

論文 Original Paper

The amazing side of the Czech Republic, Industrial Technology, Culture and Climate

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Abstract: This is an English translation of an expository article, which was restructured from the serial articles 'The Industrial Technology, Culture and Climate of Czech Republic' which appeared in the January to December issues of 'the Machine Design' in 2015 published by Nikkan Kogyo Shinbun, LTD. The serial articles were expository mainly on the superior industrial technology and its background in Czech Republic, based on my research during a one year stay in the country beginning April 2014.

Key words: Czech Republic, Industrial Technology, Technical History, Culture, Climate

Chapter 1 : Overview of the Czech Republic

1-1 Introduction

Many people will probably think of Czech Republic as a country of music represented by Dvorak (Antonin Leopold Dvořák) and Smetana (Bedřich Smetana), and art represented by a graphic designer Mucha (Alfons Maria Mucha) and the author Karel Capek (Karel Čapek), who is said to be the creator of a word 'robot'. Also, some might think Czech Republic as an unknown country hidden until recent years by the Iron Curtain, or the home country of Bera Caslavská (Věra Čáslavská), a gold medallist in women's gymnastics in the 1967 Tokyo Olympic Games, or the country of the famous tennis players Martina Hingis and Martina Navratilova (Martina Navrátilová). However, Czech Republic has another side as an industrial country with advanced technology that supports manufacturing of German and Russian tanks. The country produces many high quality crafts, including Bohemia Crystal which is famous for its high degree of transparency due to the fine and elaborate processing, and the home of Carlsbad, which ties with Meissen and Hutschenreuter among Three Great Blue Onion. (Fig.1-1, 2) The Europe's popular automaker ŠKODA Auto is also a Czech company. Czech people enjoy making things and D.I.Y., such as making bathrooms, gardens and anything else they can make themselves. Although it is difficult to describe what Czechs are like in a

word, it can be said that they are diligent and serious, firm with their promises, cheerful, frank, and beer enthusiasts. Czechs and Japanese share many aspects in their character,



Fig.1-1 Bohemia Crystal Art



Fig.1-2 The Shop of the Blue Onion

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and seem to get along with well each other. With such a national character of Czechs and the country's climate overlapping with each other, Czechs created Pilsner beer, which the nation can boast to the world, and became the first country in the world to develop puppet shows into popular culture.

I had the privilege of spending time at University of West Bohemia in Pilsen, Czech Republic, for one year, though it was a rather short period. The purpose of this stay was a research study on the main theme of my study; energy-saving equipment, and refrigerating and air conditioning systems. On this occasion, I had a chance to witness various elements of Czech culture in relation to its historical background, and through friendships with Czech people, I had a deep impression on the interesting implications between technology and culture, some of which I introduce in this article. Recently, globalisation has been also sending waves to Czech Republic. In such a time, I would like to get to know the wider people beautiful country of Czech Republic, where time still flows gently, and feels comfortable for Japanese people.

1-2 Modern History

In the land of Czech Republic, it is believed that the Slavs started to inhabit the area around the 4th to 5th century. In the 10th century, Bohemian Kingdom, the origin country of Czech Republic, was established. Although details of the country's history thereafter has to be left to history books, the country was in turmoil during the power struggles between rival local warlords who prospered and declined such as the Houses of Pujemisru, Luxemburg, Habsburg, Schwarzenberg and Liechtenstein. In the modern times, Czechoslovakia was established independently from the Hungarian Empire after the World War I. Later, in 1938, the Bohemian and Moravia regions (current Czech Republic) were merged into Germany, bringing about the dismantling of Czechoslovakia. After World War II, Bohemian and Moravia regions were liberated from Germany and became independent as Czechoslovakia. However, the Prague Spring and the Czech Coup in 1968 brought the country under the influence of Soviet Union. In 1989, the incident of the fall of the Berlin Wall triggered improving the democratisation of Czechoslovakia, and it was 1990 when the free election in the country was implemented for the first time after World War II. Until then, it was prohibited to listen to rock music freely or to wear jeans in the country. During that time, Russian language was taught as a compulsory second language at universities. This is why

many Czechs can understand Russian language. At a current university, although there is no regulation on the choice of foreign languages, being the languages of the neighbour countries, German and Austrian seem to be the favourite. However, the number of students who elect English has recently been increasing and younger generation understand English. At the moment, there are still only few universities where Japanese is offered.

