International Press-in Association
www.press-in.org

News Letter

Volume 2, Issue 2 June 2017

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Editorial Board

Message from the President

Dr. Osamu Kusakabe

The General Assembly of the year of 2017, held in June, adopted the major amendment of the Constitution for the first time since IPA's establishment in 2007. The contents of By-laws and Regulations will be discussed at the first Board Meeting to be held in July, 2017, specified in the Constitution. It will facilitate the efficiency and productivity of IPA management.

The General Assembly also endorsed the change of the Board Members. The list below gives the outgoing and the incoming members of IPA Board Members. Many thanks go to the outgoing Board Members for their great contributions during the terms. Very warm welcome goes to the new Board Members.

Incoming Directors and Auditors

Michael Doubrovsky	Kenneth Gavin	Stuart Haigh
Yukihiro Ishihara	Masayuki Koda	Andrew McNamara
Jun Otani	Rodrigo Salgado	Jiro Takemura
Hiroyuki Yasuoka	Nor Azizi Bin Yusoff	(11 Directors)
Yoshihisa Fujisaki	Albert T. Yeung	(2 Auditors)

Outgoing Directors, Auditors and Secretary General

Robert D. Holtz	Leo A. Hubert, Jr.	Barry M. Lehane
Hiroaki Tanouchi	A. Frits van Tol	(5 Directors)
Adrian F.L. Hyde	Kazuyoshi Ishii	(2 Auditors)

As was extensively reported in March issue, IPA seminar on Press-in Technology in Singapore in March was a very successful event. The next IPA seminar of the similar nature will be held in Malaysia in October in 2017. It is also planned to have the similar seminar in Thailand in 2018.

IPA will hold the first International Conference on Press-in Technology in Kochi, Japan in September, 2018, which will be partially subsidized by International Scientific Exchange Fund of Japan Society of Civil Engineers. One of the conference themes will be the high productivity of construction industry using ITC and IoT, where robotized construction machinery is expected to play an important role. This issue contains a special contribution on this topic prepared by Professor Kazuyoshi Tateyama who is one of the leading figures in this area in Japan.

IPA News Letter Volume 2, Issue 2 June 2017

Special Contribution

A New Stage of Construction in Japan — i-Construction

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The population projection for Japan suggests that the working-age population, ages 15 to 64, will drop to 70% or less of what it is today by 2045. In the field of construction, such a rapid reduction in the working-age population will bring about a severe loss in the number of engineers and workers as well as budget cuts for infrastructure investments due to the decrease in tax revenues. At the same time, the infrastructure which has already been created, will soon be due for maintenance as its facilities and systems are approaching their renewal dates. In addition, disaster prevention measures against active natural disasters, such as earthquakes, heavy rainfalls and volcanic activities, will need to be strengthened and/or updated. Therefore, the task of providing a stable infrastructure for society on into the future will be more difficult than ever. In the field of construction, more complex projects will have to be carried out with limited manpower and limited budgets. This problem will be addressed not only by an extension of the existing means, but also by innovations in construction technology. The Ministry of Land, Infrastructure, Transport and Tourism started a new system, referred to as "i-Construction", in April 2016 to cope with this situation. ICT (Information and Communication Technology) is one of the major measures in i-Construction; it is expected to play an important role in improving construction productivity. The present article gives an overview of i-Construction and discusses the current conditions and future prospects for a new construction model utilizing ICT in Japan.

Keywords: i-Construction, productivity, ICT, intelligent construction, construction robot, unmanned construction, GNSS, production cost, environmental load

1. Sophistication of Construction - "i-Construction"

1.1 Rapidly changing social conditions

Nowadays, the subject of changes in demographics is very prominent in terms of the future of Japan. Figure 1 shows a population projection published by the Statistics Bureau, Ministry of Internal Affairs and Communications [1]. The total population of Japan as of 2015 was 126,597,000, and the population between the ages of 15 and 64 (the working-age population) was 76,818,000. This projection indicates that both the total population and the working-age population will decrease in the future, and predicts that the working-age population will fall to 69.7% of what it is today by 2045. If this prediction is accurate, a working-age population of less than 70% of that of today will have to support Japanese society 30 years from now.

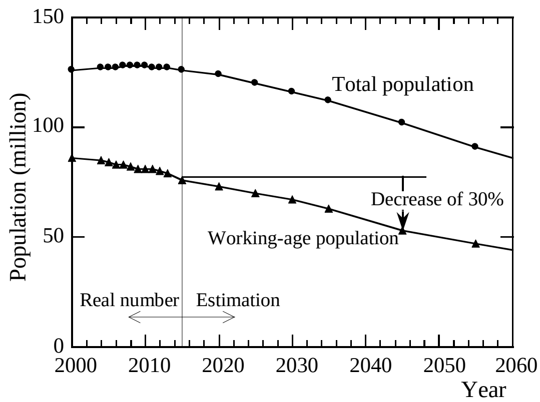


Figure 1 Population projection in Japan

A reduction in the working-age population will have a great impact on the construction industry. There are concerns that the decrease in the number of construction engineers and workers will accelerate. At the same time, a drop in construction investments will also be a problem. That is, tax revenues and infrastructure revenues will be reduced, resulting in a forcible shrinking of budgets for public investment.

While it is predicted that the rate of new construction of the physical infrastructure will slacken as the total population of Japan decreases, the number of construction projects required to maintain the infrastructure that supports the activities and the lives of people will increase in the future. In addition, disaster prevention measures must be strengthened and/or updated in response to active natural disasters, such as earthquakes, heavy rainfalls and volcanic activities.

1.2 Current situation of construction industry in Japan

Figures 2 and 3 show comparisons of the average annual wages and the average annual working hours, respectively, by industry [2]. The wage level in the construction industry is sluggish at only 79% of the all-industry average. People in the construction industry work for longer hours, by 16%, than the all-industry average. Figure 4 shows the number of deaths while working [2]. It is seen that the total number of fatalities for occupational accidents in construction comprises up to

34% of all industries. Although labor conditions have improved, in comparison with the past, the construction industry can still not rid itself of this negative situation.

It is noted that the downturn in labor productivity in the construction industry is one of the major reasons. Figure 5 shows a comparison of the changes in labor productivity by industry [2]. While productivity in the manufacturing industry has more than doubled, through the introduction of factory automation technologies, that of the construction industry has continued to decline over the past twenty years. It cannot be said that the construction industry has enough potential to play an important role in providing further infrastructure to Japanese society by an extension of the existing situation.

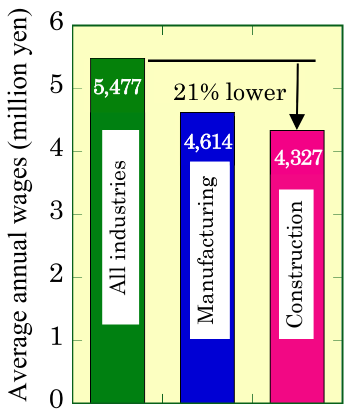


Figure 2 Comparison of average annual wages by industry

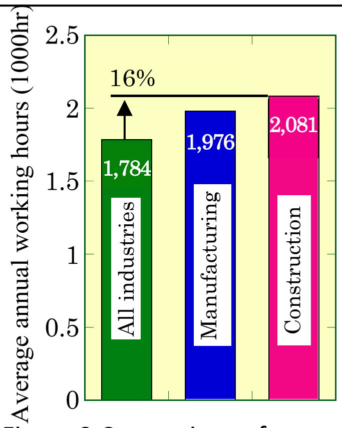


Figure 3 Comparison of average annual working hours by industry

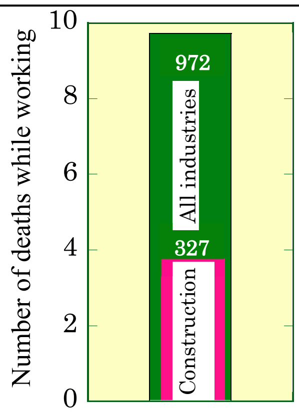


Figure 4 Number of deaths while working

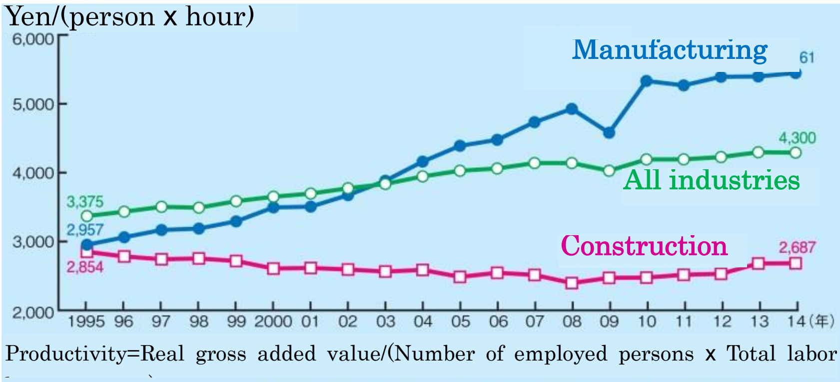


Figure 5 Comparison of changes in labor productivity by industry

1.3 Three major strategies in i-Construction

Under such a situation, the Ministry of Land, Infrastructure and Transport started a new policy of i-Construction [3], in which high wage levels, sufficient holidays and a safe labor environment can be realized through remarkable improvements in productivity. The ministry established three major steps for such improvements, namely, the aggressive use of ICT in construction, the standardization of the specifications used in construction to avoid the inefficiency caused by single-item production and the balancing of orders throughout the year regardless of the season. Among these steps, advanced construction technology utilizing ICT is expected to play the most important role in realizing the final goal. This report introduces the present situation and future prospects of ICT utilization in i-Construction.

