JPO 縁 ENISHI

March 2016

No. 12

IP Friends Connections

This Magazine is published as part of the Intellectual Property Cooperation in Human Resource Development Program of the Japan Patent Office. The aim of this Magazine is to follow up on training programs through the dissemination of information to IP Friends, those who have completed training courses of the above program.
We very much hope that the information in this publication related to intellectual property, and the comments from either IP Friends or lectures, will prove beneficial to you in your work.

JAPAN PATENT OFFICE

【The meaning of 縁 (Enishi)】
"Enishi" refers to the bond created between people when encountering someone they were destined to meet. We have chosen this term as the title for our publication because we are all members of the Intellectual Property community, and the bonds created between us extend beyond national borders. We hope that you will use this informative publication to deepen the "Enishi" you have created with your IP Friends.

Table of Contents

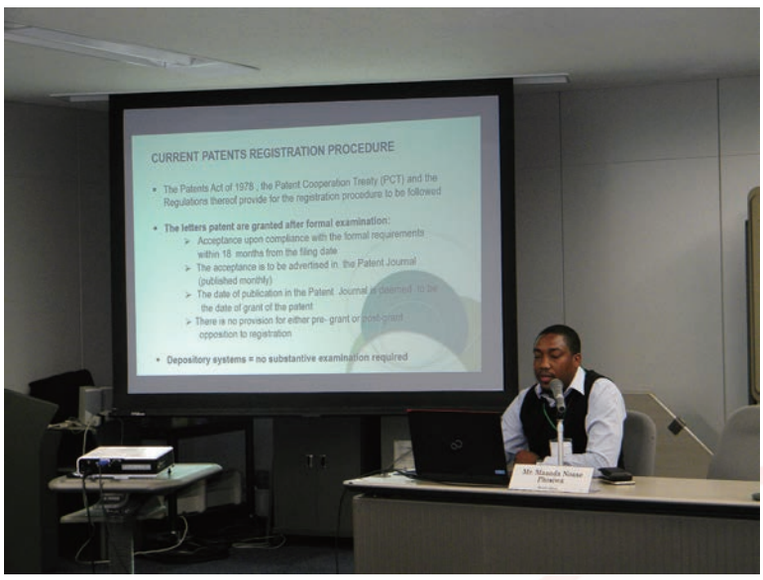
Report of FY 2015 JPO/IPR Training Course on Patent Examination Practices for South Africa from APIC

JPO/IPR Training Course on Patent Examination Practices for South Africa
February 3-17, 2016

The "JPO/IPR Training Course on Patent Examination Practices for South Africa" was held with ten trainees. The training course was designed for those who would be involved in patent examination in the Republic of South Africa.

The course program focused on deepening understanding of all aspects of patent systems, including basic patent examination practices, through lectures, discussions and enhancement of the expertise required by patent examiners.

In the morning of the first day of the course, the trainees listened to a welcome address and then presented a country report on the intellectual property system in South Africa.



In the afternoon, the students paid a courtesy call on the principal officers of the Japan Patent Office (JPO), with the attendance of JPO Deputy Commissioner Masayuki Koyanagi, who gave them a welcome address. They next toured the National Center for Industrial Property Information and Training in the JPO building and attended a lecture on the "Outline and Process of Patent Examination Conducted by the Japan Patent Office." In addition, Mika Yamana, Ph.D., a professor at Kansai University, lectured the trainees on "International Trends in Intellectual Property Rights."

From the second day the trainees learned about the basic outline of the Patent Act of Japan, basic ideas about patent examination, methods for patent information searches, and criteria for judging novelty and inventive step. They then practiced patent examination through case studies.

The trainees were so active during the lectures, asking many questions, that many lectures did not proceed as scheduled. As a result, they requested extending the time periods.

Of the various topics in the course, criteria for judging novelty and inventive step—a core part of patent examination—were of particular interest to the trainees. Therefore, they asked to practice patent examination through more case studies related to the criteria, and hear opinions from experienced lecturers.

As part of the training course, the course participants also visited Isuzu Motors Ltd., which has expanded its business overseas including South Africa, to listen to lectures on its business development in South Africa, as well as its and intellectual property management. After the lectures they toured automotive assembly lines in a factory. They got a close look at multiple parts being manually assembled into some large customized automobiles by many factory workers on an assembly line. This experience seemed very beneficial to them in examining patent applications.

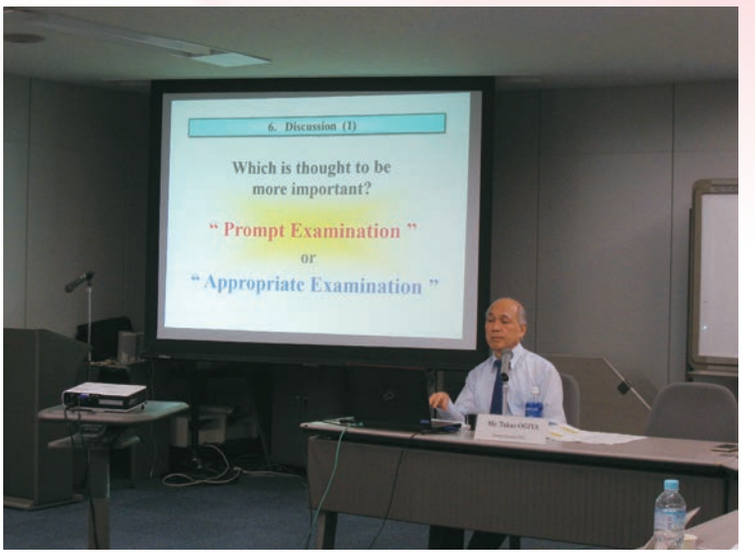
In the evaluation meeting on the last day, we received much feedback from the trainees about this training course, the first for South Africa, which will help us to provide better quality training courses next year and the years after that. Their comments will enable us to propose patent courses significant for South Africa, which will start substantive patent examinations.

The trainees will surely work as leading patent examiners conducting substantive examinations. We look forward to their success and a well-established patent system being implemented in South Africa in the future.


Dis-Chem


Protection and Utilization of
Intellectual Property Rights for
the Economic Development


Patent Examination Standards
(Practice Exercises)
Description Requirements

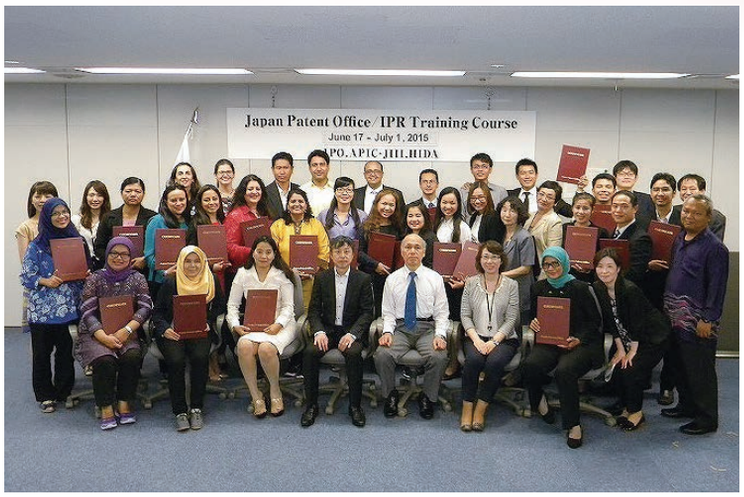

6. Discussion (1)
Which is thought to be more important?
" Prompt Examination "
or
" Appropriate Examination "


Japan Patent Office / IPR Training Course
Feb. 3 - Feb. 17, 2016

FY2015 Training Courses Completed (Yearbook)

【JPO/IPR　Training Courses】

1. IP Practitioners



2. IP Trainers

3. Managing IP

4. Practitioners Specializing in Trademarks

5. Patent Examination in Specific Technical Fields for Latin American Countries

6. Substantive Examination of Design (Basic Program)

7. Promoting Public Awareness of IP

8. Trademarks for Myanmar

9. Practitioners Specializing in Patents

10. Summer Training Courses

11. Patent Examination Practices for ASEAN Countries

12. IP Administration for LDCs

13. Operational Patent Examination Training Program

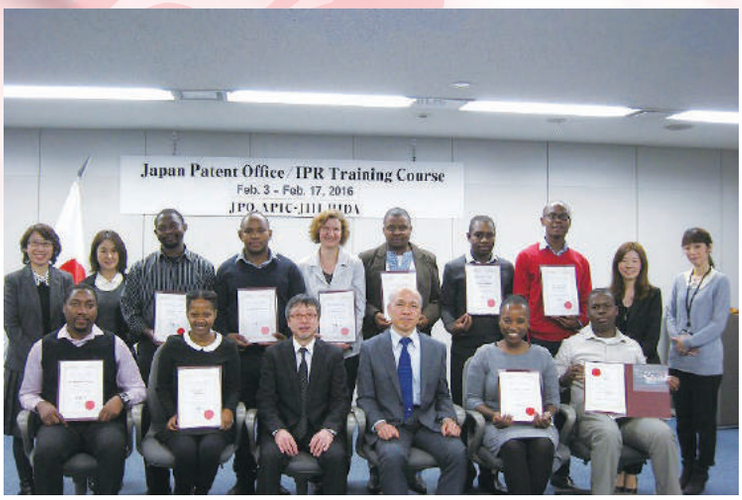
14. IP Protection Lawyers

15. Patent Examination Standards

16. Anti-Counterfeiting Measures for Practitioners

17. Trademarks for Indonesia

18. Madrid Protocol Trademark Filings for ASEAN Countries 1



19. Patent Examination Practices for South Africa

20. Madrid Protocol Trademark Filings for ASEAN Countries 2

【WIPO/JF　Training Courses】

1. The Use of Information Technology in Industrial Property Administration

2. The Industrial Property Examination (Intermediate/Advanced Program)1

3. The Enforcement of Intellectual Property Rights

4. The Industrial Property Examination (Basic Program)

5. The Industrial Property Office Management

6. The Industrial Property Examination (Intermediate/Advanced Program)2

FY2015 Follow-up Seminar Completed (Malaysia)

Seminar Held in Malaysia

On February 17, 2016, a follow-up seminar was held in Kuala Lumpur, Malaysia. The seminar was organized by the Japan Patent Office (JPO), supported by the Intellectual Property Corporation of Malaysia (MyIPO), and arranged by the Japan Institute for Promoting Invention and Innovation's Asia-Pacific Industrial Property Center (APIC-JIPII). This was the ninth seminar to be held in Malaysia since 2001.