It was in 1993 when Czechoslovakia was divided into current Czech Republic and Slovakia Republic. It was in 2013 when the first direct presidential election was implemented. As seen above, Czech Republic had been at the mercy of the power struggles among kingdoms and empires in old times. Even in modern times, the country had been involved in wars between western countries and Russia, forcing the country to go through tumultuous times that were unimaginable for Japanese people, until just recently. You could feel the weight of the history when you observed carefully and easily notice the traces of its history at various places such as holiday events, museums and what the city has. On the other hand, the history of prolonged war times has also contributed the development in firearms and industrial technology. This probably explains why Czech pistols are valued high in the world.

1-3 Economic Situation

The land area of Czech Republic is 78,866 square kilometres, about one fifth the size of Japan, and its population is 10.51 million. Prague is the capital of the country and has a population of 1.24 million. (Fig.1-3) Nominal GDP of the country in 2013 is 53rd in the world. Czech Republic is an industrial nation with the country's

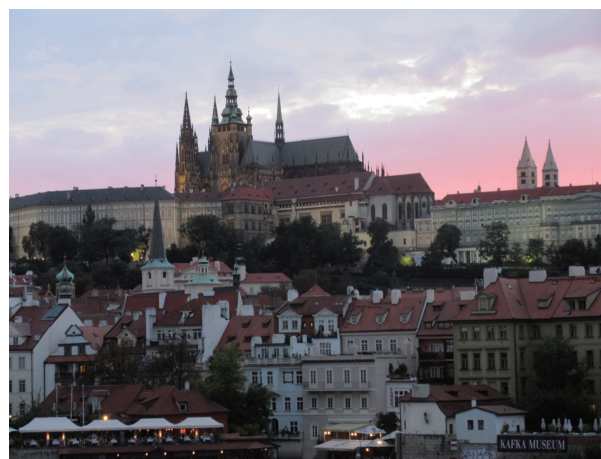


Fig.1-3 View of The Prague Castle from Charles Bridge
(UNESCO world heritage, 1992)

main export made up of automobiles and auto-related goods, electrical goods, and industrial machinery. The value of exports to Japan is eighth, behind exports to Germany, Slovakia, Poland, France, Britain, Austria and Russia. The value of imports from Japan is sixth after Germany, China, Poland, Slovakia, and Russia.

In Pilsen, the city where I stayed, about 190,000 people reside, making it the third biggest city in the country following Brno. The city is located close to the border with Germany, and many Czech people easily drive to Germany for shopping to buy groceries and other goods. As you might know, people can freely travel across the borders between countries that are members of the Schengen Agreement. Some Japanese companies are stationed in Pilsen. The city has a long history of over 700 years in brewing beer, and is the place of the origin of Pilsner beer. In fact, Budweiser Original, the originator of the famous beer brand Budweiser, can trace back the source of its origin to a beautiful traditional beer produced in the South Bohemian Region near Pilsen. (Fig.1-4)

Chapter 2 : Origin and Tradition of Czech's Technology

2-1 The Origin of the Czech's Technology

Czech Republic produces world-famous traditional crafts including glass and porcelain wares and is also an exporter of high-quality industrial products. The mechanical technology which supports the industry has been developed through a long history of calamity in wars since long ago, and has been always appreciated for its high quality. This probably owes much to the Czech character to carefully observe things and to make all possible efforts using their ingenuity. I would like to introduce some of the sources of

the Czech's technology which can be found in various fields.

(1) Thirty Years' War and Firearm Technology

The Thirty Years' War was one of the most significant incidents in European history and is the first-ever world war in human history. Although this war is categorised as a religious war, the main aspect of this war was in fact the struggle for territory and supremacy among European countries and lord monarchs, and was definitely a frightful war that involved common people. In the Bohemian Region (the current west region of the Czech Republic), many industries had been developed while maintaining the region's unique identity under moderate policies during the reign of successive kings of the Kingdom. However, since King Ferdinand of the House of Habsburg was crowned, conflicts between the Protestants and the Catholics rose to the surface within the country, resulting in the beginning of the Thirty Years' War in this region and the Bohemian Kingdom was caught up in the ravages of war.