2. Utilization of ICT in Earthwork

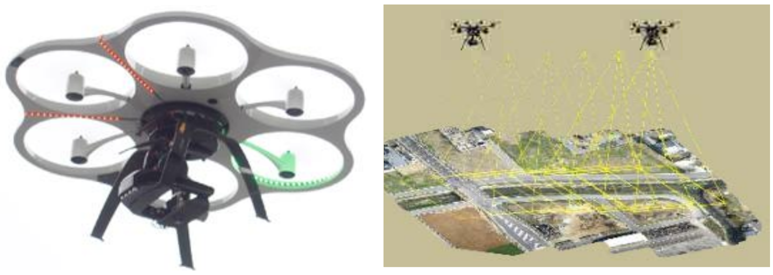
Earthwork is a generic name for the works in which soil and rock are moved for excavation, transportation, compaction and so on in order to build earth structures, such as roads, fill-type dams and levees. Figure 6 shows the stages of the earthwork process, which consists of surveying, design and construction planning, construction, inspection and maintenance.

Figure 6 Stages of earthwork process

In i-Construction, the configuration information of earth structures is grasped and treated as 3D data and various ICT tools are effectively introduced at each stage of the earthwork process to deal with the 3D data, as follows.

2.1 ICT in surveying

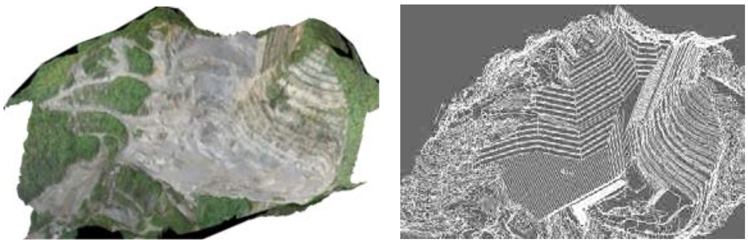
The configuration data of earth structures are grasped as 3D data through 3D laser scanner surveying or aerial surveying with a UAV. UAV is the abbreviation for unmanned aerial vehicle. Figure 7(a) shows an example of a UAV. One type of UAV, called a “drone”, is often employed to examine structures, such as bridges, which are difficult to approach due to being located at high elevations. Figure 7(b) shows aerial surveying with a UAV. The 3D configuration data of a landform are measured with the principle of photogrammetry by overlapping photographic shots taken with the UAV.



(a) Unmanned Aerial Vehicle (b) Principle of photogrammetry

Figure 7 Aerial surveying with UAV

Figure 8 shows the 3D landform data for an excavation site obtained by UAV aerial surveying. A UAV can execute 3D surveying from comparatively low-flying heights; and thus, it is able to accurately measure small areas. Through the periodic measuring of a site, changes in the landform can be grasped and the volume of soil to be excavated can be recalculated during the construction progress.



(a) Landform of site (b) Quantification of landform

Figure 8 Aerial surveying of landform with UAV

Table 1 Effect of introduction of UAV in surveying（Kajima Co. Ltd.）

Methodology	Area	Time	Human works	Cost
UAV	2ha	1hour	1 man day	1
3D Laser scanner	2ha	1day	2 man day (2days)	4.0
Electro-optical measurement	2ha	3day	10 man day（5days）	5.6

Table 1 shows a comparison of UAV surveying and other surveying methods. The case here involves the surveying of a 2ha land area. It is seen that time, labor and costs can be remarkably reduced by UAV surveying.

2.2 ICT in design and planning

Figure 9 is the completed drawing of the interchange of a highway. This figure is not a bird’s-eye-view, but a plan made with the accurate coordinates of all the points.

Figure 9 Utilization of 3D data in design and planning（from web site of NPO Cooperation Green Earth）

The design and construction planning stage has been made with 2D planar draughts of cardinal points. Although no difficulties may be encountered in the case of a simple straight alignment, the engineers have done the job by imaging 3D conceptual drawings from many 2D plans in the case of a complicated structure, as seen in Figure 9. By using a 3D data set, not only can the 3D conceptual drawing be directly obtained, but the 3D data can also be used for various applications. For example, 3D images can be obtained precisely for each step of the construction. Through their use, the steps of the construction can be confirmed in advance, and the design and construction planning stage can be made to be more exact by finding defects which are likely to occur at a certain stage of future construction and addressing them beforehand. The images can also be used to explain the construction to people residing near the site, showing them the visual 3D images of each step of the construction. These uses are the target of CIM（Construction Information Modeling）*; and thus, it is said that i-Construction is a system which includes the concept of CIM.

* CIM is referred to as BIM (Building Information Modeling) in many foreign countries.

2.2 ICT in construction

A typical example of the ICT introduction to construction is the sophistication of machine control, which can be classified into MG and MC. MG is the acronym for Machine Guidance; it is the technology with which the ease of machine operation or the accuracy of the construction can be improved by supplying the information on the construction to operators. MC is the acronym for Machine Control; it is the technology with which some parts of machines are automatically controlled.

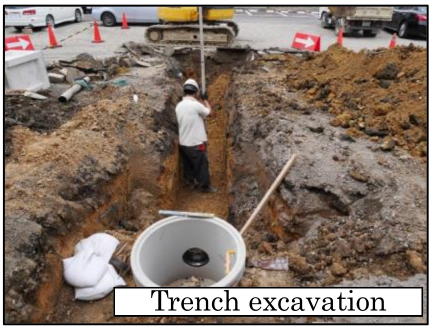


Figure 10 Typical works with hydraulic shovel

Figure 10 shows typical jobs that are done with a hydraulic shovel. In the laying of sewage pipes, for example, the workers must confirm the depth and the inclination of the trench through surveying and then give the shovel operator the precise modifications for the excavation. In completing the excavation of slopes, workers set the finishing stakes to inform the operator of the working form of the slope.

Figure 11 presents a hydraulic shovel with the MG function. This shovel is equipped with GNSS (Global Navigation Satellite System) for grasping its accurate position in the field and sensors to measure the inclinations of the bucket, arm and boom. The accurate position and inclination of the bucket are displayed on a monitor in the cabin. The shovel is also equipped with a computer into which the data with the working form of the structures are input; they are also shown on the monitor. Therefore, the operator can control the machine by confirming the relative positions of the working form and the bucket, which means that no additional surveying or finishing stakes are necessary at the construction site.

Figure 12 presents a bulldozer that has a function to control its blade by using RTK-GNSS (Real Time Kinematic-GNSS). This bulldozer has an in-vehicle PC that is inputted with data for the final finished surface of the site. The bulldozer also has the MC function that measures the positions and the inclinations of the bulldozer and the blade, one of the bulldozer's working parts, using GNSS and a sensor, and controls the blade so that the final ground shape is automatically formed [4].

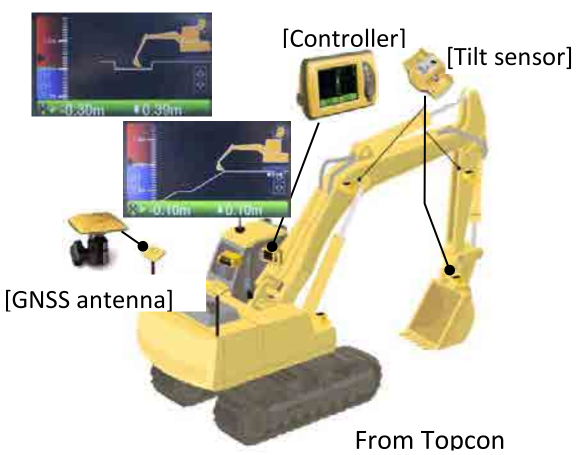


Figure 11 Example of shovel equipped with MG function

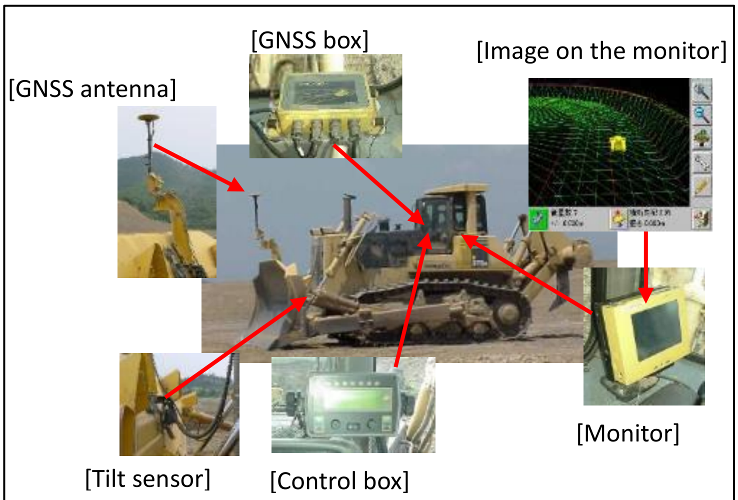


Figure 12 Blade automatic control system in bulldozer

These types of machines not only bring about a big improvement in efficiency, accuracy and working time, but also a reduction in the environmental impact caused by the construction. Figure 13 shows the results of a field experiment in which the working times for a soil-spreading job were compared between manual control by an operator and an MC machine [5]. In the experiment, the working times were measured for a skilled operator and an unskilled one under the same field conditions to discuss the effect of the difference in experience on the results.