The seminar was attended by 118 people. The attendees were mainly MyIPO officers, as well as people from universities, research institutes, and law firms, but also included professionals from private-sector companies and IP alumni of Malaysia.

The theme of the seminar was "Management of Intellectual Property Assets," and began with opening remarks from Mr. Zulkarnain Muhammad, Assistant Director General of MyIPO, and Mr. Kenichi Hasehira, Deputy Director of the Regional Cooperation Section (Southeast Asia), International Cooperation Division, JPO.

After the opening remarks Mr. Kenichi Hasehira, JPO, gave the keynote speech, which was entitled "International Cooperation on IP with Malaysia, ASEAN." This was followed by a speech from Mr. Tsuyoshi Isozumi, Director of the IP Division, JETRO Singapore, the title of which was "Progress and Developments of Financial Support Based on Intellectual Property."

Then experts from Malaysia and Japan gave speeches in two sessions: "Expanding the Value of IP Assets" and "Case Studies of Successful Utilization of IP."

From the Japan side, Mr. Yoshitoshi Tanaka, Professor at the Graduate School of Innovation Management, Tokyo Institute of Technology, gave a speech entitled "Strategy to Utilize IP for Commercial Gain," while Mr. Yoshihiro Endo, Senior Manager of the Intellectual Property Division, Motorcycle IP Office, Honda Motor Co., Ltd., gave one with the title "Success Story of Japanese Company in Utilization of IP - IP Utilization at Honda."

The speakers from the Malaysian side responded to the above speeches with addresses of their own. The speech from Mr. Mohamad Ikhwan Shadzul Bakri, Senior Assistant Director of the Business Development Division, MyIPO, was entitled "How to Value IP Assets," while that from Associate Professor Dr. Samsilah binti Roslan, Director of the Putra Science Park, University Putra Malaysia, was called "Success Story of Malaysian Local Institution." The participants listened intently to each of the speeches and also asked a lot of questions.

After joining the WIPO and becoming a party to the Paris Convention in 1989, Malaysia successfully gained membership to the WTO in 1995. Under the "1 'one' Malaysia" slogan, Prime Minister Najib has focused on achieving harmony among ethnic groups and implementing administrative reform. Among his other initiatives, he has put forward a market-oriented "New Economic Model" and announced a government reform program aimed at making Malaysia a developed country by 2020. MyIPO played the central role in organizing the seminar.

Scene at the venue

FY2015 Follow-up Seminar Completed (Yearbook)

【Vietnam】

【Lao PDR】

【Cambodia】

Introduction of FY 2015 Long Term Fellowship Researchers

Ms. Indra Rathakrisnan (Malaysia)

Ms. Indra Rathakrisnan

Salam sejahtera. I'm Indra Rathakrisnan from Intellectual Property Corporation of Malaysia (MyIPO). To be specific, I am from Hearing Unit (Opposition) of Trade Mark & Geographical Indication Division.

I am happy to be given the advantage to do research that was related to my field of work. My research theme is "Issues in the Trademark Opposition Proceedings in Malaysia and the Suggestions from the Japanese Experience". I hope my research will be helpful to my office and can contribute in the development of the Malaysian Trade Mark in the long run.

I am privileged to be one of the participants in the Long Term Study Research Fellowship Program where I can get various exposures, especially in trademarks law area that can help me for my future career development. Apart from doing the research, I am fortunate enough to be able to join some of the training classes and courses that was organized and took place in JPO/APIC. Since these programs were joined by various participants from all over the world, I have an opportunity to get knowledge and information on their respective Intellectual Property (IP) office systems. It is intriguing how each countries system vary to certain extent though we share the similar objective in industrial property rights. Information that was gained from here can be a good insight and effective tools for the Malaysian national IP system to progress even further. Besides that, it provides a good platform for the networking.

Moving on to my personal experience in Japan, I can strongly say that the time that I have spent here was one of the most enjoyable and precious moment in my life. My first exposure to Japan is via anime and manga which I adore since my teenage years. Yes, you heard me correctly. I am a big fan of manga and anime till I learnt most of the Japanese culture and lifestyle from there. Since then, I really wish to visit the Land of the Rising Sun. On top of that, I have a passion in doing research. Thus, when I am accepted as a participant in this Long Term Research Program, it was like a double shot of happiness.

Before I fly to Japan, it was a hectic period for me. I was running around settling this and that and at the same time finishing the statistics for my current workload. In no time it is already the day for my departure and I arrived at Narita Airport on December 2 2015. At the airport, I was worried about how am I going to reach my accommodation in Tokyo with all my heavy luggage. I scolded myself for not packing lightly. Thanks to the officers from APIC, Satoko Miyazaki-san and Nomura-san, I was able to settle down in my apartment without much hassle. Upon settling down, Miyazaki-san helped me to show around nearby places and the next day she came again to the apartment to show the way to APIC. On that day, I was also introduced to my research partner, Mr. Ramil R. Llantos from Philippines. He had arrived one month earlier and was already familiar with the surrounding area. Dr. Yorimasa Suwa together with Miyazaki-san and Asako Watanabe-san (person in charge for the Long Term Research Program) had also helped me to settle down and accompanied me during courtesy visits.

Due to my late participation in this program (I was 2 months behind the schedule due to offices communication), I am required to speed up my research process and Dr. Suwa has played a major role in the progress of my study. His constant supervision and consultation help me to be on the right track. He also found me the most suitable supervisors that related to my research field. Dr. Tetsuya Imamura, Associate Professor from Meiji University and Ms. Reiko Toyosaki from Toyosaki & Associates are the best supervisors that I could ever ask for. They understand my research theme and assisted me with useful information, ideas and related materials that are essential for my research study.

Apart from my research life, I am fortunate enough to be able to experience many activities that expose me to the local culture, traditions and most importantly all the delicious food! For that, I am really thankful to my friends Yoko-san, Mariko-san, Michiko-san, Miyazaki-san and Asako-san. Japan is full of wonderful cuisine that I do not think I will ever get tired of. I confess that at initial stage I was a bit worried about the food. Eventually I was able to fit in nicely food-wise. Now, I am worried that I am surely going to miss some of the local delicacies (T_T). I am also grateful to Ramil Kuya (brother) who look out for me and put up with my "excellent" sense of direction during this period.

Every beginning has an ending, but the important thing is to cherish the moments that was gained throughout the journey. This Japan journey will always be one of my favorite chapter in my life journey. These definitely will be the memories that I will always cherish.

Mr. Ramil Reyes Llantos (the Philippine)

Mr. Ramil Reyes Llantos

Mabuhay! My name is Ramil Reyes Llantos. I am one of the participant of "The JPO Six-Month Study-cum Research Fellowship Program for FY 2015". I am working as an Intellectual Property Rights Specialist II (Patent Examiner 2) under Medical Science and Biotechnology Division of the Intellectual Property Office of the Philippines (IPOPHL). I have been examining patent application for almost 15 years.

Japan's biotechnological industry can be considered as one of the most successful in the world today. The world sees the Japanese biotechnological industry as an innovator with superb R&D. With Japan's strong Intellectual Property Law in the field of Biotechnology, inventions and innovations are well protected.

Problems of Patent Examiners in our Country were dealing on proper approach to patent applications concerning different subject matters in Biotechnology and its examination. Without a concrete, clear cut policy on how to handle applications concerning Biotechnology, specifically Plant Biotechnology, there will be no uniformity on how to tackle this kind of claims. The patent applications will be examined on a different approach and vary from one Patent Examiner to the other, with the possibility of having different opinions on the case. The study will focus on the patentability requirements in search and substantive examination in the field of Biotechnology specifically Plant Related Inventions.

Recognizing the growing administrative burdens particularly of the Medical Science and Biotechnology Examining Division, a research program could provide an extensive insight of what's going on in the field of Biotechnological inventions specifically Plant Related Inventions.

Based on these problems, the theme "Toward the Improvement of IP Policy and Examination Guidelines for Biotechnological and Plant Related Inventions in the Philippines: Lessons from

Japan" was formulated.

By introducing conceptual aspects of the Japanese Patent System as a model, the problems identified will be expectedly resolved. The study on the differences or similarities in the implementation and application of appropriate and relevant legislative patent provisions as well as the study on the differences or similarities in patent examination practices between the Philippines and Japan encourages support for current and future revisions of the implementing Rules and Regulations in the field of Biotechnology. Japan's practices, policies and experience in Biotechnology will provide a perspective on how we can handle the same in the Philippines.

I would like to express my sincerest appreciation to JPO, APIC-JIPII and IPOPHL for providing me this perfect opportunity to be involved in an important program like this.

I am honored to be a part of this program. Thank You!

Questionnaire Results IPR training course in Japan and appreciation for your cooperation

As you know, we requested that everyone who completed our seminar from July to October 2rd 2015 fill out our questionnaire in order for us to evaluate the effectiveness of the seminars.