Within a 40 minute drive from Pilsen, which is located approximately in the center of the Bohemian Region, is the Subirou Castle. Around this area became the major battlefield of the Thirty Years' War. Overlooking from the Subirou Castle is a park where a special event is held every summer, in which a play of the battle of the Bohemian army is reproduced and firearms used in those times are introduced and demonstrated. Folk music and songs are also performed and the site bustles with families and couples. If you join the guided tour of the Subirou Castle, you can also observe the castle interior, have a look at what the castle contains such as furniture and porcelain which are high in cultural value, and you can imagine that period of time.



チェコで最も高い尖塔を持つ14世紀に立てられたゴシック様式の教会で、ブルゼニュの広場の中央に立っている。ブルゼニュのシンボルで広場に出店されるマーケットやイベントで毎週末賑わっている。

Fig.1-4 The Cathedral of St. Bartholomew at Plzeň



Fig.2-1

The introduction and demonstration of the firearms is performed by instructors dressed up in the costumes of the time of the Thirty Years' War, as they elaborately explain the features and performance of the firearms. As **Figure 2-1** shows what the performance looks like, interestingly, instructors explain how the first model of the rifle was devised and improved while performing a short play. Instructors actually demonstrate the oldest model of rifle which looked like just a bar. As the times changed, various technological innovations were made to improve the accuracy and effective range of rifles. While the rifles became smaller, hugely destructive cannons were also developed. During the time of the Thirty Years' War, the features of those firearms had a large impact on the course of wars. **Figure 2-2** shows what the reconstruction play on the Bohemian War looks like. The performance is reconstructed faithfully how the regional lords fought the battles, using mercenaries, including a powerful representation of a scene with a barrage of gunfire that starts with a call of drum roll. **Figure 2-3** shows the salute scene



Fig.2-2



Fig.2-3

at the ending. In the reconstruction play, there are many scenes where female nurses actively apply emergency treatments to the wounded mercenaries, indicating that women also accompanied men in the battles. It is not hard to imagine that firearms were also familiar to women and children at that time. Technology in firearm production has been passed down until now, and as shown in **Figure 2-4**, some shooting champions often select Czech made pistols in sport shooting competitions.

(2) Traditional Craft Making

Bohemian glassware production has a long history dating well back before the Thirty Years' War. The Bohemian Kingdom was established around the 10th century, and by 12th century, stained glass for churches were already being made in this region. However, it was in the 13th century when household glassware started to be manufactured, and this can be said the origin of Bohemian Crystal glassware. The art of manufacturing glass was imported from Venetia. In the forest area in West-North Bohemia, there were small-scale glass workshops where glass making techniques were handed down from father to children and developed on its own. The region is abundant with excellent ingredients for making glass and pots to pour melted glass in, and has the Moldau River that provides an excellent distribution channel for the products. By using a technique of subtle formation of potassium made from coal that was produced in the Bohemian region, it was made possible to create highly translucent glass. Also developed were the techniques of elaborate cutting, polishing, and colouring glass. Those achievements could be said to be the fruit of the unyielding



Fig.2-4



Fig.2-5 Karlovy Vary

sprit of fathers and sons who worked hard in the glass workshop with efforts and through the process of trial and error, again and again.

As mentioned earlier, Bohemian region is famous for Carlsbad porcelain. Carlsbad was born in the spa and health resort Kalovy Vary in the region of northwest of Bohemia. Originally the porcelain techniques were brought from China, and rapidly developed as blue painting techniques were developed in Germany in the 18th century. Porcelain includes more glass components than earthen ware and has a glazed finish. In Kalovy Vary, you can see many hot spring faucets and many visitors to the hot spring resort are seen walking while drinking hot spring water in a special pot. This region produces excellent china clay, which is a necessary ingredient for making porcelain as it is for making Bohemian crystal. This is why porcelain manufacturing techniques were developed in this region. Influenced by Missen and Japanese Imari, traditional white porcelain decorated with blue painting, and also pale-pink coloured porcelain which is unique to this region is seen. (Fig.2-5)