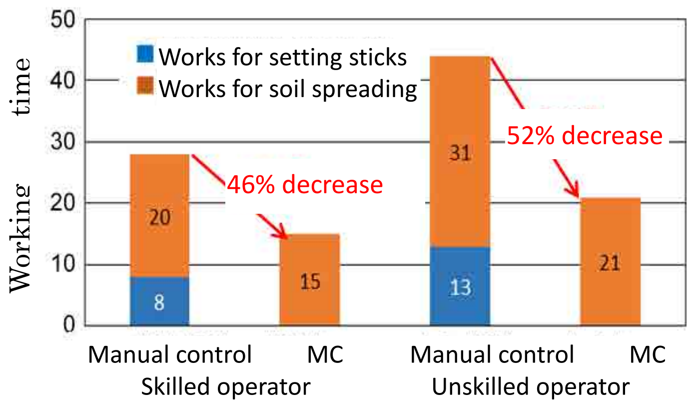


Figure 13 Comparison of working times in soil-spreading job

The results clearly show that the time for the spreading job is reduced by appropriately half in the case of the MC bulldozer regardless of the skill of the operator. This experiment proves that even an unskilled operator can level the ground with almost the same accuracy as a skilled operator.

It is seen that the productivity in construction can be remarkably improved by utilizing ICT from different viewpoints than those introduced above. In this report, the precise management of construction through the effective utilization of ICT and the introduction of robot technologies to construction will be presented with some examples.

3. Enhanced Management in Construction

The infrastructure in Japan has been developed based on a systematized concept of structural design according to thorough construction standards and manuals. Thanks to this concept, Japan has efficiently accomplished infrastructure development with a uniquely high level of quality. This is undoubtedly a benefit of across-the-board controls using standards and manuals. At the same time, however, across-the-board control methods are problematic in terms of excess, resulting from the unavoidable unpredictability of uncontrollable factors, because across-the-board controls must comprehend the effect of indefinite factors, such as weather and geological conditions, the performance of the machines and so on. Therefore, plans made through across-the-board control methods should offer assurance that jobs can be completed even if the real construction conditions are not favorable. This means that a margin of error must be built into the plans. However, even when the construction conditions are not so unfavorable, it is not unusual to pump in more materials, more machinery and/or more labor than is actually necessary, according to the original plan. If the real on-site conditions can be grasped and the original plan can viewed with some flexibility, based on the real conditions, the input of materials, machinery and labor can be reduced to the true level of necessity, as shown in Figure 14.

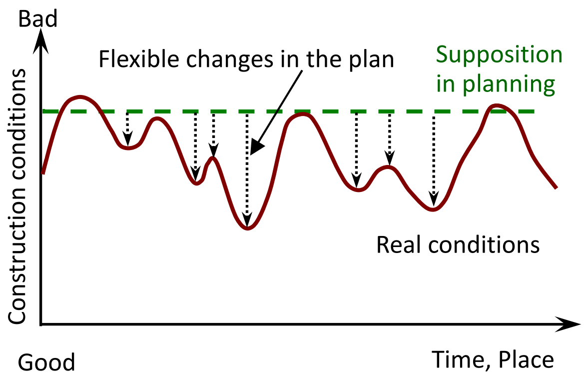


Figure 14 Graphic image of flexible responses using information

Today, there are increasing demands for the efficient use of limited resources, the mitigation of the environmental effects from construction work and an improvement in the quality of structures. Across-the-board controls based on standards and manuals are not enough to meet these demands. Following the standards and manuals is important, but relying too much on them should be avoided. Flexibility is necessary for construction works to be as sophisticated as on-site situations demand. By using a variety of sensors and other ICT devices to grasp the specific situations at a site, intelligent construction can induce work that conforms to each unique site. Summaries of some successful introductions of intelligent construction tools at work sites are herein presented in accordance with this principle.

3.1 Introduction of intelligent construction into large-scale earthwork [6]

The above-mentioned principle was introduced to a large-scale earthwork. Figure 15 shows an outline of the construction process. At the site, a hill was excavated by blasting or by mechanical excavation using hydraulic shovels. The excavated soil was loaded on dump trucks with loaders or shovels and then carried to crushers. The rock masses, larger than 20 cm in size, were crushed by the crushers and then carried to a pier for loading onto a ship by a conveyer belt. The soil was loaded on barges and then transported to the construction site of an offshore airport. The size of the construction site was 2 km in length by 1 km in width. The total field area was 149 hectares and the total volume of excavated soil was 50 million m^3.

In general, the work efficiency at earthwork sites depends on various factors, such as weather, geological conditions, geographical features and machine performance, and these factors can change in an unsteady manner with the progress of the construction work. To improve the work efficiency, it is necessary to flexibly change the construction methods, such as the arrangement of heavy machinery, the blasting method and so on, in accordance with the changes in the above factors. Doing so requires the creation of a system that collects information on the construction site conditions in real time and supports the site engineers in making good decisions for improving the construction method properly and flexibly, corresponding to the changeable site conditions.

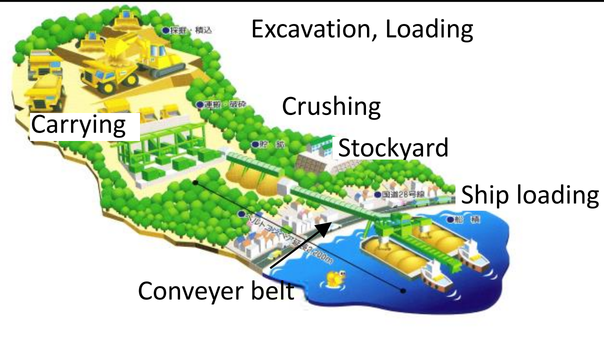


Figure 15 Outline of construction process

A great deal of information on the geological conditions, the geographical features, the working performance of the machines and other construction conditions at the site was precisely collected by the ICT tools equipped on the construction machines or at the site, and then commonly shared with a plural number of offices and site stands related to the construction after being unified and analyzed by the construction management system shown in Figure 16.

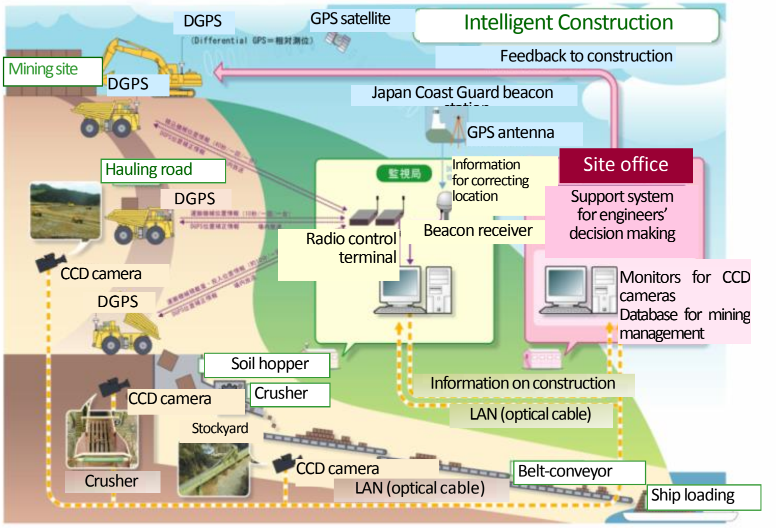
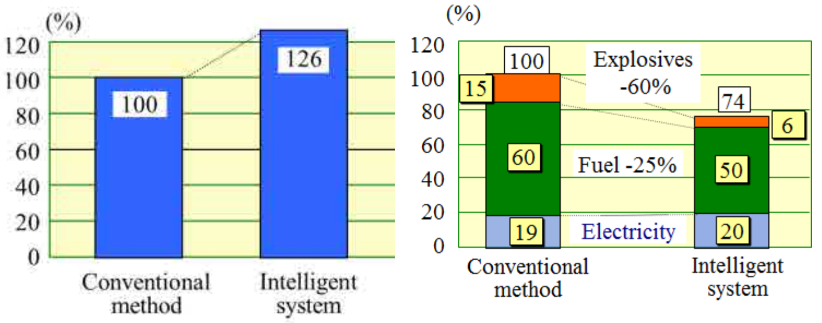


Figure 16 Information and communication equipment introduced into large-scale soil collection and construction work

This system brought about quick decisions regarding the improvement of the construction process, and it produced good results in terms of improvements in construction efficiency and a reduction in the environmental impact brought about by the earthwork.

Figure 17(a) shows the production volume per day. The results are presented as a comparison of the intelligent construction method to the conventional method employed before implementing the new system. It can be clearly seen in this figure that the daily supply volume increased by 26%. In addition, as shown in Figure 17(b), there was a 26% reduction in environmental impact (emission of CO_2) through the efficient operation of the construction machinery and by saving on the amount of explosives.



(a) Production volume per day

(b) Environmental load due to construction work

Figure 17 Effect of introduction of intelligent construction

3.2 Introduction of intelligent technology into tunnel construction

To maintain a proper working environment inside a tunnel that is under construction, ventilation is necessary. Ventilation is conducted with a large fan by circulating the air between the inside and the outside of the tunnel; the fan must work constantly. However, the air quality, or the cleanliness, depends on the type of work being done, namely, blasting, shotcrete, mucking or other types of operations. Therefore, the air volume of the ventilation facility at a site needs to be adjusted according to the type of work being done inside the tunnel, based on the measurement results for CO_2, the dust volume, the oxygen concentration, poisonous gas and so on (Figure 18). The electric energy consumed in a ventilation facility can be successfully reduced by controlling the air volume at an output of 100% only when the tunnel air is dirty and at 70% when it is less dirty [7].