In order to continue advancing JPO's "Cooperation in Human Resource Development," we would also like to ask for your active participation as IP Friends in various projects for our course alumni.

Thank you again for your cooperation with our survey.
The tallied results for each question are as follows:

Details of the Survey

1) Survey period: October 27, 2015- November 26, 2015

2) Area of survey:
1. Trainees that completed WIPO short term training courses from FY 2014
2. Trainees that completed JICA training courses from FY 2014
3. Trainees that completed JPO short term training courses from FY 2014 - FY 2015

excluding those whose contact information (email) is unknown .

total: 631 trainees

3) You may respond either by completing this online questionnaire, or returning the questionnaire by email.

■Number of replies

	Valid responses	Number of questionnaires sent	Response rate
	(Number of people)		(%)
Government sector	95	401	24%
Private sector	100	230	43%
Total	195	631	31%

■Breakdown of respondents (classification by field)

		Number of valid responses (Number of people)	Number of questionnaires sent (Number of people)	Response rate (%)
Government sector	Intellectual Property Office	87	350	25%
	Court	3	21	14%
	Prosecutor's Office	0	2	0%

		Number of valid responses (Number of people)	Number of questionnaires sent (Number of people)	Response rate (%)
Government sector	Police Office	0	0	0%
	Customs Office	0	1	0%
	Other	5	27	19%
Private sector	Research Institute	2	3	67%
	University or Educational Institution	20	52	38%
	Government-related Organization	0	0	0%
	Employee of a private company	29	60	48%
	Employee of a legal or consulting firm	49	115	43%

1. What aspects were most beneficial to you in attending the JPO training?

(Multiple answers allowed)

	Number of valid responses by government employees	
	(Number)	(%)
I gained a better understanding of Japan's intellectual property system.	54	16%
I gained a better understanding of agreements on intellectual property, such as the Madrid Protocol and the Patent Cooperation Treaty, and international conditions.	28	8%
I gained a better understanding of application screening.	77	23%
I gained a better understanding of patent searches.	22	7%
I gained a better understanding of countermeasures for counterfeit goods.	15	4%
I gained a better understanding of the JPO organization and its operating structure.	15	4%
I was able to broaden my experiences of Japan in areas other than intellectual property.	21	6%
I gained a better understanding of intellectual property in other countries by exchanging views with other training participants.	38	11%
Other	68	20%
Total	338	

2. Specific actions utilizing the training information

(Multiple answers allowed)

	Number of valid responses by government employees	
	(Number)	(%)
Policy proposals	19	6%
Improvement and revision of laws and regulations	15	5%
Development and amendment of policies measures, etc.	11	4%
Development and revision of examination standards etc.	9	3%

	Number of valid responses by government employees	
	(Number)	(%)
Examination judgments	38	13%
Lawsuits, trials and hearings	15	5%
Computerization of intellectual property-related procedures	16	5%
Provision of instructions within and outside the organization	19	6%
Dissemination and promotion of intellectual property system	39	13%
Countermeasures to counterfeits	10	3%
International cooperation	5	2%
Application procedures	26	9%
Consulting	9	3%
Countermeasures to rights infringement	11	4%
Commercialization and promotion of intellectual property system	18	6%
Technology transfer and licensing contracts	11	4%
Transactions with Japan-affiliated companies	0	0%
Other	30	10%
Total	301	

3. What topics would you like to learn about?
(Multiple answers allowed)

	Number of valid responses by government employees	
	(Number)	(%)
More detailed knowledge on Japan's patent laws, trademark laws and design law	21	7%
More detailed knowledge on patent laws, trademark laws and design law in countries other than Japan	7	2%
The Japanese government's initiatives to boost public awareness about intellectual property	13	4%
Collaborations between industry, academia and government	0	0%
Technology licensing organizations (TLOs)	4	1%
Intellectual property management	34	11%
Techniques for evaluating value of intellectual property	10	3%
Commercializing and utilizing intellectual property and patent license operations	19	6%
OJT on examinations	34	11%
Case studies (examinations)	36	12%
Case studies (infringemental cases)	24	8%
Overseas applications and examinations such as PCT and the Madrid Protocol	23	8%
Points to note regarding intellectual property when expanding overseas	3	1%

	Number of valid responses by government employees	
	(Number)	(%)
Intellectual property systems other than industrial property rights, such as copyright law and the Plant Seed Act	10	3%
Other	62	21%
Total	300	

4. If a follow-up session (such as a seminar or workshop) were to be held in your country with the aim of maintaining or improving the knowledge of training participants after the training was completed, what topics would you like to see covered?

(Multiple answers allowed)

	Number of valid responses by government employees	
	(Number)	(%)
Intellectual property management by companies	17	6%
Intellectual property management by companies (SMEs)	8	3%
Intellectual property management by research institutions and educational organizations (universities)	6	2%
Connections between intellectual assets and economic development	21	8%
IP enforcement	19	7%
Brand strategies	4	1%
Patents for computer programs	4	1%
Affiliations between industry, academia and government	2	1%
Public awareness about intellectual property	11	4%
Cases of infringement, countermeasures	12	4%
Effective acquisition of rights	28	10%
Know-how about examination	52	19%
Systems to speed up examinations (such as PPH)	11	4%
IP management (overseas expansion)	4	1%
Other	81	29%
Total	280	

Details of the Survey

1) Survey period: October 27, 2015- November 26, 2015

2) Area of survey:
   1. Trainees that completed WIPO short term training courses from FY 2012 - FY 2013
   2. Trainees that completed JICA training courses from FY 2012 - FY 2013
   3. Trainees that completed JPO short term training courses from FY 2012 - FY 2013

   excluding those whose contact information (email) is unknown .

   total: 455 trainees

3) You may respond either by completing this online questionnaire, or returning the questionnaire by email.

■Number of replies

	Valid responses	Number of questionnaires sent	Response rate
	(Number of people)		(%)
Government sector	32	354	9%
Private sector	20	101	20%
Total	52	455	11%

■Breakdown of respondents (classification by field)

		Number of valid responses (Number of people)	Number of questionnaires sent (Number of people)	Response rate (%)
Government sector	Intellectual Property Office	26	317	8%
	Court	3	11	27%
	Prosecutor's Office	1	6	17%
	Police Office	0	5	0%
	Customs Office	1	2	50%
	Other	1	13	8%
Private sector	Research Institute	0	2	0%
	University or Educational Institution	0	19	0%
	Government-related Organization	0	0	0%
	Employee of a private company	4	25	16%
	Employee of a legal or consulting firm	16	55	29%

2. Specific actions utilizing the training information

(Multiple answers allowed)

	Number of valid responses by government employees	
	(Number)	(%)
Policy proposals	1	2%
Improvement and revision of laws and regulations	3	6%
Development and amendment of policies measures, etc.	0	0%
Development and revision of examination standards etc.	3	6%
Examination judgments	4	8%
Lawsuits, trials and hearings	5	10%
Computerization of intellectual property-related procedures	5	10%
Provision of instructions within and outside the organization	2	4%
Dissemination and promotion of intellectual property system	7	14%
Countermeasures to counterfeits	0	0%
International cooperation	2	4%
Application procedures	5	10%
Consulting	3	6%
Countermeasures to rights infringement	1	2%
Commercialization and promotion of intellectual property system	0	0%
Technology transfer and licensing contracts	1	2%
Transactions with Japan-affiliated companies	1	2%
Other	7	14%
Total	50	

3. What topics would you like to learn about?

(Multiple answers allowed)

	Number of valid responses by government employees	
	(Number)	(%)
More detailed knowledge on Japan's patent laws, trademark laws and design law	6	9%
More detailed knowledge on patent laws, trademark laws and design law in countries other than Japan	1	2%
The Japanese government's initiatives to boost public awareness about intellectual property	2	3%
Collaborations between industry, academia and government	0	0%
Technology licensing organizations (TLOs)	0	0%
Intellectual property management	7	11%
Techniques for evaluating value of intellectual property	3	5%
Commercializing and utilizing intellectual property and patent license operations	1	2%
OJT on examinations	8	12%

	Number of valid responses by government employees	
	(Number)	(%)
Case studies (examinations)	11	17%
Case studies (infringemental cases)	7	11%
Overseas applications and examinations such as PCT and the Madrid Protocol	2	3%
Points to note regarding intellectual property when expanding overseas	0	0%
Intellectual property systems other than industrial property rights, such as copyright law and the Plant Seed Act	0	0%
Other	18	27%
Total	66	

4. If a follow-up session (such as a seminar or workshop) were to be held in your country with the aim of maintaining or improving the knowledge of training participants after the training was completed, what topics would you like to see covered?