2-2 Science and Technology Fair

As introduced in the above examples of technology in the manufacture of firearms and porcelain, the country has a cultural climate to hand down techniques from father to sons, and adults to children. This was also true for farming machines such as wheat cropping machines, and the spirit is also alive in their traditional folk dancing. This spirit is present even today. In the main square of Pilsen, an annual event where people can experience hands-on science and technology demonstrations is held, involving the whole region, with the University of West Bohemia acting as the main organiser and with cooperation of the Pilsen city council. At this event, more than 30 booths are set up by

participants from many of university laboratories, high schools and companies, aiming mainly at children to experience hands-on science and technology. Markets of food, green vegetables and cloth are also open in the square at this occasion. The event is truly the work of cooperation among government, industry, academia and private. It is held in the largest square in the Pilsen city, for which four sectors with different characters from each other get together for the purpose of having children experience science and technology. This kind of occasion is tremendously difficult to organise in Japan, and it is wonderful that they can make it happen. Some of the demonstration booths are set up outdoors to have children experience the microscopic world by looking at the surface of familiar items such as coins and insects, feel the extreme low temperature of liquid nitrogen up close, or control model kits which move with superconductivity power. There are also outdoor booths to help understand the principles of planet observation by operating large model kits, to get to know the structures of bridges and buildings, to experiment with medical tools, fossil excavation, light and chemical themes, and experiments for hands-on learning of mathematical principles. These were designed to help to understand every kind of science miracles. The booths are not only for basic experiments and underlying principles, but also for displaying or demonstrating practical equipment, which adults and technicians also can enjoy. People who assist teaching at each booth are mainly university and high school students and young engineers. Imagine children enjoying experiencing these activities with excitement. These attempts lead to transmitting science technology into the future and contribute to the ongoing development of a high level of technology. (Fig.2-6, 7)

The high standards of industrial technology of Czech



Fig.2-6 Science and Technology Fest. (part1)



Fig.2-7 Science and technology fest. (part2)

Republic owe a lot to the ingenuity and the process of continuous efforts through the process of trial. Such is the spirit that has been handed down through familiar themes since ancient times.

Today, this spirit is still naturally passed on to children of the future as their own identity.

Chapter 3 : Pilsen, an Epicenter of Academic and Technological Information

3-1 Pilsen, Venue of International Conference

The Czech Republic is an industrial country and Pilsen is one of the leading industrial cities. The city functions not only as a manufacturing base, but also functioning as a research and development base, with underlying advanced academia and technology. Pilsen is a place where international communication in academia and technology is continuously happening and is a powerful epicentre of academic and technological information.

(1) Geography and Transportation of Pilsen

Pilsen is located approximately 90 kilometres to the south of Prague. The Vaclav Havel Airport Prague is in the suburbs of Prague, and Pilsen is connected by air to various cities in Europe. There is a good connection by railways and highways between Prague and Pilsen, providing convenient access. To get to Pilsen from the airport, it takes less than one hour by car. Czech's bus service is popular, providing good and safe travel, and the bus transportation network is highly-developed. Buses are equipped with Wi-Fi access, individual videos, and offer free drinks, magazines and newspapers. Bus services are well developed not only within the country but also internationally. The bus fare between Prague and Pilsen is 100 CZK. Czech Republic became a member of the EU in 2004, and also became a

member of the Schengen Agreement in 2008, allowing free movement among member countries of the agreement. Japanese people can also travel freely among those countries once they step into one of those contracting countries. Pilsen is close to Germany and Prague International Airport, making it a convenient place for travelling and an ideal place for international communications.

(2) Surrounding environment of Pilsen

In Pilsen, there are companies that represent the country, such as the ŠKODA group of companies and Plzensky Prazdroj brewery. These companies often economically support international exchange programs, including international conferences, together with Pilsen city and EU countries. When international conferences are held in Pilsen, unique and interesting tours to those companies which represent the country can be organised. Also, there are beautiful castles and places of historic value in the suburbs of Pilsen. (Fig.3-1) Although many historical buildings were destroyed in the war, there are still many other buildings which survived the calamity of war, some of which were saved by the enemy from the perspective of their own use after the capture, and some others for which reconstruction work was carried out. We can now see those buildings as they are left now. Pilsen is a city with plenty of assets to attract people from all over the world and satisfy their interest.