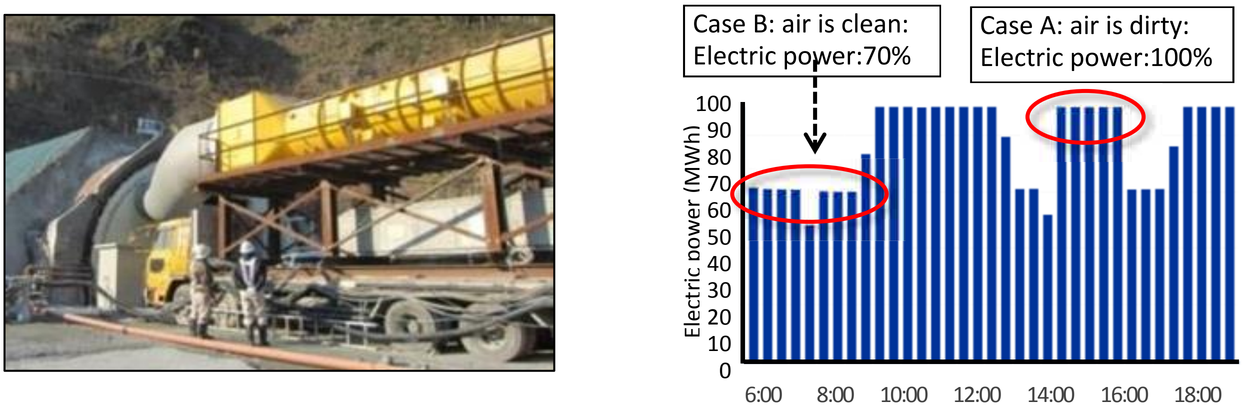


Figure 18 Control of air volume in accordance with air environment inside tunnel （Shimizu Co. Ltd）

Other than that, a CO_2 reduction was achieved at this site by introducing energy-saving awareness through the visualization of various work situations, such as helping the dump truck operator understand how braking and acceleration impact energy efficiency [7].

Due to the introduction of intelligent construction, detailed control of the construction, based on the situation at the site, generally promotes work efficiency and reduces the environmental load resulting from the construction. Significant costs are usually incurred for general manufacturers to achieve energy savings. However, improvements in productivity and savings in energy can occur simultaneously by introducing the idea of individual evaluation into across-the-board controls in the field of civil engineering. Depending on the focus, there are many opportunities to utilize new technologies.

4. Introduction of Construction Robots

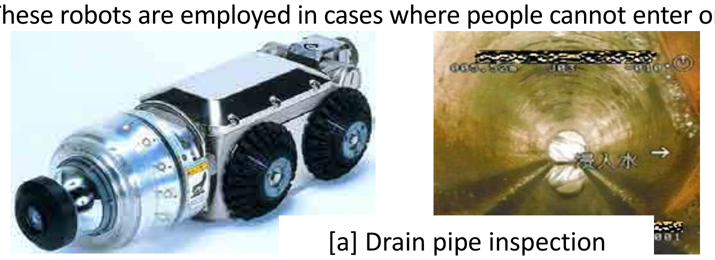
The introduction of robots in construction is said to lag behind that of manufacturing by 20 or 30 years due to the unpredictable situations in construction. Figure 19 shows the difference in working conditions between manufacturing and construction.

In manufacturing, the form and the materials are clearly specified in the design of products and the working environment is stable because the work is done indoors. Objects come to robots on a conveyer; and thus, robots do not need to move around in the factory. In construction, on the other hand, the materials are soil and rocks; and thus, their properties are not constant, but variable. Machines must work outdoors, and the working conditions are very much affected by the weather. For example, machines cannot move smoothly across muddy soil after a heavy rain. The working objects are mountains, rivers and so on; and thus, the machines arrive at them after traveling across a huge field. Therefore, the robots in construction should have a function to determine their own action flexibly and in accordance with the situation at each construction site. This means that it is much more difficult to introduce robots to construction than to manufacturing.

Figure 19 Difference in working conditions between manufacturing and construction

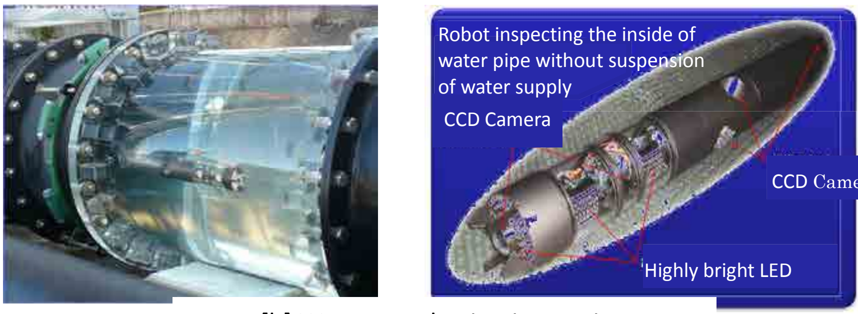
4.1 Progressing introduction of construction robots

In spite of the difficulties of introducing robot technology to construction, some robots have been practically used at construction sites. Figure 20 shows some examples of robots used in the field of maintenance. [a] and [b] are inspection robots for drain and water supply pipes, respectively. [c] is a UAV used for checking the heights of the slabs of bridges, etc. [d] is a robot that searches for any faults on the surface of a spherical gas tank, sticking and moving along it with suckers. These robots are employed in cases where people cannot enter or approach the site for reasons of narrowness or danger.



[a] Drain pipe inspection

[c] UAV for height inspection



[b] Water supply pipe inspection

Figure 20 Robots used in field of maintenance of infrastructure

Figure 21 shows robots used at the recovery construction site of a natural disaster. In the case of a slope failure due to an earthquake or heavy rain, etc. or in the case of an area being covered by ashes or earth and sand due to a volcanic eruption, the ashes or earth and sand must be removed immediately for lifesaving or retrieval purposes. However, if the situation continues to be dangerous after the occurrence of a disaster, no one will be allowed to enter the site in order to prevent a secondary disaster. In such a case, an unmanned construction system is often employed. The heavy machinery applied for such work is operated from a control room, located at a distance from the site, using visual information transmitted from the site and displayed on monitors. These kinds of unmanned construction systems have become popular and reports of their track records have increased. It is said that these systems comprise indispensable technology for Japan where various natural disasters often occur all over the country.

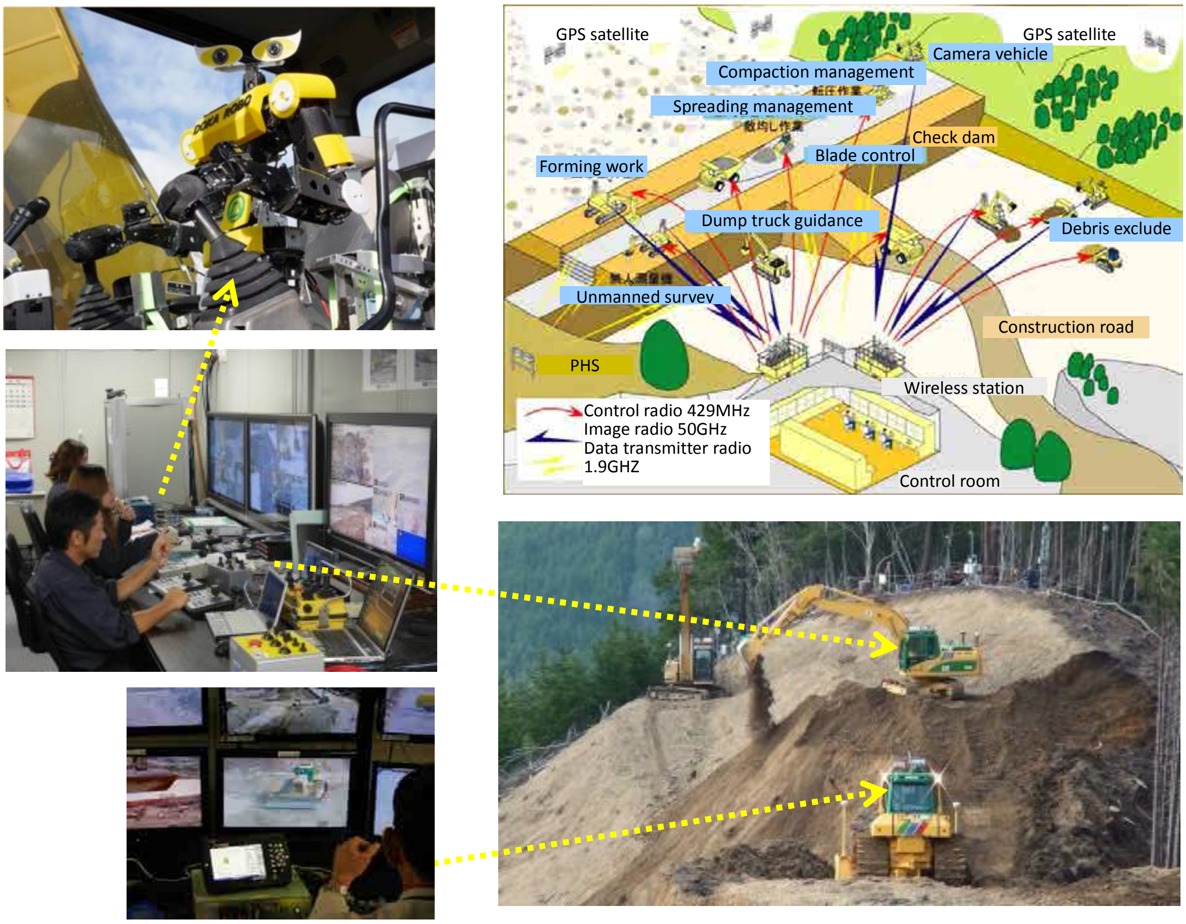


Figure 21 Robots used in the recovery works from natural disaster

Figure 22 shows a comparison of the rate of the budget for research and development to gross sales by industry. The pharmaceutical industry spends more than 12%, while the manufacturing industry spends about 4% of their gross sales for the research and development of new products. On the other hand, the construction industry spends just 0.4% of its gross sales for the development of new technologies. In spite of the small budget for research and development, various advancements have been made in construction, as shown in Figures 20 and 21.