(Multiple answers allowed)

	Number of valid responses by government employees	
	(Number)	(%)
Intellectual property management by companies	7	10%
Intellectual property management by companies (SMEs)	2	3%
Intellectual property management by research institutions and educational organizations (universities)	2	3%
Connections between intellectual assets and economic development	4	6%
IP enforcement	6	8%
Brand strategies	2	3%
Patents for computer programs	0	0%
Affiliations between industry, academia and government	1	1%
Public awareness about intellectual property	3	4%
Cases of infringement, countermeasures	10	14%
Effective acquisition of rights	3	4%
Know-how about examination	9	13%
Systems to speed up examinations (such as PPH)	2	3%
IP management (overseas expansion)	4	6%
Other	16	23%
Total	71	

Messages from Lecturers

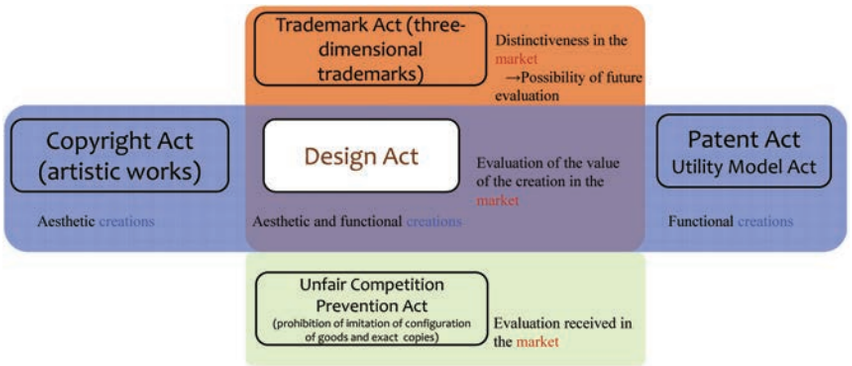
Message from the Lecturer on "The Design Act and Associated Laws"

Mr. Hiroyuki NAKAGAWA,
Patent Attorney,
Nakagawa International Patent Office

Mr. Hiroyuki NAKAGAWA

Last year, I handled "The Design Act and Associated Laws" in the WIPO/JF Training (Examination Advanced Course). I have already had four opportunities to give lectures on this subject.

To begin with, I would like to brief you on the "design" that I handle in this course. Compared to other intellectual property rights, design right is very unique. Design right is positioned close to patents and copyright in terms of the "protection of creations." On the other hand, the design regulations are positioned also close to trademarks and the prohibition of confusion-creating acts under the Unfair Competition Prevention Act, in terms of "selection on the market". In other words, among the numerous intellectual property rights, design is the only one that combines the two perspectives of "creation" and "market." This is why we often say "design stands at the crossroads of creation and market" (see the diagram below).



These respective acts have their own independent philosophy of protection. Each act establishes a consistent system within itself. However, in actuality, many subjects of protection exist across adjoining acts, sometimes causing the philosophy of protection to waver. As I mentioned above, design stands at the crossroads of several laws, and therefore involves many subjects that cross the borders of adjoining acts. Those areas become the major focus of questions that I receive from participants during the class, and also of questions that I ask participants concerning the design systems in their countries. I would like to describe two adjoining areas below.

(1) "Design" and "art works"

As you may know, in Japan, design as "applied art" is not protected by copyright. To begin with, the Berne Convention states: "It shall be a matter for legislation in the countries of the Union to determine the extent to which their laws are applied to works of applied art and industrial designs and models" (Article 7). This means that countries are not obliged to protect

applied art under copyright law, and its protection is left to the legislative system of each country. It is understood that, in Japan, applied art is not included in the scope of "art works" protected by copyright (with the exception of artistic crafts).

Chairs as art work

Chairs as applied art (Photos by the author)

I ask participants in the class about legal systems in their own countries, and have gained the impression that about 30% of countries protect applied art by copyright. This refreshed my recognition that common sense in Japan is not always common sense in other countries. One participant told me that the protection of applied art had yet to be explicitly stipulated by law in his country, and that the relevant argument was to be started in the coming years. To tell the truth, no Japanese law explicitly states that applied art should not be protected by copyright, either, but guidelines have been established based on rulings by the Supreme Court. I also learned from the participants in my class that it was difficult to divide the two areas in any country.

(2) "Design" and "three-dimensional trademarks"

In Japan, laws have been established on the premise that these two areas may overlap each other. There are cases, as indicated below, where the same item is registered both as a design and as a three-dimensional trademark.

Trademark Registration No. 4356423
"Controller for consumer video games"

Design Registration No. 952253
"Operating device for game machines"

In such cases, a question naturally arises as to which would be the more beneficial if the right holder could make a selective registration. Participants from countries that do not have a three-dimensional trademark system ask a very reasonable question: "Would anybody use the design system when it is definitely more beneficial to acquire the registration of a three-dimensional trademark, which grants a permanent right?" As a matter of fact, to register the shape of an article itself as a three-dimensional trademark in Japan, the rule requires that the registrant should acquire its distinctiveness on the market through continued use. Before I explain this point, I sometimes describe the legislative theory of how design and three-dimensional trademarks could be combined. One participant made a suggestion for combining these by securing exclusive use for a specified period through design registration, and then shifting to the registration of a three-dimensional trademark after acquiring distinctiveness. It is enjoyable for me to exchange such ideas with participants in each class.

In this way, it is exciting for me, as well, to have discussions with participants as to what

systems could be established through various legislative theories. One participant asked me, "What is the requirement for the protection of works in Japan: 'creativity' or 'originality'?" Because copyright is not an absolute right (i.e. if two individuals make an identical creation by chance, copyright accrues to both of them), it may be possible to add the definition of originality, etc. to copyright. In this way, I sometimes learn from the participants in my class.

In my class, I not only seek to help participants understand the legal system in Japan, but also hope to deepen our understanding of the essence of the respective legal systems of all of our countries.

Column: My Views on the "Shinkansen" Bullet Train

Mr. Takao Ogiya,
Director General of APIC

Mr. Takao Ogiya

At the summit meeting held in December 2015, Japan and India reached an agreement on the introduction of Japan's High-speed Railways (HSR) technologies (the Shinkansen system) to India's High-speed rail projects. The Shinkansen bullet train is an innovation that Japan can boast of to the world.

The Shinkansen came into commercial operation in October 1964, as an integrated system realized by further evolving the railway techniques that Japan had by then accumulated in such fields as machinery, electronics and communications, and also by capitalizing on cutting-edge science and technologies.

To ensure high speed and safety in operation of the Shinkansen system, the front train car featured a bullet-nosed appearance styled after an airliner, with the shape of other cars streamlined to reduce running resistance and weight. In addition, the Shinkansen used longer rails than had ever been laid before, and the pantographs were designed to minimize pneumatic noise. Furthermore, the Shinkansen lines were laid out with no railroad crossings. Regarding traffic control, Shinkansen operators have employed the automatic train control (ATC) system to provide safe, high-speed passenger rail services, supported by the centralized traffic control (CTC) system, which exercises integrated control over numerous trains in a safe and efficient manner.

By mobilizing all these technologies, the Tokaido Shinkansen, even with about 120,000 trains running on the line each year, has achieved first-rate punctuality with an average delay of less than one minute per train. The Shinkansen has also an impeccable safety record with zero passenger fatalities caused by train accidents over the more than 50 years since the Tokaido Shinkansen commenced operation. Moreover, there is virtually no disturbance due to noise or vibration in the train cars, so Shinkansen passengers can enjoy comfortable rides.

Due to the successful achievements of the Shinkansen as stated above, the usefulness of a high-speed railway transportation system became highly re-evaluated not only in Japan but also around the world, accelerating the realization of high-speed railway networks in France, Germany and other countries. In 2000, the U.S.-based Institute of Electrical and Electronics Engineers, Inc. (IEEE) designated the Tokaido Shinkansen as an IEEE Milestone in Electrical Engineering and Computing. This honor was awarded for innovations that have made a great contribution to the development of local communities and industries, as one of the world's most advanced high-speed urban railway networks.

The Shinkansen has recently been attracting worldwide admiration. But to tell the truth, this admiration is not for the aforementioned system, but for the cleanup services in the train cars. Overseas media have covered and introduced the Shinkansen cleanup services to the world as a "seven minute miracle," leading to great acclaim.

A Shinkansen train stops at Tokyo Station for only twelve minutes before departing again in the reverse direction. Since five minutes of the twelve must be allowed for passengers to disembark and board, members of the Shinkansen cleaning crew have only seven minutes to carry out their tasks. In those seven minutes, they collect garbage, wipe off the table tops in front of each seat, open the window blinds, check for items left behind on the overheard racks, clean the aisles, and perform other tasks. They complete these cleanup tasks in just seven minutes, with one staff member in charge of each train car (with 100 seats). Then, after fully completing their cleanup, the staff assemble on the platform to form a line before the cars, and bow in unison toward passengers before they board.

The company providing this cleanup service describes these activities as "Shinkansen Cleaning Theater." The company staff consider Shinkansen passengers to be their "customers" and assert that it is their duty to provide cleaning services that make customers' travel on the Shinkansen truly memorable.

Seeing the staff's attitude toward their work, I feel that they have respect for and pride in cleaning as professionals. They never take a casual attitude to their work nor think lightly of cleaning jobs.

Here, I would like to mention Mr. Fumiaki Nakamura, someone I have deep respect for. When he was young, Mr. Nakamura came to Tokyo without any particular vision, but after meeting with his mentor, his life changed dramatically. Now, he has delivered 300 lectures per year for more than ten years, thereby continuously inspiring and heartening many people.

One of his statements that I find impressive is as follows: "If you are asked to do something, you should think you are being tested, and respond to that request beyond the expectations of the person who made it. Then, you can greatly impress that person." Mr. Nakamura personally experienced an apprenticeship as a cook at a top-rated restaurant, where he was first assigned only to wash dishes. However, he dedicated himself to this job, striving to wash dishes faster and cleaner than anyone else. As a result, after completing his apprenticeship, on the day he opened a small restaurant, the chief cook of the top-rated restaurant visited, bringing many hand-made hors d'oeuvres. Mr. Nakamura was delighted to see the chief cook serving these hors d'oeuvres to guests of the new restaurant, saying "Please give your patronage to Nakamura." This was because the chief cook was very impressed by the sincere commitment of Mr. Nakamura, who had worked hard to do his best at dishwashing, without making light of the job.

I think that this also holds true for the cleaning staff of the Shinkansen. They have so sincerely committed themselves to their work that Shinkansen passengers are impressed with them and overseas media highly praise them. Additionally, since the Shinkansen itself has given a better-than-expected answer, it has achieved today's success.

