

(高中自選題 1)

## **100% Fish Program**

In 2020, Petur Oddsson, a power station worker in Iceland, was struck by a 60,000-volt current. The electrical shock burned almost half of his body and melted layers of his skin off. Such deep and extensive burns can be fatal. But Oddsson's life was saved by a creative invention: transplanting codfish skins onto human bodies.

A triumph for medical technology, Oddsson's fish skin transplantation was actually part of the astonishing achievement of "100% Fish," an ambitious task in promoting environmental efficiency. The Icelandic project, from which this pioneering procedure emerged, strives for making a fundamental change in the marine industry. It aims to encourage full utilization of each fish caught, and to strengthen innovation in seafood products.

Reducing waste of fish catch has become a serious issue today, when many countries are faced with food crises. According to a 2003 study, about 60% of a codfish caught in Iceland was lost or wasted during the production process for human consumption. Under the guidance of 100% Fish, however, Icelanders are now using almost 95% of a cod. Cod skin, for example, is made into calcium supplement and energy drinks, and even as material for skin transplantation as in Oddsson's case. Dried fish heads and spines are exported to West Africa, where they are used as the base of a protein-rich soup. Other groundbreaking products, including Omega-3 capsules, cold virus pretreatment sprays, and dog snacks are made from what was once cod catch detritus.

The Icelandic success is accomplished largely through cooperative efforts across various industries. 100% Fish takes the initiative to show seafood companies the importance of collaboration, and facilitate valuable connections between fishing companies and other participants of the project, including academia, start-ups, and research and development teams. By sharing knowledge and information, the different sectors are able to come up with improved processing and handling, through which creation of various innovative products was made possible. The project not only helps Icelanders to get 30% more value from each cod than most developed countries, but also provides an effective model to promote resource efficiency worldwide.

## (高中自選題 2)

### **Hard Head Invention**

A hard hat is a helmet used mostly at worksites to protect the head from injuries due to falling objects. Since its introduction in the early 20th century, the headgear has saved countless lives and is considered the number one safety tool for construction workers.

The hard hat was invented in 1919 by Edward W. Bullard, who had just returned from World War I. Before the war, workers used to smear their hats with coal tar for protection of their head. Bullard, having witnessed the life-saving power of the metal helmet in the War, decided to produce a head protection device that was affordable for every worker and lightweight enough to be worn all day long. The Hard Boiled Hat was thus born, using steamed canvas and leather, covered with black paint, and featuring a suspension system to reduce impact. Soon, hard hats became widely used. The headgear was later made mandatory at construction sites in major construction projects, such as the Hoover Dam in 1931 and the Golden Gate Bridge in 1933.

Over the past century, hard hats have advanced considerably, evolving from canvas and leather to aluminum, fiberglass, and, eventually, to thermoplastic. Recently, new models have been introduced and accessories added to meet the needs of laborers working on various job sites. For instance, a ventilated hard hat was developed to keep wearers cooler, and see-through face shields were attached to better see the hazards lurking above. Today, attachments include radios, sensors, cameras, and a lot more. A common color code has also been developed for recognizing people and their roles on site. Yellow is used for general laborers and contractors, white (or sometimes black) for supervisors and managers, and green for inspectors and new workers.

New products continue to expand the market. Global sales of hard hats totaled USD 2.1 billion in 2016, and are expected to reach USD 3.19 billion in 2025.

(高中自選題3)

## Japanese Train Speaker

Researchers in Japan have installed on a train a speaker that barks like a dog and snorts like a deer in order to prevent collisions with animals on the tracks.

The country has been troubled by a problem with trains colliding with deer on its railways. According to Japan's transport ministry, there were 613 cases of train services suspended or delayed for at least 30 minutes resulting from collisions with deer and other wild animals in 2016-17.

Deer are attracted to railway lines because of a need for iron in their diets. They lick the rails to pick up iron filings caused by the action of wheels against tracks. This dietary need has led to a constant battle to keep the deer separate from the unforgiving nature of tons of onrushing rolling stock. In the past, flashing red lights and even lion faces have been unsuccessfully trialed in an attempt to keep deer off the tracks.

This new device has been invented by a team at the country's Railway Technical Research Institute (RTRI). RTRI officials explain that deer have a habit of repeatedly snorting short, shrill sounds to alert other deer when they perceive danger. The barking of the hound, which drives deer to panic, strengthens the effect of the warning noise, according to the RTRI. When the deer hear a combination of a 3-second-long recording of a deer's snort and 20 seconds of a barking dog, they panic and flee rapidly.

RTRI researchers say late-night tests, at times when deer are most frequently seen by railway tracks, have resulted in a 45 percent reduction of deer sighting. Future plans include static barking sites where deer are commonly seen, but "the noises will not be blared in areas where people live beside the tracks."