



Realize Progress of Railway Safety and Prevention of Human Errors
By Considering Specificity of Human.

~Think from “Railway Safety,” “Industrial Safety,”
“Prevention and Reduction of Disaster” ~

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1. East Japan Railway Workers’ Union’ s challenge from work places towards safety

We, East Japan Railway Workers’ Union jumped over a fence of workers and employers, has been seeking railway safety, and spread it to the world. 30 years have passed since JREU was established and we have been doing “challenge from work places” to raise philosophy “from pursuing liability to investigating the cause” to East Japan Railway Company’ s corporate culture. At the same time, without hiding incidents, we have been realizing safe railway with considering and enforcing recurrence preventive measures by investigating background and prioritizing investigating the cause.

Fundamental principle when we consider railway safety is to recognize a human characteristic such that human makes mistakes. There are 4 characteristics of human errors. First, there is not “error mode” in the human brain. Second, a result of doing the best became an error. Third, punishment is not effective to prevent reoccurrence. Fourth, it is the most important to investigate background causes. It is impossible to get rid of human errors which are results of human activities. It is important to consider safe railway operations by facing human errors which are our fate and thinking how to prevent accidents.

We, who experienced The Great East Japan Earthquake which was beyond expectation, disciplined 217 union members and they became disaster prevention experts, and define a point of view of disaster prevention and reduction of the effects of a natural disaster. We have been promoting efforts to save lives by prospecting improvement of railway safety and railway in the future, by learning from experts from various fields, by establishing safety, and by raising to “preventive safety” and “predictive safety” from “tombstone safety.”

As I mentioned before, we have to consider “human makes mistakes” if technology progresses. Therefore, we have been appealing importance of human factors and inspecting incidents with union members.

A human factor is defined as a practical study of knowledge, concept, and technique of human ability and its limit, sensory illusion, carelessness, shortcut act, and omitted act which are needed to operate machines and system safely and effectively. Fields of human factors are “all about human” and very extensive.

2. Consider countermeasures from human labor’ s characteristics.



From human factors views, we verify a physiological phenomenon, a doze. This verification is very important for occupational safety.

Now, a nap during driving which leads serious incidents attracts attention. A nap during driving must not be happened for drivers even if it is momentary. In spite of that, most of drivers say they have experienced to feel sleepy during driving. There is no countermeasure except drivers themselves try “standing driving” and “opening the window.”

To prevent serious incidents caused by sleep disorder, JR East obligates all drivers (from 2003) and all conductors (from 2017) to examine Sleep Apnea Syndrome. SAS is treatable sleeping disorder so the union and the company decided the company does not punish anyone if incidents caused by SAS happen.

However, railway crew members who do not have SAS take a nap at work.

There are several reasons. There is no partition between workplace and resting room so workers cannot rest under the situation that supervisors can always watch them. Even though functions of rolling stocks are updated and jobs are simplified by automation, long-distance shifts are made so the psychological burden and the physical burden are becoming huge.

When we verify further, we find there are 3 sleepiness rhythms: 24-hour rhythm, 12-hour rhythm, and 1 hour 30 mins rhythm. In general, it is said we feel sleepy after meals, however, these 3 rhythms are not related to meals. Various studies show these 3 rhythms are related to the organism rhythm.

As a countermeasure for a nap at work, JR East tried to mandate all drivers and conductors to fill out a sleep diary. Also, things that consciousness as a crew is problematized and a crew is punished happened. An attitude at work which causes to anxiety is a problem, however, when we consider sleepiness as a characteristic human, a nap cannot be prevented by punishing crew members. There are some issues to solve such as making shifts which fit sleepiness rhythm and making environment that crew members can relax in a short period of time. It is important to grasp problems from ordinary work “operation of trains,” and to come up with countermeasure to prevent incidents. It is impossible to raise a level of safety without establishment of “preventive safety.”

On the other hand, airline industry is working on before others. It is important to take root “predictive safety” within railroad industry in Japan.

“Predictive safety” is based on “preventive safety” ; “to think about problems of safety preventively at work and predict how these problems are developing, and make safety countermeasures.”

3. Historical experiences create safety in the future.

Various incidents expressed “beyond expectations” became “within expectations” by experience of The Great East Japan Earthquake.