(3) Conference Venues and Facilities

Pilsen has a few sites suitable for holding an international conference. Park Hotel shown in Figure 3-2 is one of those sites and is used for many international conferences that are held there every year. Surrounding the hotel are tennis courts, a roller skating rink, and a spacious green park with a playground accommodating valley-ball and basketball



Fig.3-1 The Chateau Nebilov



Fig.3-2 Park Hotel

courts. Squirrels searching for tree nuts can be seen in the morning and at night, and it is a nice and comfortable place to enjoying walking. The Park Hotel has facilities for conferences including a stage, a big hall equipped with a PA system, a lecture room overlooking an outdoor swimming pool, and a number of rooms of various types which are suitable for talks. The Hotel's restaurant offers Czech sweets as well as traditional Czech cuisine. Besides convenient tram and bus services, renting a car can be also organised at the reception, making it an ideal site for international conferences. The staff members of the hotel are very helpful in running conferences and offers meticulous support including at the restaurant and the café. This might be the way of hosting in Czech Style.

3-2 Report on International Conference

I would like to introduce two examples of international conferences held in Pilsen in 2014. Please look at the website on the details.

(1) ICDES2014

ICDES is an academic conference related to design organised by the Japan Society for Design Engineering, and a conference was held under cooperation with the University of West Bohemia, at the Park Hotel from 31st August to 3rd September, 2014.

The conference was very lively with poster sessions by students and displays of instruments were organised as well as presentations of lectures. Delegates from the EU and its neighbouring countries, Japan, Taiwan and China participated in the conference, becoming the very site of communication for researchers from Asia and Europe, providing a valuable opportunity for finding areas of common interest and differences between Japan and EU

countries.

(2) COMAT2014

COMAT meets biannually in Pilsen, which is organised by a committee composed of universities and research centres from countries such as Slovakia, Poland, Germany, Austria, Britain and Russia, with COMTES FHT as a core organiser. COMAT2014 was held during November 19th to 21st, 2014. The program included presentations on industrial materials and new materials, new processing methods of those materials, investigative research by CAE, machinery displays, and a tour to COMTES FHT. The social event after the tour was held at the restaurant in the Pilsner Urquell Brewery, and technological discussions on various topics kept going on until midnight while enjoying original Pilsner beer.

3-3 Czech's Traditional Music and Dancing

Czech Republic is the birth country of great composers such as Dvořák and Smetana, and we can enjoy not only performances of classical music by chamber orchestras, but



Fig.3-3 Complete Facilities of The Hotel



Fig.3-4 ICDES2014



Fig.3-5 Traditional dance and songs

also splendid singing by an opera singer of the world, Ms. Jana Hofmannová from Sokolov in the Bohemian region. Also, traditional songs and dancing in beautiful national costume performed by a traditional folk culture group would make you feel Czech-ness. These wonderful performances will add grace to the international conference held in Pilsen and leave memorable experience for the delegates. (Fig.3-4, 5)

Chapter 4 : Czech's Fascinating Transportation

4-1 Convenient Road Network between East and West

Czech Republic has a well-developed highway network system to connect east and west, as shown in Figure 4-1. Prague as a center, via Pilsen, the D5 highway directly connects to Nurnberg, Germany to the west, and by the D8 directly connects to Dresden, Germany. To the east, by the D1 through Bruno, and via the D2 connects to Bratislava, the capital city of Slovakia, and through Ostrava to Poland. In this way, Czech's road network provides convenient transit between east and west. The speed limit on highways is 130 km/h, and the roads are four-lane, allowing enough space for large trucks with trailers and providing a big role in delivery of goods and services.