Mr. Nakamura also says, "What is important is to consider your ultimate objective." The Shinkansen achieved fame as the world's first high-speed railway, after overcoming various difficulties, with the objective of carrying passengers to their destinations as fast and as safely as possible—in other words, for the sake of customers' satisfaction. Now, the Shinkansen concept is proliferating around the world.

Likewise, the Shinkansen cleaning staff devote themselves to staging the impressive "Shinkansen Cleaning Theater," not with the objective of merely cleaning but with a sincere hope that passengers will feel comfortable during their travel on the Shinkansen, which will be a good memory for them.

What is our ultimate objective?

I think it is truly important that we make all-out efforts to do something, never for our own sake, but to make someone else happy. I believe that this is the foundation of the spirit of *omotenashi*—Japanese hospitality, which our country can pride itself on being able to offer to the world.

出典：www.nikkeibp.co.jp

Selection from TOP 100 Japanese Innovations ~"Shinkansen"~

Outline

The Shinkansen that the then Japanese National Railways (hereinafter referred to as JNR) started operating commercially on October 1, 1964 was the world's first high-speed intercity railway system and was achieved with the essence of Japan's railway technology.

The Shinkansen system was realized by advancing railway technologies such as mechanical, electrical, civil, and communications engineering, accumulated since the conceptualization of the pre-war bullet train, and by integrating them by means of the foremost science and technology then available[1], with the world's top-class railway system achieved that connected Tokyo and Osaka in a matter of three hours and ten minutes (four hours at the inauguration of the system) with a maximum speed of 210 km/h. With the features of high-density and mass transportation[2], on-schedule operating punctuality, and safety backed by a record of no fatal accident for 50 years since its inauguration, in particular, the Shinkansen system has enhanced the convenience of railways, contributed to the movement of a huge number of people, and become an artery supporting Japan's economic activities.

Viewed technically, the Shinkansen system, based on AC railway electrification technology, forming the base of high-speed train operation, and electronified component parts, is equipped with: Technologies for reducing running resistance by the adoption of an optimum front shape and the smoothing out of the vehicle body and for reducing the vehicle body weight; technologies of long rails and turnouts with movable nose crossing that suppress vibration accompanying high-speed passing; overhead contact line technologies of composite compound contact lines that endure frequent high-speed operation; and technologies in terms of traffic control of automatic train control (ATC) equipment that enables high-speed operation and centralized traffic control (CTC) equipment that enables a large number of trains to be controlled centrally with efficiency and safety[3].

These technologies include ones developed under the short-term Tokaido-Shinkansen project as well as ones cultivated through constant efforts toward high-speed railway technologies that have been made by the head office of the JNR, the Railway Technical Research Institute, private railway companies, railway vehicle manufacturers, and the like.

The success of the Shinkansen led to the recognition of the effectiveness of railway-based intercity high-speed transportation systems not only in Japan but also worldwide, leading to the realization of high-speed railway networks in France, Germany, and other countries.

In 2000, the U.S.-based Institute of Electrical and Electronics Engineers, Inc. (IEEE) selected the Tokaido Shinkansen as an IEEE Milestone, which is awarded to innovations contributing greatly to the development of local communities and industries, for being an intercity high-speed railway system designed on the basis of the world's most advanced electrical, mechanical, and railway technologies[4].

The course of innovation

(1) Before the decision to construct the Shinkansen

Before World War II, Japan had the Bullet Train Plan, which aimed to construct a railway

targeting a speed of 200 km/h on the Tokaido line. Based on this, efforts such as research and development and land acquisition were initiated. With the technology available then, however, the speed of 200 km/h was not attainable, and besides, the worsening war situation frustrated the plan.

After World War II, the plan was forgotten for a while. Railway technologies, on the other hand, made steady progress.

In 1950, 80 Series electric trains ("Shonan electric trains") were introduced into service on the Tokaido line; the trains were developed under the leadership of Hideo Shima, who later directed the development of the Shinkansen as Chief Engineer of the JNR, setting a record of running the distance of 125 km between Tokyo and Numazu in 2.5 hours. The new electric train was a 16-vehicle-long electric train driven by a distributed traction system, with each vehicle providing driving force. Such an electric train was the first in the world. The new trains experienced problems like fires soon after being put into service, but such problems were resolved one after another, with the experience and know-how accumulated of operating long-distance electric trains driven by a distributed traction system.

In 1953, newspapers reported the idea of Tadanao Miki, chief of the Vehicle Research Department of the Railway Technical Research Institute ("the Institute") for the journey between Tokyo and Osaka taking just four and a half hours[5]. Having experience in designing the dive bomber "Ginga" during the war, Miki was one of the excellent researchers with experience in developing aircraft for the Japanese Army or Navy and who were hired by the Institute right after the war as a result of the efforts of its then chief, Hisakazu Nakahara. There were opinions in the head office of the JNR that such an idea was beyond the competence of the Institute. However, the Ministry of Transport exhibited an interest in it and established the Ultra-Fast Vehicle Commission by commissioning the Japan Association of Rolling Stock Industries. The Institute, the Department of Engineering of the National Railway, and rolling stock manufacturers joined the commission. At first, a traction train system using electric locomotives was discussed. As discussions on the potential for development advanced, however, opinions converged on electric trains driven by a distributed traction system. A report issued in September 1954 stated that the target was the development of a seven-vehicle-long train driven by a system as described above with a train length of 100.9 m, a motor output of 110 kW × 8, a passenger capacity of 224, and a maximum speed of 150 km/h.

It was Odakyu Electric Railway ("Odakyu") that took note of this report; Odakyu was competing intensely with the JNR to acquire more passengers between Tokyo and Odawara and was planning the development of new high-speed vehicles. In the month following the publication of the report, Risaburo Yamamoto, the then director of Odakyu, visited the Institute and requested its guidance and cooperation in the development of the Super Express (SE) that Odakyu was planning. Masayuki Otsuka, who was chief of the Institute at the time, willingly agreed to this request, and thus began the development of new high-speed railway vehicles[6].

In designing these new vehicles, the most important challenge was the reduction of the total weight. For this purpose, a monocoque integral structure, in which the plate structures of the floor, sides, and roof of the train are integrated into the body structure, was adopted, and the use of light alloys considered to reduce the weight. However, the use of light alloys was abandoned because of the high price of such materials and the use of steel plates was instead adopted[7]. Weight reduction efforts were directed at trucks also, and weight reduction holes were made in the cross beams as in aircraft. With these approaches, they succeeded in reducing the weight of the body structure to almost two thirds the weight of a conventional one. At the same time, disk brakes were adopted as braking devices in rolling stock for the

first time in Japan. Skirts acting as obstruction guards were also developed simultaneously to prevent the head vehicle from floating at high speed. The methods of acquiring data through load tests and wind tunnel tests have greatly affected the design of vehicle structures for JNR vehicles since then. Through design based on wind tunnel tests, they succeeded in reducing the profile drag coefficient, from 0.64 for the Shonan electric train to 0.25 for SE trains[8].

Although the SE train was completed as a vehicles exceeding the highest world standards at the time, it was difficult to test it sufficiently at the highest speed on Odakyu tracks, which included a number of curves. Yamamoto of Odakyu, once an employee of the Ministry of Railways, proposed the use of tracks owned by JNR for test runs. A test run was conducted between Kan-nami and Numazu in September 1957, achieving the world's highest speed then on the narrow-gauge track of 145 km/h. This success endorsed the great possibilities of the distributed traction system. The result of the test was submitted to JNR, and the technology and design techniques acquired through the development of Odakyu SE vehicles were later passed on for the Shinkansen.

In parallel with this, JNR was developing a new business limited express train that was to have a speed exceeding that of conventional electric locomotives. This was the business limited express Kodama-type electric train (20 Series electric train), which later recorded a speed of 110 km/h. The Kodama vehicles were equipped with various technologies that were to be adopted in the Shinkansen (e.g. Truck technologies developed by the Group for Studying High-speed Truck Vibration, the parallel cardan driving system and flexible coupling driving system[9], light-weight motors with high revolving speeds, and a monocoque vehicle structure like an aircraft.) In addition, silicon rectifiers for AC electrification, AF track circuits in the field of signal communications, automatic train controls with cab signals, and the like were developed. These technologies were also passed on to the Shinkansen, and after further improvement, were incorporated into the Shinkansen systems[10].

In addition, on-train air conditioning units, double-layer glass and a floating floor structure significantly enhanced riding comfort.

(2) The decision to construct the Shinkansen and the cabinet meeting report

In the latter half of the 1950s, the rapid growth phase in Japan's economy sharply increased the traffic of people, goods, and information centered around the Pacific belt zone, causing fears that the capacity of railway transportation based on the conventional Tokaido main line alone might soon reach its limit.

Shinji Tokawa, who was inaugurated as the fourth president of JNR in 1955, aimed to construct a standard gauge Tokaido main line. Even in JNR's inner circle, however, the opinions of those concerned did not always converge on this. At the end of 1955, Tokawa received Shima, who was an ex-chief of the Bureau of Vehicles of JNR, as chief engineer, establishing a Group for Studying Reinforcement of the Tokaido Line ("the Study Group") headed by Shima in the head office in the following year, tin 1956. The tasks of the Study Group were to look into: [1] the future amount of traffic, [2] the current state of the comprehensive amount of traffic including roads and railways, the current state of different means of traffic, and the estimated amount of traffic in the future, [3] the degree of services to be provided in the future, [4] the schemes of means to increase the capacity of traffic, and [5] different schemes of traction, vehicles, maintenance, and the like. The managing directors, the bureau chiefs of the head office, assistant chief engineer, and the chief of the Railway Technical Research Institute joined the Study Group as commission members, with the chiefs of the sections involved in the head office joining as specialist commission members[11].