Now, JREU’ s 217 disaster prevention experts take a leading part in making disaster preventive hazard maps of each railroad section in JR East.

Tidal wave came to pacific coast and a region and railway got a great deal of damage under The Great East Japan Earthquake. Each union member walked through disaster prevention shelter bases and found situations which only can be felt when they actually go there. JREU investigates and implements to move quickly in emergency situations. We assume not only earthquakes but also localized torrential downpour and storms. Landslide disaster can be happened at railway in mountainous areas. We consider prediction and countermeasures of crises of secondary disaster and evacuation routes, and proposing universal standard traffic signs. We make movements from “nothing happens” to “implementing countermeasures with assuming the worst situation.”

We experienced The Great East Japan Earthquake and acquired the view of “predictive safety,”



however, when we consider incidents happen at work and think about safety of railway overall, “predictive safety” was not taken root. We did not break through the idea of “tombstone safety.” With this negative lesson, it is our mission to establish safety climate of JR East in the future.

4. A severe incident which we could not make use of lessons in the past.

I will show you an incident which is brought by poor safety management.

It was on April 12, 2015. An electric pole fell down between Kanda Station and Akihabara Station of Yamanote line, the main artery of metropolitan area. When the electric pole fell down, no train was around the place, so derailment and overturning were not happened. If trains are close to the place, severe incidents will have been happened.

This incident was caused by a wrong change of work planning when the old pole was replaced. Strength of the electric pole which holds an overhead line was not enough. The electric pole was not enough for 5 tons of tension. There are many background problems. Strength calculation was not enough. Checking system was not fixed. Also, there are problems of work system and work environment.

Construction section noticed the pole was out of upright on April 10, however, they judged it was not emergency issue and they decided to do a construction of the pole on April 13, on the next day of the incident. They did not tell other sections.

A train crew noticed the pole was out of upright on April 11 and told it to other members. However, maintenance section did not know it. On the day of the incident, people from maintenance section went to see the pole and noticed it was out of upright. However, they did not determine to stop trains immediately.

It was good that crew noticed the pole was out of upright and told other people, however, no one could decide to stop trains.

Then, why did no one decide to stop trains? The core problem is no one imagined collapse of the pole. No one had an image of “collapse→collision→severe incident.” This is a result of Human characteristics such as sensory illusion and omission. These characteristics created consciousness like “okay for now” or “fix a slope of the pole.” “It will not fall down immediately” was groundless. JR East established a countermeasure “evaluation standard to find out an abnormal slope of electric poles.” It is valid to make an evaluation standard, however, other incidents other than collapse of poles cannot be prevented. It is not enough to establish countermeasures after incidents happened. We try to move ahead from “tombstone safety.” For future railway safety, it is important to recognize human factors sufficiently, to establish safety management system which contains “preventive safety” and “predictive safety,” and to establish work system based on these ideas.

5. “Predictive safety” should be universal standard of safety management.

JREU has been claiming importance of education programs to develop countermeasure ability of risk management, and preparing to implement it. When we consider “what is safety?” from the view of human factors, what is always in front of us is dangerous, and we cannot say stable safety is promised. Automation and systematization by technological development and technological innovation are developing fast in the world not only in railroad industry but also other industries. On the other hand, when we consider a characteristic of railroad industry which relies on human labor, safety management equals risk management.

Human tends to make mistakes, however, human has sensitiveness and sensibility which can find risks. To manualize jobs and severe punishment policy discourage these sensitiveness and sensibility.



Understanding human characteristics, and solve each risk factor during managing risks. From this continuous risk management, realize real railway safety. There were a huge number of precious sacrifices. JREU has been establishing safety with a purpose not to make same incidents happen again. Human has a strong power such as “learn.” We need to make good use of successful examples such as “no one died” and “prompt decisions to save lives” when The Great East Japan Earthquake attacked. On the other hand, naps and collapse of the electric pole are failure cases that we could not make good use of lessons in the past.

30 years have passed since JREU has been organized. We should not ignore history we have been accumulating. We experienced “railway safety,” “predictive safety,” and “disaster prevention and reduction” in history, and with these view, “preventive safety” and “predictive safety” cannot come true without changing corporate climate and awareness.

We advocate making good use of failure cases and building safety culture.

Thank you.