Among the cities highways run though, there is Ostrava which flourished in the old days by coal mining. More recently, the city had developed as a base of manufacturing steel products, and is still a heavy industry city mainly producing steel products. Although it is not sure whether such a historical background has any connection, the city is also famous for having many drinking alleys and has many drinkers. Another city, Bruno, is located in the east of the country in the Moravia region and is a leading commercial city. The city also holds Grand Prix races of cars and

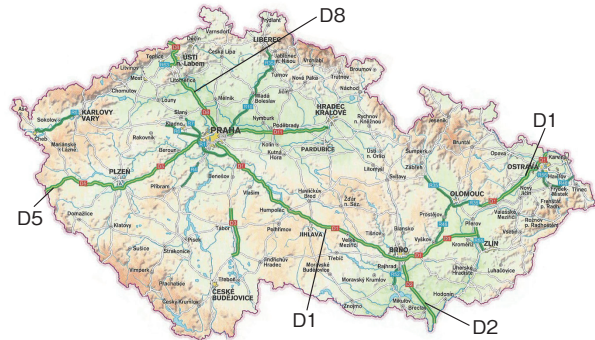


Fig.4-1 The high way net of The Czech Republic



Fig.4-2 The Karlštejn Castle

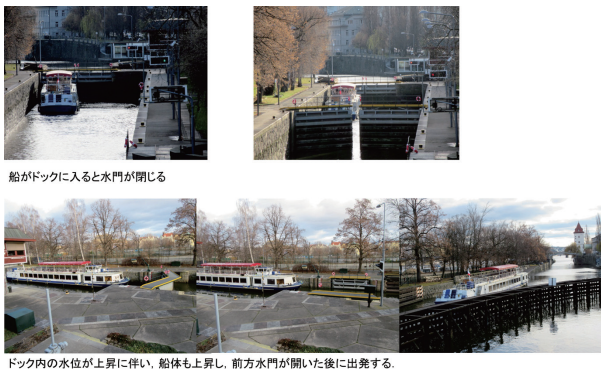
motorbikes and is a hub city to connect to Slovakia. If you look at the west side of the Bohemian region, there is the industrial city Pilsen. Pilsen was developed as a base of advanced industrial technology due to being geographically close to Germany. The road network has developed probably because of technology and resources and for the need for good distribution channels for industrial products. With its historical background, along the highway network there are places of highly valuable cultural heritage. As an example, on the way to Prague from Pilsen, there is Karlstien Castle as it can be seen in Figure 4-2. However, the road network that runs through north to south has not been well developed compared to the east-west road network, with the historical background being one of the reasons.

4-2 Waterways as a Traditional Distribution Channel

Although Czech Republic is a landlocked country surrounded by mountains, the country has many rivers such as the Moldau, a famous river for Smetana's symphonic poem 'Our Homeland'. Also, the river played an important role in the development of the three great Blue Onion of porcelain, and Bohemia Crystal. Flowing through the centre of Prague, the scene of a wide and majestic flowing of the Moldau is just like it is depicted in Smetana's 'Our



Fig.4-3 A Dam of Vltava River



船がドックに入ると水門が閉じる

ドック内の水位が上昇に伴い、船体も上昇し、前方水門が開いた後に出発する。

Fig.4-4 A ship in a Dam

Homeland'. Since around the 14th century, a weir has been constructed across the river, using wood and stones, in order to prevent flood disasters and to intake the water. Recently the weir was replaced by a new construction with a power-generating unit. The weir also has a special path for boats to cross the weir. Currently, by regulating the water level using a floodgate, larger boats are also able to cross the weir. As shown in **Figure 4-3**, creating the splattering sound of the water and the flow of water at a varied pace, the weir presents beautiful scenery. **Figure 4-4** shows a boat crossing the weir through the ship channel. A boat traveling upstream enters the lock, and once the gate is locked, the water level goes up to the level of upstream. A boat traveling downstream can cross the weir in the same way. Today, sightseeing boats cross the weir with passengers on board and they can experience the change of the water level as they enjoy drinking wine.

4-3 Development of Railway Network

Prague has three subway lines, and many international trains arrive and depart at the Prague Main Station. There might be many Japanese people who wish to visit the Czech Republic from Germany by train, but the train is not as good as a bus, in the point of required traveling time, fares and



小さな子ども大喜び
これも、ものづくりに強い国を作る基になっているのかもしれない。

ヘッド部の回転速度: 4.5[1/min-1]
トルク: 23.707[kN/m]
入力: 6.2[MW]
最大速度: 80[mm/min]

トンネル内の特殊車両

Fig.4-5 The Railway Tunnel Digging Spot



樹脂のシートの上に軌道の基礎を築く。防振材を埋設し、石を並べて仕上げる

Fig.4-6 The Tram at Plzeň

services. In fact, it takes one hour by bus to travel between Prague and Pilsen, and one and a half hour by train to do this trip. Bus fares have been cheaper than train fares, but train fares have been reduced to compete against bus fares. Also, in order to reduce the traveling time by train, tunnels for bypassing some mountains are under construction. Recently, a construction site had an open day as seen in **Figure 4-5**. Many Czech people have a great interest in manufacturing, and those types of events bustle with many people, with families and couples, young and old.

