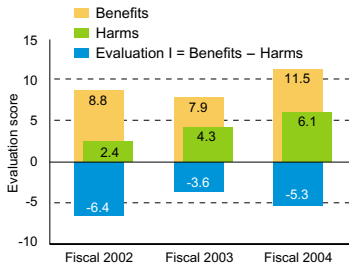


# Technology Development Center efforts on behalf of the environment and society

## Degree of environmental impact of research themes

Evaluation I (Benefits – Harms) x Evaluation II (Potential extent)

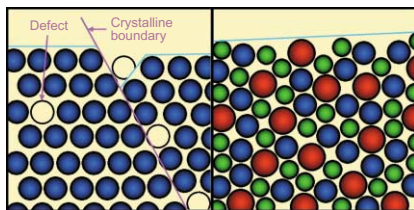
Evaluation I		x	Evaluation II	=	Degree of environmental impact
Benefits	Harms				
[1] Energy conservation [2] Resource conservation [3] Waste reduction etc.	[1] Harmful substance use [2] Valuable resource use [3] Odor countermeasure need etc.		Impacts on society Significance of the results Likelihood of realization		



**Degree of environmental impact of research themes:** At the Technology Development Center, we pay attention to the benefits and harms to the environment that our research themes might have and assign points to each factor. By deducting harmful evaluation points from beneficial evaluation points, we reach a score for Evaluation I. We also calculate a score for Evaluation II that includes the research theme's potential extent, including impacts on society, the significance of the results and the likelihood of realization. Together these two categories allow us to calculate quantitatively the degree of environmental impact of all our research themes and rank them for oversight.

Looking at the changes from fiscal 2002 to 2004 in the average environmental impact values of our research themes, as expressed by Evaluation I, the value has gone up and down, but over this same period, the average beneficial value has increased from 2.4 points to 6.1 points. In short, positive influences on the environment have increased. For Evaluation II, impacts on society, themes related to the medical field have very positive scores, as in the example described below.

The Technology Development Center will continue to conduct environmental impact evaluations of research themes at the beginning of each fiscal year and as new themes are established. We will pursue research and development with consideration for the environment by continually tracking these changes.



Typical atomic structure of metal (Crystalline metal) Atomic structure of metallic glass (Non-crystalline metal)

**Development of ultra-precise metallic glass gear:** The YKK Group is participating in the New Energy and Industrial Technology Development Organization (NEDO) Metallic Glass Formation Project along with the Tohoku University Institute for Materials Research, the R&D Institute of Metals and Composites for Future Industries (RIMCOF), laboratory of Tohoku University, Namiki Precision Jewel Co., Ltd. and the Gunma University Faculty of Engineering. As a result of our collaborative efforts, we have succeeded in developing the world's smallest geared motor (1.5 mm diameter) using super-small metallic glass gears.

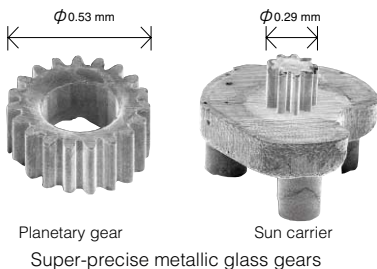
Metal normally has a crystalline structure in which the atoms are neatly arranged, but the metallic glass that YKK developed with the Tohoku University Institute for Materials Research is like glass and does not have a crystalline structure even though it is metal. This substance is strong and difficult to bend, and does not easily swell or shrink. Since it does not shrink easily when hardening from a liquid state, this material very accurately recreates the shape of the mold used when forged. Utilizing the features of metallic glass, the Technology Development Center has been working to develop ultra-precise forging technology and we have been able to make super-small gears as a result.

We believe that this micro-gear motor will be used to power medical equipment, including endoscopes and catheters, for treatments that occur inside the human body. In addition, if applied in small portable medical pumps, insulin delivery devices for diabetics that could be attached to the body at all times and other non-intrusive treatments could be made possible. This could reduce the need to make trips to hospitals and improve peace-of-mind. Advanced diagnosis and treatment without increasing patient suffering is no longer a dream.

We have great expectations for the use of this technology. We believe that research themes such as this will have positive impacts on advanced medicine and are our way of contributing to society.



World's smallest gear motor created using ultra-precise metallic glass gears



Planetary gear Sun carrier Super-precise metallic glass gears