

# What If There Were No Surface Modification Technologies?



## Environmental Contribution through Surface Modification Technologies

In recent years, climate change caused by global warming has begun to significantly impact not only people's lives but also the ecosystems of all living creatures. Now more than ever, we need to create a sustainable society.

So what can we do in the industrial segment? We are considering two concepts to enable sustainable social development: "the right material in the right place" and "longevity".

It has been more than 5,000 years since humans began using metals. We will continue to use metals as beneficial materials from the perspective of using "the right material in the right place". However, it is also true that refining metals from ore consumes a large amount of energy and emits GHGs (greenhouse gases). Our challenge is to identify how to use the metal materials we have obtained with care and continue to use them over the long term. In other words, it is about protecting metals from corrosion (chemical loss) and wear and tear (mechanical loss).

According to estimates by the Japan Society of Corrosion Engineering, corrosion costs in Japan amount to JPY4.3 trillion per year to prevent corrosion (corrosion cost)<sup>\*1</sup>, assuming the corrosion cost and metal losses (converted from monetary values) are equal. These losses must be replaced; such replacement would result in an additional 80 million tons of CO<sub>2</sub> emissions during manufacturing, according to our calculations. On a global scale, this amounts to as much as 3.8 billion tons of emissions, equivalent to 11% of global CO<sub>2</sub> emissions<sup>\*2</sup>. On the other hand, friction and wear cost<sup>\*3</sup> are also shown in advanced countries. Using this figure to calculate the metal loss in Japan and assuming that this loss must be recovered, as much as 80 million tons of CO<sub>2</sub>, equivalent to corrosion, will be emitted in the manufacturing process.

As such, it is clear that current corrosion prevention and wear resistance technologies protect metal materials from corrosion and wear, thereby contributing to reduced CO<sub>2</sub> emissions.

<sup>\*1</sup>: Japan Society of Corrosion Engineering and Japan Association of Corrosion Control, Cost of Corrosion in Japan (2020)

<sup>\*2</sup>: Energy Institute, CO<sub>2</sub> emissions (EI statistics)

<sup>\*3</sup>: K. Holmberg: Tribology International, 135, 389-396 (2019)