In the construction industry, the development of new technologies has often been tackled during actual construction projects with their budget. Therefore, the technologies developed here must certainly serve the projects well and lead to the development of extremely practical technologies rather than the development of highly sophisticated technologies. This is the reason that most construction robots can be effectively used in actual construction projects.

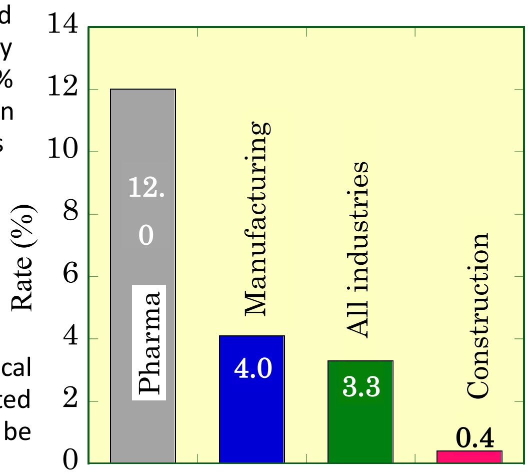


Figure 22 Comparison of rate of budget for research and development to gross sales by industry.

4.2 Recovery project from volcanic disaster in Mt. Unzen Fugen

When the development of unmanned construction systems is discussed, the recovery project from the volcanic disaster at Mt. Unzen Fugen should not be excluded.

In November 1990, Mt. Unzen Fugen suddenly erupted. In the aftermath of this eruption, many researchers and mass media personnel came to investigate the volcano. Unfortunately, due to a second eruption in 1991, 43 of these people either lost their lives or went missing. The Ministry of Land, Infrastructure and Transport made a plan for sediment control work in which a check dam would be constructed at the foot of the mountain to protect the neighboring villages from the ensuing debris flow. However, the dangerous situation continued due to the potential for a sudden succeeding pyroclastic flow and people were prohibited from entering the site. Thus, it was requested that a construction method be developed whereby a dam could be built at the site while keeping people out of the area. The development of the unmanned construction system, explained in Figure 21, was started in 1993. It has been continued for more than 23 years and has led to improvements in technologies which have been applied to actual construction jobs at dam sites. These efforts have made this system quite practical, and its usefulness was clearly proven after the accident at the Fukushima nuclear power plant due to the tsunami disaster following the Great East Japan Earthquake of 2011. The unmanned construction system was introduced to the site just after the accident and it worked smoothly to remove debris and to demolish a damaged house, as shown in Figure 24. It is said that the system's technologies had been refined while being used in an actual construction project; and thus, it could be used quite smoothly as an extension of the existing technologies. This means that the technologies generally used as common methods are really effective in emergency situations; and therefore, efforts should be made to refine all technologies even in the usual works.

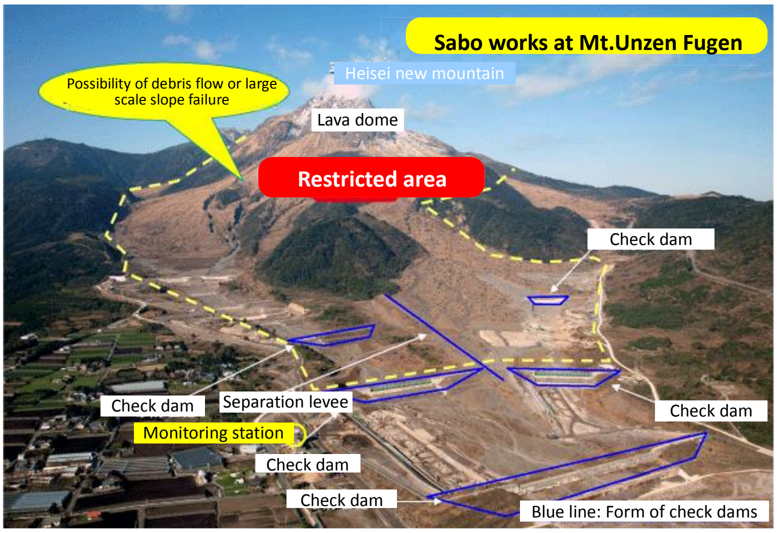


Figure 23 Recovery project from volcanic disaster at Mt. Unzen Fugen.

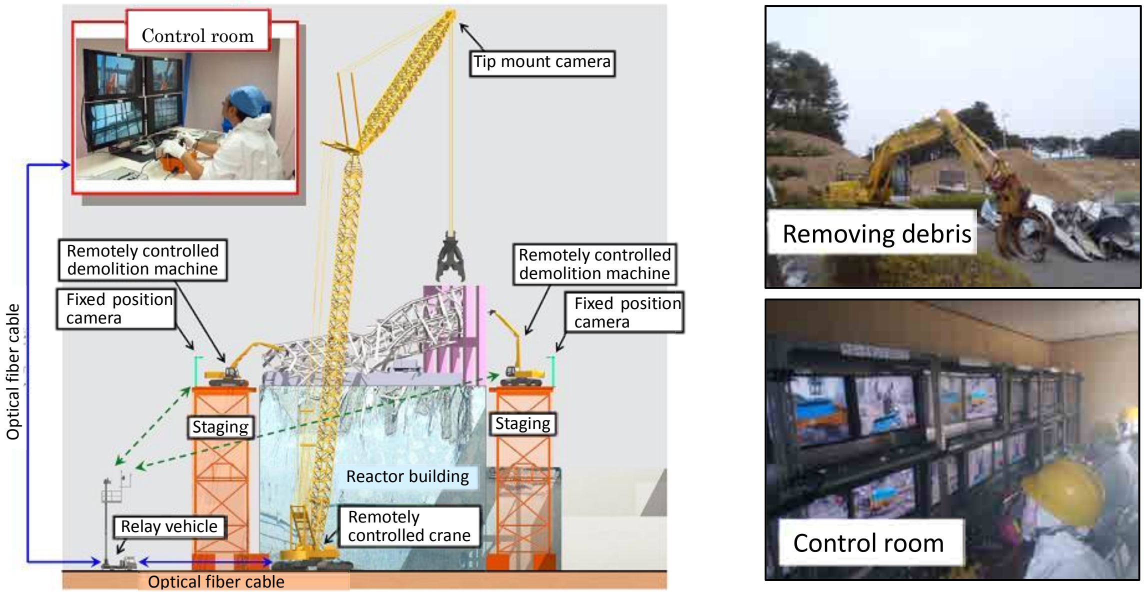


Figure 24 Unmanned construction system employed in accident of Fukushima nuclear power plant.

Conclusion

In the promotion of the i-Construction policy, it is worthy of special mention to state that the criteria and manuals for this policy have been largely modified. Although intelligent construction was introduced more than 10 years ago, it has not sufficiently prevailed because these criteria and manuals had not been modified. It has been impossible to adequately demonstrate the high ability of ICT under the conventional criteria and manuals. The new criteria and manuals have been introduced by assuming the utilization of ICT; and thus, the potential of ICT can now be demonstrated sufficiently. However, both ICT tools themselves and the way in which they are to be used have not yet been established. In the near future, however, they will be established for practical construction sites. It is highly anticipated that technological development in this area will soon gather momentum at construction sites.

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◆A brief CV of Dr. Kazuyoshi Tateyama

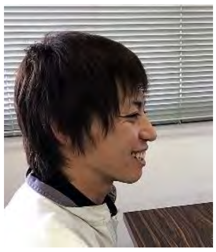
Dr. Kazuyoshi Tateyama is a professor in the college of science and engineering and an executive trustee of Ritsumeikan University, Japan. He graduated from Kyoto University with Bachelor in Civil Engineering and took the Doctoral Degree in Kyoto University in 1988. He has taken on the research and development on the rationalization of construction for many years and engaged in a lot of committees of governments and academic societies. He is now the chairperson of the committee for construction robotics in Japan Society of Civil Engineers and Council for Construction Robot Research.

Interview
On-Site Interview

Ms. Hongjuan He
IPA Secretariat

I interviewed Mr. Matsuzawa (Sato Jyuki Kensetsu Co., Ltd.) and Mr. Asano (Kajikawa Construction Co., LTD) who are engaged in the Press-in project named "Aseismic reinforcement work to embankment on Turumi – Shinkoyasu line", On March 3rd 2017, at Yokohama city, Kanagawa prefecture. I thank them for giving us valuable insights during this interview. Satojuki construction Co., Ltd is responsible to manage the entire project and conduct the Press-in operation on inbound line (for Tokyo). Kajikawa Construction Co., Ltd conduct the Press-in operation on outbound line.