In 1956, the entire length of the Tokaido line was electrified. The Study Group started discussions in May the same year, but these became heated. From the beginning, opinions were split as to whether the new line should be used in parallel with the existing line, or be constructed as a new line, as well as whether narrow or standard gauge was better. Discussions lasted eight months, and opinions did not seem to converge. Early the following year, in February 1957, the chairman of the commission, Shima, was forced to declare the closure of the Study Group by stating, at the 4th commission meeting, that there was a need to listen more widely to the opinions of society. However, the accumulation of the discussions here provided a big step forward in that the challenges for the Shinkansen were made clear and shared within JNR.

A new development was triggered by a memorial lecture held in May of the same year celebrating the 50th anniversary of the foundation of the JNR Technical Research Institute. That year, Takeshi Shinohara (Shinohara) was inaugurated as chief of the Institute. He took note of the high-speed railway technology accumulated, proposing that a lecture on the theme "Super Express Train, the Possibility of Connecting Tokyo and Osaka in Three Hours" be held as an event commemorating the 50th anniversary of the founding of the Institute.

Respecting the concept held by Shinohara of constructing an ultra-fast railway not bound by any conventional types to replace the Tokaido line whose transportation capacity had reached saturation point, the lecture was intended to make the technical feasibility of the ultra-fast railway more widely known in society. At the opening of the event held in Tokyo in May 1957, Shinohara stated that the Institute was conducting research into a high-speed railway with a speed of 250 km/h as the target, that a new line should be constructed not in the conventional narrow gauge but in the international standard gauge (the standard gauge), that connecting Tokyo and Osaka in three hours would be feasible if these conditions were met, and that whether this would be achieved or not would depend on the nation's judgment[12,13].

The event evoked a massive reaction, including favorable reports in a number of newspapers. Tokawa, who had been aware of the necessity of a standard-gauge high-speed railway, requested Shinohara to hold a special lecture at the head office of JNR targeting the managing staff as audience. Having listened to the lecture, Tokawa grew more confident in his own beliefs, felt the time was ripe, and started taking actions toward the realization of a standard-gauge high-speed railway[14]. In July 1957, Tokawa submitted to Taneo Miyazawa, the then Minister of Transport, a written request appealing for the reinforcement of the capacity of the Tokaido line by means of a new standard-gauge line, while establishing the Trunk Line Survey Department and appointing Shigenari Oishi, later to be appointed General Manager of the Shinkansen General Office, to head the survey department, which started creating a draft plan. Upon receiving the request, the (then) Ministry of Transport created the Japan National Railways Study Council for a Trunk Line to start a full-fledged study. The Study Council submitted a Report on the Necessity of Constructing a Tokaido New Trunk Line and Concrete Measures of Execution to the Minister of Transport. This report solidified the image of the Shinkansen reflecting a super-express train that would run on standard-gauge double tracks to connect Tokyo and Osaka in three hours. After examination at the Transport-related Cabinet Ministers' Council established in the (then) Economic Planning Agency, the need to start construction work for the Shinkansen was reported to the cabinet as the conclusion of the said Council for their final decision in December that year.

In response to the move in the head office of JNR concerning the construction of the Tokaido new trunk line, the Institute decided to integrate studies on high-speed railways that

had been conducted separately in different research fields into a comprehensive project directed towards the single goal of the construction of the Tokaido new trunk line, reorganizing its organization into a priority team system not limited to the conventional structure of a laboratory-based organization[15.16].

(3) The realization of World Bank financing and the course to completion

It was clear from the beginning that the construction of the Shinkansen would require a tremendous amount of funds, as much as 200 billion yen. A significant proportion of the funds had to be raised from outside financing institutes. Advised by the then Minister of the Treasury, Eisaku Sato, JNR applied for a loan of 100 million dollars (then) from the World Bank in 1959. As conditions for the loan, the World Bank demanded that the following requirements be met:

- So-called experimental technologies such as newly invented technologies and trial technologies are not the objects of financing;
- Sufficient economic benefit can be expected from the project; and
- The necessity of foreign funds must be clearly demonstrated.

To clear these requirements, JNR accepted an investigating commission from the World Bank. It was said that there were concerns among the members of the investigating commission that the construction of the Shinkansen itself was experimental, but JNR explained to the commission that most of the basic technologies had already been developed, which dispersed these concerns[17]. On May 1, 1961, a loan of 80 million dollars from the World Bank was decided. This sum was only 28.8 billion yen (at the then exchange rate of ¥360/dollar) compared with an estimated construction cost of 200 billion yen, but it was the third largest loan the World Bank had made up to then. In this way, this project became one involving the whole nation from which no one could withdraw.

In August 1958, surveys based on aerial photography started and the ground-breaking ceremony on April 20, 1959, launched full-scale construction work.

The construction plan for the Shinkansen was based on the draft route surveyed and studied in the Bullet Train Plan in 1930's. For this reason, land bought during the war and tunnels under construction were available for the Shinkansen. The land required for the Shinkansen for the distance of 515 km between Tokyo and Shin-Osaka was 10.8 million m^2, of which 2.2 million m^2 had been bought before the war. However, since JNR had permitted cultivation on some of the acquired land, compensation problems occurred later. The excavation of a long tunnel under Mt. Suzuka, originally planned, was abandoned because of the prospect of not being able to complete it within five years due to geological problems, with the route changed to the Sekigahara route.

The Shin-Tan-na tunnel (7,959-m long), for which construction work had been started in accordance with the bullet train plan until disrupted during the worsening war situation, had been kept serviced by JNR personnel who desired the construction work to be resumed.

In parallel with the construction work for the route, vehicles and safety systems were developed and manufactured. Regarding vehicles, basic research into the force acting on rails, wind pressure and air resistance, pantographs and trucks was carried out at the Institute, and vehicles were designed on the basis of the findings acquired through the basic research. A prototype two-vehicle-long train made jointly by Kisha Seizo and Nippon Sharyo and a prototype four-vehicle-long train made jointly by Hitachi, Kawasaki Heavy Industries, and Kinki Sharyo were completed in April 1962, and the trains were put on trial runs on the model route between Kamomiya and Oiso, the earliest built section, on June 25.

On March 30, 1968, a high-speed test on the model route recorded a maximum speed of 256 km/h, demonstrating the high-speed running performance of the Shinkansen under construction.

Mass-production vehicles were ordered in two groups, 180 vehicles for the first delivery and as many for the second. The air-tightness test, pass-by test, general performance test and ATC test were conducted with the specified performance confirmed. Following this, a 200-km/h speed test was started between Maibara and Osaka beginning in June. And on August 25, about one month prior to the opening, a comprehensive test on the entire line connecting Tokyo and Shin-Osaka in four hours was started.

The opening ceremony of the Tokaido new trunk line was held on Platform 9 of Tokyo Station on October 1, 1964, immediately before the opening of the Tokyo Olympics.

Inaugurated as vice-president (later, president) of the Japan Railway Construction Public Corporation, Shinohara publicized the concept of constructing high-speed railway networks throughout the nation as the president of the Japan Society of Civil Engineers in 1967. Part of this concept was realized through the New Nationwide Comprehensive Development Plan of 1969. Starting with the 515-km route connecting Tokyo and Osaka, the Shinkansen has become Japan's artery connecting Aomori City at the northern end and Kagoshima City at the southern end as of July 2014. Currently, the annual number of users of the Shinkansen exceeds 270 million (excepting users of commuter passes), with the number of commuter pass users exceeding 40 million. (Refer to Table 1 Change over time in the number of Shinkansen users)

The success of the Shinkansen ignited the development of new intercity high-speed railways abroad. The first TGVs (Trains à Grande Vitesse) of the National Railway of France (SNCF), for which development work had started immediately after the start of the Shinkansen construction work, started operations between Paris and Lyon in 1981. The Intercity-Express (ICE) of the German National Railway (DB) started commercial operations in 1991. The technologies and know-how accumulated at home were highly evaluated abroad as well, with technological cooperation provided to AMTRAK of the U.S. in 1980. Furthermore, Shinkansen technologies have been exported to Taiwan, China, and the United Kingdom, with export to Vietnam, India, and the State of California in the U.S. being under study.

These testify that the track record of safety and punctuality based on the above technologies has greatly contributed to its international competitiveness.

Outline of inventions and technological developments related to the Shinkansen

A variety of technologies are used in the Shinkansen, of which those related to vehicles, tracks, and operating systems are overviewed in terms of development activities here.

(1) Development of vehicles

The development of high-speed electric trains by JNR and Odakyu played an important role in developing Shinkansen vehicles.

The reduction of vehicle weight was the first focus regarding Shinkansen vehicles also. The vehicle body was structured with parallel steel columns, with 1.6-mm-thick outer plates. For plate material, aluminum alloy was tested, but not adopted due to durability. A diagonal brace structure was considered but not adopted. To reduce the weight of the trucks, a high-frequency quenching technology was applied to the axles. In the course from tests to mass production to commercial operation, a new problem arose of air pressure difference between the inside

and the outside of a vehicle. One of these problems was ear-popping[18], and this problem was solved by making the passenger room air-tight.

The window pane was another focus of the development toward high-speed operation. Mass-production vehicles adopted multiple-layer glass composed of three panes of glass. On the outside, a 5-mm-thick glass pane and a 3-mm-thick glass pane were glued together with a 0.3-mm-thick film in between to form laminated glass. Opposite the laminated glass and on the passenger room side, a pane of 5-mm-thick tempered glass was placed with a 6-mm-thick air layer to the laminated glass. In the test stage, the outside glass was formed from a single pane, but it was replaced with laminated glass to prevent the glass from shattering should a stone from the ballast hit the window. Ordinary glass used on the passenger room side, which was used in the test stage, was changed to tempered glass in mass-production vehicles.

