVIEW No. 86, (2018) 102-107.

Photo of author (representative)



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