Profile of Mr. Kazuyuki Matsuzawa, Sato Jyuki Kensetsu Co., Ltd.
Mr. Matsuzawa has experienced in construction industry for 28 years. He has joined Sato Jyuki Kensetsu Co., Ltd. in 2013 with his career of construction management in piling. He is responsible for construction planning, management and quality control in welding work as the construction manager in this project. He has qualifications of the First-class Civil Engineering Works Execution Managing Engineer, the Second-class Welding Engineer, the licenses for various cranes and construction vehicles and etc.



Profile of Mr. Yoshikazu Asano, Kajikawa Construction Co., Ltd
Mr. Asano has joined Kajikawa Construction Co., Ltd. in 2009 with 8 years of the field experiences on the "Hard Ground Press-in method" and other application of the Press-in method. He was engaged as a main operator for this project. He has qualifications of the Second-class Press-in Operation, Supervisor for safety program in charge and so on.

Q1. Can you explain the background, overview and features of this project?

Mr. Matsuzawa: As everyone knows that the Great East Japan Earthquake happened in 2011 and brought a severe damage to Japan. Therefore, Japanese government has committed the aseismic reinforcement projects of the railway embankment to minimize damages due to an inland earthquake in Tokyo area. The project is ordered to press-in 120 pieces of U shaped steel sheet piles (L=16.5m) to the both side of inbound and outbound lines then the top of parallel steel sheet piles are connected with tie rods.

Mr. Asano: The significant characteristic of the project is to conduct press-in operation on the very steep and narrow slope adjacent to the railroad during day time. As shown in the Picture1, the workable construction space is limited in 4.5m to 10m width for inbound line and 2.5m to 3.5m width for outbound line for 60m length on each line. Vibration was strictly limited during the operation since the distance from the safety guard fence along the railway was only 1.6m away as shown in Picture2. It was required to pay very careful attention particularly for material hoisting process since trains are passing by every 5 minutes in morning and evening commute.

Picture1: Construction overview

Red frame: Construction for inbound line

Yellow frame: Construction for outbound line

Picture2: Non-staging system (outbound line)

Picture3: Side-view

Q2. What are the significant points for the Press-in Method to overcome constraint conditions on the project?

Mr. Matuszawa: It is impossible to utilize the conventional methods which require to place the necessary machines and equipment side by side on the narrow and steep slope. We introduced the Non-staging system, as shown in Picture 2, that the system only enables all the piling machineries for the Press-in operation to walk on the previously installed sheet piles by itself (self-walking).

Q3. *Has the construction been carried out on time? Can you tell us about difficulties or concerns that you have faced on the project?*

Mr. Asano: Yes, the construction has been carried out smoothly so far and we predict that the project will be completed earlier than planned schedule. The Press-in operation has completed on the outbound line yesterday and the self-walking backward operation has just commenced today, and it is projected to complete in two days. We have judged that the ground condition will be relatively easy to deal with based on the given soil boring log, but we found obstacles in 14m depth as shown in Picture 4, unfortunately. We have continued the operation since the Crush Piler enables to penetrate those obstacles. I reaffirmed that the Press-in method is versatile and applicable to deal with varieties of ground conditions, applicable to hard ground again through this project.

Picture4 obstacle

Mr. Matuszawa: The progresses was made generally on time but have experienced difficulty to carry-in the machines and sheet piles to the construction space. We introduced 200 tons all terrain crane to carry the equipment and materials over the railways because the large vehicle is unable to access to the construction yard, then we divided the Crush Piler into two segments to hoist them in with the crane. Electric supply is cut-off only for 2.5 hours between 1:00am to 3:30am and we are required to safely carry in the equipment and materials during the limited time period. We carefully made the plan that all necessary equipment and materials are kept in the temporary stock yard just outside of the railways then hoist them over to the construction yard during 2.5 hours. However, we could not execute it in the winter season occasionally because trains need to be run in the mid night to prevent the rails to freeze. We have learned that the construction plan need to be carefully examined to absorb those unpredictable incidents.

Picture5 carry-in the equipment

Q4. Were there any specific requirements from project clients?

Mr. Matsuzawa: Safety is the most important issue than anything else. The first priority is to assure the safe train operation. If accidents do happen due to rush of construction, it will cause enormous effects on the train operation and passengers, though it is important for us to complete our construction soonest possible. Since we are dealing with sheet piles, we extremely care to prevent scattering of metallic noise with anti-noise sheets around the construction area.

Q5. Please share with us your toughest operational experience.

Mr. Asano: I experienced difficulties to dear with underground obstacles where I conducted the Press-in work with the Zero-clearance Crush Piler in Gifu prefecture two years ago. I was aware that the gravel layer was existing 6m below the ground surface according to the soil boring log, which the Crush Piler should not have any problems for penetration. I observed the Press-in operation became difficult though and I felt very rushed due to lack of my experience, then I asked for my seniors' advice for problem solving. With having their advice, I have learned that even though the soil boring log is important but the prediction of problems by hearing the sound during augering process and making an appropriate judgement is very important on the job site. The advice is still useful in this construction.

Mr. Matsuzawa: I also experienced difficulties at project of aseismic reinforcement to embankment at Takadanobaba, Tokyo three years ago. The project was ordered as the steel sheet piles Press-in with Crush Piler in accordance with the specifications but some H shaped steel piles were left in the ground. We tried to extract H shaped steel piles (12 m in length!) with Crush Piler and its successfully done, otherwise we might have to divert the press-in line from the initial plan. The extra efforts ended up with adjustments to construction schedule with re-arrangement of manpower and machines. Through this experience, I become keenly aware of the importance of the on-site inspection to identify the existing condition before the commencement of the work.

Q6. Please share your prediction with us about the future of the Press-in Technology.

Mr. Matsuzawa: GRB system (Non-staging System) is the system that enables all the piling machineries necessary for the Press-in operation to move by itself (self-walking) on the previously installed sheet piles. It has enormous advantage compared to other methods which require other construction machineries to occupy large area besides piling machine. Especially, Japan has a large amount of earthquake. We believe GRB system (Non-staging System) is effective method for expeditious restoration works at disaster area cause by earthquake and/or tsunami.

Mr. Asano: I fully agree with what Mr. Matsuzawa said. I often use GRB system on construction site. I hope we could use GRB system without using heavy machineries such as rough terrain crane. Also, I will make more effort to become much better by utilizing the Press-in System so I could contribute myself more through a lot of construction sites.

★Comments:

For this interview, I went to the site where Press-in machine was in operation and was so surprised that I knew that the Press-in Method could use under the restricted circumstances such as narrow space and limited construction time in night. It was very impressed that the trains I watched at construction site were felt much larger than what I see them in daily life. When those train are passing by, the site staff ceased their work, giving the train driver hand signal to assure safety with facing to huge train. I was so impressive by their attitude towards safety issue. Moreover, I found it amazingly that no claim has been received from the neighbors because of trust relationship between them and the site staff being well developed, though the construction site is surrounded by family houses. Through this interview, I strongly felt that they are proud of not only the Press-in Method but themselves, which they have experienced a lot through having hard time to deal with difficult situations.

I believe that the Press-in application adjacent to railway will be a very useful case-example internationally so that I would like to continue to introduce similar topics in our Newsletter.

I would like to express my sincere appreciation toward Mr. Matsuzawa, Mr. Asano and all who are concerned in this interview. Thank you so much.

Picture 6: Interviewing with Mr. Matsuzawa and Mr. Asano

Picture7 Mr. Matsuzawa is checking lateral joints on the site

Picture8 Mr. Asano is operating the system of self-waling backward

We welcome the on-site operators who are able to accept the interview. If you have any questions, please contact to IPA Secretariat address to Ms. Hongjuan He (ipa.ka@press-in.org). We are waiting for you!

Report

Activities of Japan Press-in Association (JPA)

Mr. Mamoru Kawabe

Japan Press-in Association

About JPA

- The Japan Press-in Association (JPA) is an incorporated body established in 1979, currently over 200 members, for facilitating and improving press-in piling techniques and operations related to construction of piles and retaining structures, with the objectives of promoting the press-in method and soundly developing the press-in piling industry. JPA has the headquarters in Tokyo with three branches (Miyagi, Osaka and Fukuoka Prefecture).

Activities of JPA

1. Dissemination activities of Press-in method and supports of Press-in Industry

- JPA offers seminars and on-site visits related to the press-in method in various places for project clients, design consultants, construction companies and so on.
- Over 1000 engineers participate the seminars and on-site visits every year, through which JPA is disseminating advantageous features of the press-in method over other piling methods.
- JPA provides technical supports when the JPA members prepare bidding and making construction plans and design of pile and retaining structures using the press-in method.
- As an example of JPA's contribution to society, JPA signed an agreement with Kochi Prefecture called "Restoration Support Activities for Large-scale Disaster Agreement" in 2015.

2. Collaboration with IPA (International Press-in Association)

- JPA makes full use of IPA publications in the seminars such as "Design and construction manual of steel tubular pile earth retaining walls by Gyropress Method (Rotary cutting Press-in) published in 2014 and "Design and construction manual of press-in method" published in 2015. The numbers of the participants to the seminars have amount to 342 and 375, respectively.
- JPA sells these IPA publications for the convenience to construction engineers.