High-speed operation made still another focal point the shape of pantographs in terms of noise and safety. To handle this problem, rhombiform wing profiles and covers based on fluid dynamics were newly developed to be employed on 0 Series Shinkansen vehicles and later models also.

Test vehicles
Image provided by Satoshi Kubo

(2) Development of vibration reduction technologies

① Snake motion reduction technology

Research and development activities on vibration had been carried out by the Group for Studying High-speed Truck Vibration established mainly under the auspices of the General Railway Bureau of the Ministry of Transport and the Institute in 1946. Tadashi Matsudaira[19], who had been employed by the Naval Aeronautical Engineering Arsenal and engaged in research into the analysis of vibration phenomena in aircraft, was one of the members of the Study Group. The “snake motion” phenomenon in which an increase in speed intensifies vibration and leads to derailing was known to railway engineers. Railway engineers had long considered snake motion to be caused by the rails, but with the underlying cause not elucidated, the snake motion was a great barrier to high-speed operation.

Analyzing a derailment accident of a Class D51 locomotive, Matsudaira found the snake motion phenomenon to be caused by factors on the vehicle side. Cooperating with other ex-aeronautical engineers, Matsudaira created a model vehicle running a test device to demonstrate his theory, convincing other railway engineers of his findings. They had acquired the concept behind this test device from the flutter test they had conducted for the Zero fighter. After the test using this test device, it was scaled up so that it could reproduce a 300-km/h run with an actual vehicle on it. This was utilized in the later development of the Shinkansen.

② Air spring

In 1955, the Institute started to develop a vehicle-use air spring with which the height of the spring could be held constant by an automatic height adjusting valve independently of the load condition. Magazines then reported that automotive air springs had been developed in the United States and were used for buses, with the details not clarified. Given this situation, the Institute began to develop air springs for use on rolling stocks based on its own ideas, succeeding in bringing the technology into active use in 1958. This technology was applied to the Tokyo-Hakata sleeper limited express "Asakaze" and the Tokyo-Osaka limited express electric train "Kodama." This success made the air spring one of the features of Japanese railway vehicles.

Furthermore, attempts began around 1960 to make the air spring itself perform a lateral spring action. Although this scheme was examined with the aim of adopting it for the prototype truck for the Shinkansen, early-stage bellows-type air springs had a critical problem. For this reason, the Institute conducted joint research with Sumitomo Metal Industries and Sumitomo Electric Industries, succeeding in developing a diaphragm-type air spring in 1962[20].

(3) Development of track technologies

The Shinkansen was designed completely independently of the conventional railway and without road crossings. The gauge adopted is the world's standard gauge, 1,435 mm. In the field of track technologies, pre-stressed concrete (PC) ties and 1,500-m long rails were developed. The Institute's Track Structure Team, headed by Yoichi Hoshino, took the initiative of developing these. This team, responsible for research into track structures for high-speed operation, was engaged in 25 research subjects.

In addition, to achieve the goal of eliminating pedestrian crossings, most parts of the route were constructed on soil roadbeds and elevated bridges. The truss structure that is simple and stable, as used with the Fujikawa Bridge, was frequently applied to bridges[21].

One of the track technologies newly developed for the Shinkansen is the 1,500-m long rail. The basic rail length is 25 m; a long rail is formed by welding basic rails to a length of 200 m or so at the construction base, and 200-m-long rails were welded to reach 1,500 m on the construction site. This contributed to reducing shock from rail joints and vibration load. Furthermore, prestressed concrete (PC) ties were developed. A PC tie refers to one made of concrete with piano wire or steel bars placed at the core. This contributed to laying robust tracks capable of withstanding high-speed operation and reducing maintenance work.

(4) Development of train operation systems

At a speed of 200 km/h, it becomes difficult for the train driver to visually confirm wayside signal devices and then operate the brake and the like, and for this reason, cab signals are used instead of wayside signals. In addition, an automatic control device to keep a safe distance from the foregoing train constantly becomes necessary. To respond to this need, train operation systems such as ATC and CTC dedicated to the Shinkansen were developed.

In May 1957, at the memorial lecture meeting for the 50th anniversary of the founding of the Institute, Hajime Kawabe, the then chief of the Signal Laboratory, explained that it was most preferable to develop a fully electronic ATC by combining the audio frequency (AF) track circuit, being brought into actual use gradually then, and the type A cab alarm. By following this line in the research, the SSB-AF-type indicative ATC based on power supply synchronization was developed[22]. Kawabe, too, had been engaged in the study of balloon bombs and underwater mine detectors in the Japanese Army.

The ATC used by the Tokaido Shinkansen was one called a cab signal system, by which wayside signals are received constantly onboard; as wayside signals change, cab signals change accordingly, allowing an immediate response. ATC reduces the speed in multiple steps to a stop; for ATC for the Tokaido Shinkansen, a six-step system comprising 210, 160, 110, 70, 30, and stop was used. When a train running at 210 km/h approaches the foregoing train and enters a 160 km/h section, the indication of the cab signal changes from 210 km/h to 160 km/h after 1.8 seconds, with the bell sounding once at the same time. When an additional 1.5 seconds has elapsed, the automatic brake starts to operate. The transistor-operated six-step speed control is said to be the world's first. Track circuits used in the Tokaido Shinkansen adopted the fruits of new developments such as the synchronization of Japan's unique AF track circuit, studied at the Institute and extensively used in Japan's AC electrification sections, with the overhead contact line power supply used for the Shinkansen.

CTC for the Shinkansen is intended to enable the Tokyo General Operations Control Center to grasp the conditions of trains over the entire section and to operate, on the basis of this information, the turnouts and signals at stations. Conventional CTC has been used mainly for the purpose of reducing the costs of single track sections. The application of CTC to the Tokaido Shinkansen was an epoch-making innovation[23] that overturned the common understanding that CTC was not so effective when applied to double track sections with high train traffic densities and that demonstrated new effects of centralized monitoring of train operations, monitoring of failures of signal facilities, and control of train by-passing. Furthermore, in the past CTC was used in train traffic sections in which the train speed was low and the amount of information to be transferred was small, and consequently, a delay in information transfer did not pose problems. On the contrary, the Shinkansen needed high-speed, short-period coded communications and its durability. For this reason, coded communications using electronic circuits was developed. The logic circuits that were brought into actual use adopted transistor-based digital circuits, and to improve operational reliability, the major parts were structured in a triplex configuration with the majority logic adopted[24].

* On the information in this article:
* The names of companies and products are the trademarks or registered trademarks of the companies concerned.
* For the unification of the document style, designations such as Co., Ltd. are omitted.
* Personal titles have been omitted.

References

1. Cited from Part 1, Chapter 1, Section 2 , Science and Technology for Expansion of Social Infrastructures, from Science and Technology Agency's "1980 White Paper on Science and Technology: Locus and Perspective of the Development of Science and Technology" (issued by the Science and Technology Agency)
2. According to materials prepared by the Japan Overseas Rolling Stock Association, the operation intervals of the Shinkansen at the peak time are 14 trains/h on the Tohoku-Shinkansen, Joetsu-Shinkansen and Hokuriku-Shinkansen and 12 trains/h on the Tokaido-Shinkansen and Sanyo-Shinkansen, as compared with five trains/h for French TGV and German ICE.
3. Science and Technology Agency, above footnote (1)
4. IEEE website: Tokaido Shinkansen (Bullet Train)

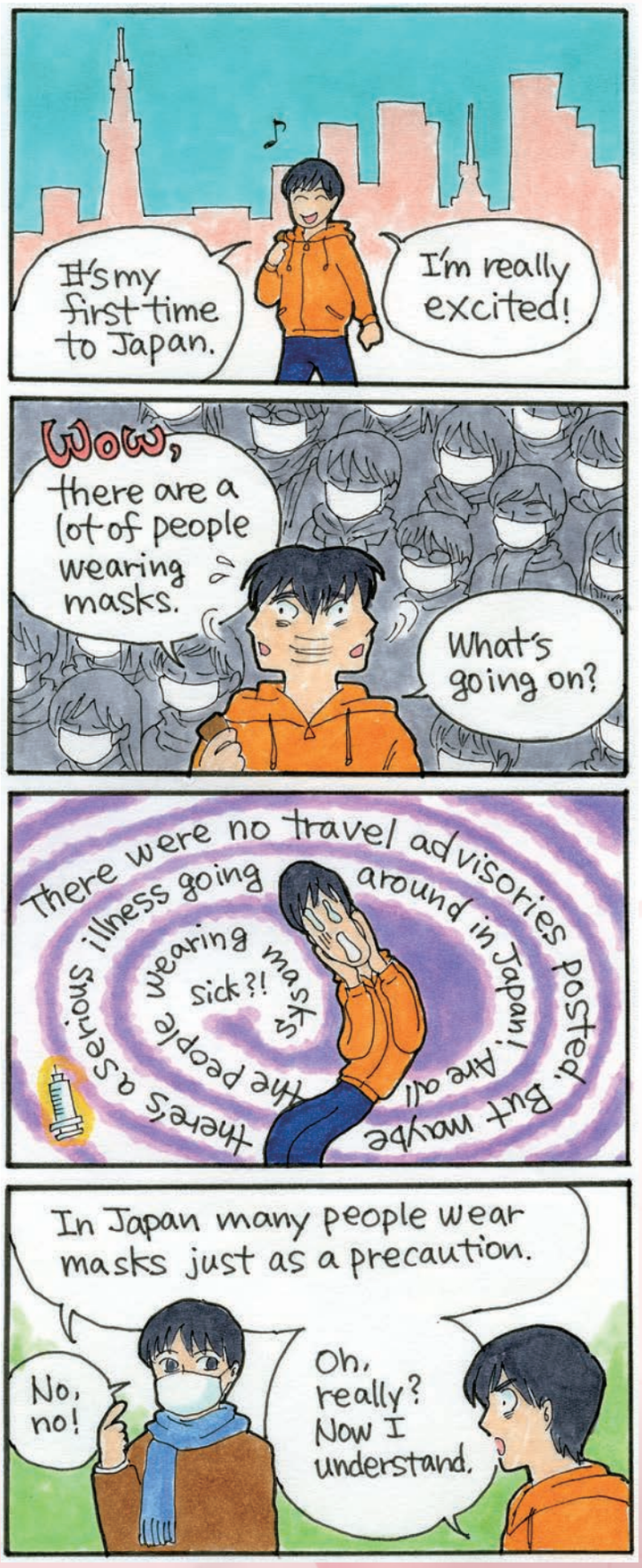
(http://www.ieeeghn.org/wiki/index.php/Milestones:Tokaido_Shinkansen_(Bullet_Train),_1964) (Accessed on May 19, 2014)

5. The Asahi Shimbun, JNR Rapid Train Design Completed, Lightweight, Small, and Streamlined Connecting Tokyo and Osaka in 4 Hours 45 Minutes. October 17, 1953 issue.
6. Tadanao Miki (1992) Recollecting Odakyu's Model 3000 SE, Railway Fan, July
7. Miki, above footnote (6)
8. Miki, above footnote (6). The shape resistance coefficient of Shinkansen vehicles is said to be 0.21.
9. A motor is mounted on the bogie frame and the torque of the motor is transmitted to the pinion of the reduction gear through a flexible coupling. The reduction gear is composed of pinions and a wheel, and the wheel is attached to the axle and transmits the torque to the axle. The flexible gear coupling tolerates the displacement in the relative position between the axle on the motor side and the axle on the gear device side by means of the method in which gear grooves are cut. (2004) (Yoshihiko Sato, Shinkansen Technologies (Sankaido Publishing) pages 211-212)
10. Sato, above footnote (9) pages 21-23
11. Shigeru Onoda (2012) Technical Legacy of the Railway Technical Research Institute, "Materials Prepared by the Group for Studying Reinforcement of the Tokaido Line," and Its Significance." RRR, Vol. 69 No. 8, page 35
12. Study on High-speed Railways—Mainly on the Tokaido Shinkansen, edited under the supervision of the JNR Railway Technical Research Institute (1967) (Ken-yusha, Inc.)
13. Takeshi Shinohara, Hideshige Takaguchi (1992) Monologue of a Guy Who Proposed the Shinkansen: The Concept behind a Networked Shinkansen Held by Takeshi Shinohara, Former President of the Japan Railway Construction Public Corporation (Pan Research Publishing), pages 81-106 and elsewhere
14. Shinohara, Takaguchi, above footnote (13)
15. Tadashi Matsudaira (1972) Recollecting the Research and Development on the Tokaido Shinkansen—On the Problems of Vibration of Vehicles in Particular. Journal of the Japan Society of Mechanical Engineers, Vol. 75, No. 646 page 1558
16. Science and Technology Agency, above footnote (1)
17. Hideo Shima says as follows: No novel technologies are used in the Shinkansen. Technologies required to run a train at 200 km/h or so can be structured satisfactorily by combining or improving the proven technologies we have cultivated. For a railway we are going to have passengers ride safely, it is not necessary for us to chase after unproven, novel technologies at the expense of extra effort. (Cited from a book titled A Lost War as Seen by Engineers, by Takanori Maema, published by Soshisha Publishing in 2013, page 86)
18. When a train enters a tunnel at a high speed, the resulting difference in air pressure in a vehicle that is not airtight causes pain to be felt in the ears.
19. Matsudaira, above footnote (15)
20. Matsudaira, above footnote (15)
21. Sato, above footnote (9), pages 16-236
22. Hajime Kawabe (1964) Automatic Train Control, Journal of the Institute of Electrical Engineers of Japan, Vol. 84-10, No. 913, page 1501
23. Mitsuo Yasuhara (1964) Centralized Traffic Control, Journal of the Institute of Electrical Engineers of Japan, Vol. 84-10, No. 913, page 1509
24. Yasuhara, above footnote (23)

Other references

- Website of Central Japan Railway Company: The 50th Anniversary Perfect History, a Story Woven by Technology and Passion <http://shinkansen50.jp/history/> (Accessed on May 19, 2014)
- Shinkansen Operations Division, Central Japan Railway Company: Thirty Years of the Shinkansen: Its Track of Growth (Issued by Central Japan Railway in 1995)
- Yoshio Ikari: The Dream Super Express Runs! Guys Who Created the Shinkansen (published by Bungeishunju Ltd. in 2007)
- Ikaros Publications: A Close Look at the World's No. 1 Railway from Civil Engineers' Eyes!! Riding on the Shinkansen (published by Ikaros Publications in 2011)
- Takanori Maema: A Lost War as Seen by Engineers (published by Soshisha Publishing in 2013)

Happenings in Japan (Four-Frame Cartoon)



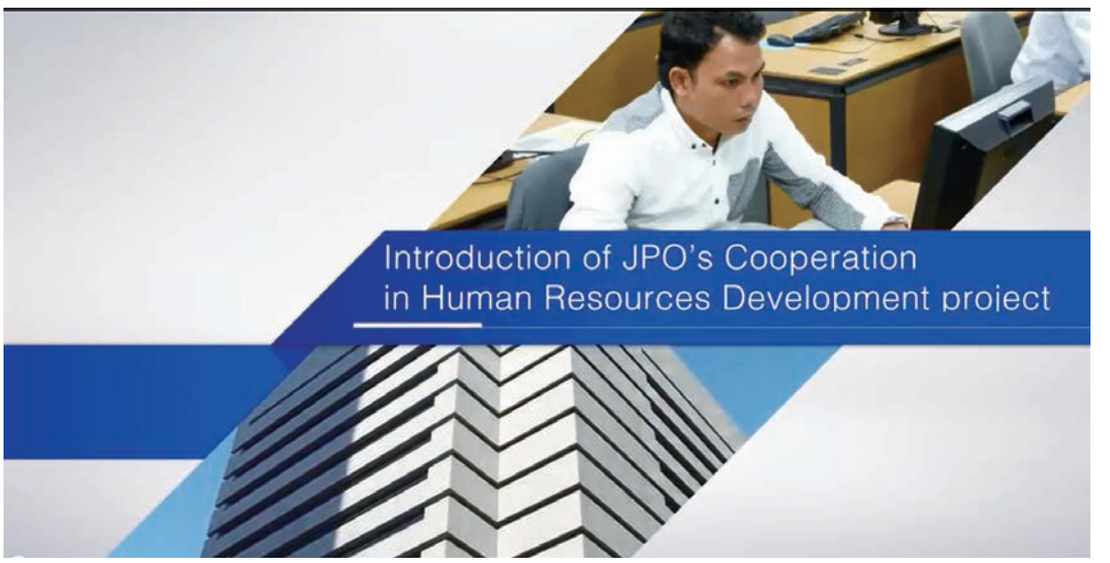
Introduction of Website Feature: “Introduction of JPO’s Cooperation in Human Resource Development Program”

Video Message

The video clip titled “Introduction of JPO’s Cooperation in Human Resources Development Program” has been posted on our website. The video clip is a total of around 12 minutes in length.

→ http://www.training-jpo.go.jp/en/

The video content includes a message from a former trainee, an outline of our program, highlights from our lectures and study tours, comments from trainees, images regarding the training environment, an overview of alumni association activities, and more. We would greatly appreciate it if you would watch this video.



Editors' Note

Hello. It's Mitty. How are you doing? Tokyo has just experienced a winter of widely fluctuating temperatures, with both cold, snowy days and warm, spring-like days. It's just like Aesop's fable "The North Wind and Sun." Of course, it is when the sun appeared that I took my jacket off.

In this issue, we focus on the Shinkansen, or bullet train. The Hokkaido Shinkansen will begin running between Aomori Prefecture and Hokkaido at the end of this month. We will then be able to travel between Hokkaido and Kyushu by Shinkansen.

A very long time ago, people made this journey on foot. From bicycles, to cars, trains, planes and the Shinkansen, our transportation network has really developed over the years. I think that the Shinkansen is very convenient, but because it already existed when I was born, I will never understand just how much more convenient it is than before it was invented. The reason that we have more and more convenient things in our lives is because someone asks, "How can I make something that will make life better for us?" Perhaps what is created by asking this question is the result of "omoiyari," or consideration, for the well-being of others.

You will discover "*omoiyari*" in the new and more convenient Hokkaido Shinkansen. Do take a ride on it when you are in Japan.

This is the final issue for this fiscal year. Thank you for your cooperation in producing this magazine and see you again soon!

Publication of this Magazine is consigned to the Japan Institute for Promoting Invention and Innovation by the Japan Patent Office.

[Consigner]

Japan Patent Office(JPO)
Address: 4-3, Kasumigaseki 3-chome, Chiyoda-ku, Tokyo 100-8915, Japan
Telephone/Facsimile: 81-3-3503-4698 / 81-3-3581-0762 (International Cooperation Division)
Web site: http://www.jpo.go.jp/

[Publisher]

Asia-Pacific Industrial Property Center(APIC),
Japan Institute for Promoting Invention and Innovation (JIPII)
Address : 4-2, Kasumigaseki 3-chome, Chiyoda-ku, Tokyo 100-0013, Japan
Telephone/Facsimile: 81-3-3503-3026 / 81-3-3503-3239
Email: apic-jiii@apic.jiii.or.jp
Web site: http://www.training-jpo.go.jp/en/