3. Contribution to society by human resource development

- JPA offers the special training program about how to operate press-in machines designated by Japanese laws.
- JPA has a qualification system for press-in operators for improving and recognizing their press-in operation skills. Those who are successful in the examination given by JPA are called "Registered Press-in Operator".

4. Mission

- JPA continues to contribute to society as well as to the development of construction industry by promoting the press-in method.

Report
Collaboration between JPA and IPA

Mr. Tatsuro Sakai
Japan Press-in Association

1. Purpose
International Press-in Association (IPA) and Japan Press-in Association (JPA) share common missions, in which both Associations will dedicate to prevention and mitigation of disaster, and contribute to expand industries related to the Press-in technology, through developing and disseminating the Press-in technology. To achieve our common goals, further collaborations between the two Associations are of vital importance. The two Associations will continue to strengthen the collaboration.

2. Policy
(1) Short term vision

◆The website of IPA includes case histories appeared in the website of JPA with JPA permission.
◆The research committee of IPA and the technical committee of JPA share technical themes to study together.
◆JPA disseminates the Press-in method by making full use of the IPA publications.
◆IPA distributes IPA Newsletter to JPA members.
◆IPA members can attend the on-site visits which JPA organizes.
◆JPA encourages IPA members to participate the JPA technical seminars.

(2) Long term vision

◆JPA will submit case histories on IPA Newsletter.
◆JPA will contribute the report on “Awarding construction case for Press-in technology”to IPA Newsletter.
◆IPA and JPA will continue to collaborate in studying on the technical subjects with it’s research methodology, which both Associations share their interests, regarding to Press-in Technology.

Photo 1 On-site visit held by JPA (in Osaka)

Photo 2 On-site visit held by JPA (in Itami)

Serial Report

History of Cambridge – GIKEN collaboration research

Yukihiro Ishihara, GIKEN LTD.

Stuart Haigh, University of Cambridge

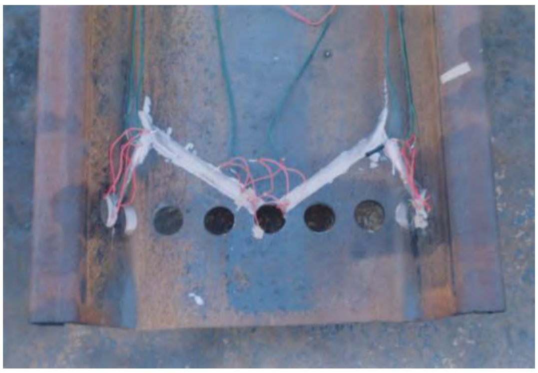
The Cambridge – GIKEN collaboration research started in 1994, based on the strong awareness of Mr. Akio Kitamura, President of GIKEN LTD., of issues relating to construction. Every summer two students visit Kochi, Japan, to carry out field and model tests using the press-in machines and other facilities of GIKEN, in order to learn this technology by experience. In some cases, they also conduct model tests or numerical analyses in their own laboratories on their return to Cambridge. In this report, research related to the tests carried out in Kochi from 1994 to 2003 are presented.

■ [1995-1996]

Project title	:	Effect of water jetting
Outline of tests in Kochi	:	Field tests were conducted using a press-in machine to investigate the effect of water jetting on reducing press-in time in dense sand. U-shaped sheet piles with a width of 400mm (SP-III) were used. The size of the water-jetting nozzle was varied between 6.5 and 8.5mm, with a flowrate of about 320ℓ/min. Two different nozzle shapes (directions of jetting) were also examined. The effect of these parameters on press-in time was analyzed, and the mechanisms were discussed qualitatively.
Main students	:	Matthew Carter, Fiona Gooch
Related publications	:	None

■ [1997-1998]

Project title	:	Investigation into pressure bulbs
Outline of tests in Kochi	:	The resistance on the base of the sheet pile during press-in was obtained by measuring the strain due to the hoop stress around the holes in the base of the sheet pile, as shown in **Picture 1**. The unit base resistance in dense sand was approximately constant at 35MPa, beyond a penetration depth of 3m, of the same order of magnitude as the crushing strength of coarse sand.
Main students	:	David White, Peter Kirkham, Naomi Lyons
Related publications	:	White, D. J., 1998. Deep penetration in sand. M.Eng. Project Report, Cambridge University Department of Engineering, 51p.



Picture 1

■ [1998-1999]

Project title	:	Press-in force and pile type / Press-in speed
Outline of tests in Kochi	:	The press-in force during press-in was compared using U-shaped sheet piles, H-shaped sheet piles and open ended tubular piles. Two press-in rates were adopted. An attempt to estimate the press-in force based on CPT data was discussed, and the necessity of considering the effect of soil plug in the pan of the sheet pile was pointed out.
Main students	:	Peter Kirkham, Haramrita Sidhu
Related publications	:	None

■ **[1999-2000]**

Project title : Measurement of soil plug strength

Outline of tests in Kochi : The phenomenon of plugging was investigated using a split tubular pile. The pile was pressed-in, extracted and separated into two, as shown in **Picture 2**, so that the inner soil column could be directly observed. The creation, dissolution and re-creation of the soil plug during press-in was confirmed, and the mechanism of the creation of soil plug was discussed.

Picture 2

Main students : Haramrita Sidhu, Timothy Finlay

Related publications : White, D. J., Sidhu, H. K., Finlay, C. R., Bolton, M. D. and Nagayama, T., 2000. Press-in piling: the influence of plugging on driveability. 8th International Conference of the Deep Foundations Institute, New York, pp. 299-310.

■ **[2000-2001]**

Project title : Friction cutter / Strain measurement

Outline of tests in Kochi : A double-walled tubular pile, shown in **Picture 3**, was pressed-in to investigate the horizontal earth pressure on the internal surface of the pile. Piles with and without friction cutters on their base were also pressed-in, to investigate their effect on reducing the press-in force. The friction cutter reduced the shaft resistance but had little effect on the base resistance during press-in.

Picture 3

Main students : Timothy Finlay, Yueyang Zhao

Related publications : Finlay, T. C. R., 2001. Press-in piling: noise, vibration and the relief of hard driving. M.Eng. Project Report, Cambridge University Department of Engineering, 49p.

Finlay, T. C. R., White, D. J., Bolton, M. D. and Nagayama, T., 2001. Press-in piling: the installation of instrumented steel tubular piles with and without driving shoes. 5th International Conference on Deep Foundation Practice, Singapore, 1, pp. 199-208.

■ **[2001-2002]**

Project title : Press-in force and bearing capacity

Outline of tests in Kochi : A double-tubed tubular pile was pressed-in. The static vertical load test was conducted and its bearing capacity was measured.

Main students : Yueyang Zhao, Gulin Yetginer

Related publications : Zhao, Y., 2002. Pile set-up in sand. M.Eng. Project Report, Cambridge University Department of Engineering, 48p.

Zhao, Y. & White, D. J., 2006. A model-scale investigation into 'set-up' of displacement piles in sand. Physical Modelling in Geotechnics - 6th ICPMG, pp. 889-894.

■ **[2002-2003]**

Project title : Features of pressed-in group piles / Vibration measurement / Time effect

Outline of tests in Kochi : Open-ended tubular piles with an outer diameter of 101.6mm were pressed-in as a cell foundation in a square or a circular manner. A static vertical load test was conducted as

shown in **Picture 4**, and the group effect on the press-in force and the bearing capacity of these pressed-in piles was investigated. The press-in force increased with the progress of the construction of the cell foundation. The group efficiency in terms of the bearing capacity, if the capacity of the single pile was taken as the press-in force of the first pile in the group, was slightly greater than but almost equal to unity.

Picture 4

Main students : David Rockhill, Gulin Yetginer, Andrew Deeks

Related publications : White, D. J., Finlay, T. C. R., Bolton, M. D. and Bears, G., 2002. Press-in piling: ground vibration and noise during pile installation. Proceedings of the International Deep Foundations Congress, Orlando, USA, ASCE Special Publication 116, pp. 363-371.

Yetginer, A. G., 2003. Press-in piling. M.Eng. Project Report, Cambridge University Department of Engineering, 50p.

Rockhill, D., 2003. Ground vibrations due to construction operations. M.Eng. Project Report, Cambridge University Department of Engineering, 46p.

Rockhill, D. J., Bolton, M. D. and White, D. J., 2003. Ground-borne vibrations due to press-in piling operations. BGA International Conference on Foundations: Innovations, Observations, Design and Practice.

Yetginer, A. G., White, D. J. and Bolton, M. D., 2003. Press-in piling: field testing of cell foundations. BGA International Conference on Foundations: Innovations, Observations, Design and Practice.

Yetginer, A. G., White, D. J., Bolton, M. D., 2006. Field measurements of the stiffness of jacked piles and pile groups. Geotechnique 56, No. 5, pp. 349-354.

[2003-2004]

Project title : Load test on groups of pressed-in piles

Outline of tests in Kochi : Open-ended tubular piles with an outer diameter of 101.6mm were pressed-in in a circular manner. Two circular groups of piles were constructed, one with a constant embedment depth **(Figure 1 (a))** and the other with two different embedment depths for each pile **(Figure 1 (b))**. The bearing capacity of these groups were comparable, even though the embedment depth of some piles in group (b) was smaller than the other piles. The group efficiency in terms of the bearing capacity, if the capacity of the single pile was taken as the press-in force of the first pile in the group and the capacity of the pile group was taken as the plunging load, was approximately equal to unity. On the other hand, the stiffness of the group decreased with the increasing number of piles in the group.

Main students : Andrew Deeks, Melvin Hibberd

Related publications : Deeks, A. D., 2004. An investigation into the strength and stiffness of jacked, driven and bored piles. M.Eng. Project Report, Cambridge University Department of Engineering, 51p.

Deeks, A. D., White, D. J. and Bolton, M. D., 2006. A comparison of jacked, driven and bored piles in sand. The 16th International Conference on Soil Mechanics and Geotechnical Engineering, Osaka, Japan, pp. 1685-1688.

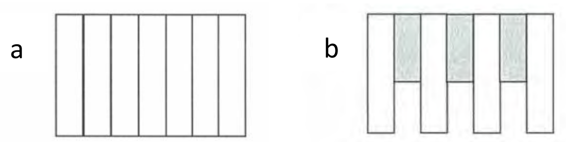


Figure 1 (Deeks (2004))

Report

International Workshop on the 2016 Kumamoto Earthquake

Prof. Hemanta Hazarika

Department of Civil Engineering
Kyushu University, Fukuoka, Japan

An International Workshop on the 2016 Kumamoto Earthquake was held at Inamori Center, Kyushu University, Fukuoka, Japan on March 6, 2017. It was held under the auspices of J-RAPID Project team, which is a team formed by a group of researchers from Japan and the USA. J-RAPID is a project on the 2016 Kumamoto Earthquake funded by Japan Science and Technology agency (JST). The workshop was co-organized by Kyushu University, National Disaster Research Council of Japan, National Disaster Information Center of Western Japan of Kyushu University, International Press-in Association, and Center for Reducing Disaster Risk of Kumamoto University. The workshop was supported by the Japan Science and Technology Agency and Japan Foundation Engineering Co., Ltd., Japan. The workshop was also the Japan-USA joint workshop on the 2016 Kumamoto earthquake.More than 60 participants not only from Japan and the USA, but also from other Asian and African countries attended the workshop. (Photo 1)

Photo 1

Four Keynote lectures and one Special lecture were presented in the workshop as what follows;

Keynote lectures:

- Analysis of a fast-moving landslide during an earthquake in Japan by Prof. K. Ishihara (Chuo University, Tokyo, Japan)
- Geotechnical extreme-event reconnaissance (GEER) mission to the 2016 Mw 6.0, Mw 6.2, and Mw 7.0 Kumamoto Japan earthquakes by Prof. R. Kayen (University of California Los Angeles, USA)
- Slope failures during recent earthquakes and their interpretations in terms of energy by Prof. T. Kokusho (Prof. Emeritus, Chuo University, Tokyo, Japan)
- Damaged situation of residential area of Mashiki-town by Mr. M. Tajiri (Tajiri Engineering Office, Kumamoto, Japan)

Special lecture:

- Horizontal sliding of Uchinomaki hot spring area during the 2016 Kumamoto earthquake: Insight from satellite data, field observations and direct borehole measurement by Prof. T. Tsuji (Kyushu University, Fukuoka, Japan).

The workshop program came to an end with the closing address delivered by Prof. Osamu Kusakabe (President, International Press-in Association), and the vote of thanks by Prof. Hemanta Hazarika (Chairman of the Workshop).

The workshop was financially supported by Tokyo Head Office of Japan Foundation Engineering Co., Ltd., Japan and Kyushu Branch office of Japan Foundation Engineering Co., Ltd., Japan. The organizing committee expresses the heartfelt gratitude for this financial support.

The papers presented in the workshop will be published in special issues on “Kumamoto Earthquake and Disaster” in Lowland Technology International (LTI) journal, an international journal published by the International Association for Lowland Technology.

Announcement

10th IPA Press-in Seminar in Kochi 2017

IPA Secretariat

International Press-in Association (IPA) will hold the 10th IPA Press-in Seminar on 20th July, 2017 in Kochi City, Japan. There will be 4 lectures in this seminar. The topics include Press-in construction examples in overseas and the application of sheet piles to permanent structures. From this seminar, you can experience the state-of-the-art Press-in technology, communicate with kinds of people from various fields and get hints for your researches and projects.

We are sure that you will have a memorable and productive seminar. We are looking forward to your attendance to the seminar.

Date: 20 July 2017, Thursday
Time: 13：30 - 16：45
Venue: Sunpia Chres, 3rd floor, Rainbow Hall
Address: 155 Takasusunachi, Kochi-shi, Kochi 781-8101, Tel. 088-866-7000
Program:

13:00 - 13:30	Registration
13:30 - 13:40	Opening Address
13:40 - 14:20	Lecture-1 Title: Singapore experiences in Press-in Lecturer: Prof. Leung Chun Fai
14:20 - 15:00	Lecture-2 Title: Press-in Method application in Bangladesh Lecturer: Mr. Tsunenobu Nozaki / GIKEN LTD.
15:15 - 15:55	Lecture-3 Title: Behavior of Partially Floating Sheet Pile Lecturer: Prof. Jun Otani / Kumamoto University
15:55 - 16:35	Lecture-4 Title: Development and Construction Examples of Sheet Pile Foundations Lecturer: Dr. Hidetoshi Nishioka / Railway Technical Research Institute
16:35 - 16:45	Closing Address

Organizer: IPA Research Committee
Supporters:

○ Kochi Prefecture
○ Kochi City
○ Japan Press-in Association
○ Kochi Industrial Association
○ Kochi Institute of Invention and Innovation
○ Kochi Engineers Corporation
○ Kochi University of Technology
○ Kochi National College of Technology
○ The Shikoku Bank, Ltd.
○ THE BANK OF KOCHI, LTD.
○ The Kochi Shimbun
○ GIKEN LTD.

Registration fee: Free (lecture documents will be sold on 20th July at cost)
Registration: Please download the registration form from IPA website:
http://www.press-in.org/events/seminar10/outline/en
CPD Points: This seminar is qualified for “3.0 CPD points” by The Japan Civil engineering Consultants Association (Registration No.201705180002)

Event Diary

■ IPA Events
http://www.press-in.org/events/calendar/en

IPA Board Meeting
July 20, 2017/ Kochi, Japan

10th IPA Press-in Engineering Seminar in Kochi 2017
July 20, 2017/ Kochi, Japan,

IPA Malaysia Seminar
October, 2017 / Malaysia

International Conference on Press-in Engineering (ICPE) 2018, Kochi
September 19-21, 2018/ Kochi, Japan

■ International Society for Soil Mechanics and Geotechnical Engineering
http://www.issmge.org/events

2nd International Symposium on Coastal and Offshore Geotechnics (ISCOG 2017) & 2nd International Conference on Geo-Energy and Geo-Environment (GeGe2017)
July 5-7, 2017/ Hangzhou, China

GeoMEast 2017
July 15-19, 2017/ Sharm EL-Sheikh, Egypt

PBD-III Vancouver 2017 - The 3rd International Conference on Performance Based Design in Earthquake Geotechnical Engineering
July 16-19, 2017/ Vancouver, Canada

19th International Conference on Soil Mechanics and Geotechnical Engineering
September 17-22, 2017/ Seoul, Korea

■ Deep Foundations Institute
http://www.dfi.org/dfievents.asp

SuperPile '17
June 14-15, 2017/ Coronado Bay, CA

Design and Installation of Helical Piles and Tiebacks for New Construction and Rehabilitation
September TBD, 2017/ QC, Canada

DFI-India 2017: 7th Conference on Deep Foundation Technologies for Infrastructure Development in India
October 5-7, 2017/ Chennai, India

■ Construction Machinery Events

Plantworx 2017
June 6-8, 2017/ Lutterworth, UK
http://www.plantworx.co.uk/

Buildexpo Rwanda 2017
July 12-14, 2017/ Kigari, Rwanda
http://expogr.com/rwanda/buildexpo/index.php

Buildexpo Tanzania 2017
August 10-13, 2017/ Dar es Salaam, Tanzania
http://www.expogr.com/tanzania/buildexpo/

The Big 5 Construct India 2017
September 14-16, 2017/ Mumbai, India
https://www.thebig5constructindia.com/

14th Beijing International Construction Machinery Exhibition & Seminar (BICES) 2017
September 20-23, 2017/ Beijing, China
http://www.e-bices.org/engdefault.aspx

■ Others

Pile 2017
"International Conference on "Advancement of Pile Technologies and Case Histories"
September 25-27, 2017/ Bali, Indonesia
https://www.pile2017.com/

International Tsunami Symposium (ITS) 2017
August 21-25, 2017/ Bali, Indonesia
http://itsbali2017.com/meetingsite

International Disaster and Risk Conference (IDRC) 2017
November 25-27, 2017/Sendai. Japan
https://idrc.info/2017/

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Editorial Remarks

The Editorial Board is pleased to publish Volume 2, Issue 2 on schedule. This issue highlights the special contribution on the hottest issue of i-construction written by a well –known professor in this field, Dr. K. Tateyama of Ritsumeikan University. Thanks to the rapid development of information technology and intelligent robotics technology, construction industry is shifting from a labor intensive industry to a high productivity industry with unmanned construction machinery.

This issue also includes the articles of Cambridge – Giken research collaboration program, and of On-Site Interview and more. The report of 'Activities of Japan Press-in Association' may interest those who are in the industry.

Please feel free to contact the Editorial board members below with email address or IPA Secretariat (tokyo@press-in.org) for your clarifications and/or suggestions.