4-4 Trams- Easy and Convenient Access

Trams or street cars are very popular as an easy transportation method. Main cities such as Prague, Bruno, and Pilsen have trams with good connections. In this section, I would like to introduce the trams in Pilsen. In Pilsen, there are trolley buses, buses and trams, and common tickets for any transportation are used. Trams have three lines that run east to west; the Central Square is located right in the middle. The tram tracks are built orderly on beautiful stone pavements. As shown in **Figure 4-6**, foot pavement, roads and tram tracks are nicely segregated, and

it is designed so that rain water would drain into the central ditch on the road, instead of to the curb. This prevents pedestrians from getting splashed by water from trams and cars, and they can walk safely without their feet slipping. The structure of tram tracks are also carefully designed, which use vibration-proofing materials buried underneath and stone pavement and pebbles to cover the surrounding surface of the tracks. Not only are the tracks constructed with high technology in consideration to noise and vibration hazard, it is designed to keep the appearance of traditional beauty. Although it takes a long time to pave manually with pebbles, there are many points we should learn in their wisdom, inspiration and their passion in town planning. The trams have various cars of different designs, with playful painting inside and outside.

There is something all first visitors to the country notice when they travel around in the city taking either a bus or tram – whenever elderly people or injured people come aboard, there is always someone who immediately stands up to offer their seat. Although the give-and-take spirit on transportation is encouraged in Japan, I was impressed with the situation that the spirit of give-and-take is thoroughly instilled and naturally practiced among Czech people.

Chapter 5 : The Pilsen – European Capital of Culture 2015

5-1 What is European Capital of Culture

The year 2015 is a special year for Pilsen, as it plays a role as the European Capital of Culture of this year. It started from a pre-event in 2014, and in 2015 various kinds of events have been taking place almost daily, making the town bustling with life each and every day. The year 2015 is a year of major milestones and a special year in Europe, as it is the 70th year since the end of World War II, or liberation from Germany, and also the bicentennial since the Napoleonic Wars. In this important year, Pilsen was selected as the European Capital of Culture, sending a strong message on its traditional culture and history and future vision.

The concept of European Capital of Culture was advocated by Melina Mercouri, Minister for Culture at the time in Greece, in 1985. The main purpose of the event is to share the history and culture of cities among EU member countries, and to contribute to the continuous development of each city. Originally it was called European City of Culture, and one city was selected annually among the EU member countries. A list of the host cities in the past is in

Table 5-1 Host Cities of European Capital of Culture

年次	開催都市(開催国)	年次	開催都市(開催国)
1985	アテネ(ギリシャ)	2003	グラーツ(オーストリア)
1986	フローレンス(イタリア)	2004	リール(フランス), ジェノバ(イタリア)
1987	アムステルダム(オランダ)	2005	コーク(アイルランド)
1988	ベルリン(ドイツ)	2006	パトラス(ギリシャ)
1989	パリ(フランス)	2007	シビウ(ルーマニア), ルクセンブルグ
1990	グラスゴー(UK)	2008	リバプール(UK), スタヴァンゲル(ノルウェー)
1991	ダブリン(アイルランド)	2009	ヴィリニウス(リトアニア), リンツ(オーストリア)
1992	マドリッド(スペイン)	2010	イスタンブール(トルコ), エッセン(ドイツ), ペーチ(ハンガリー)
1993	アントワープ(ベルギー)	2011	トウルク(フィンランド), タリン(エストニア)
1994	リスボン(ポルトガル)	2012	ギマランイス(ポルトガル), マリボル(スロベニア)
1995	ルクセンブルグ	2013	コシツェ(スロバキア), マルセイユ・プロヴァンス(フランス)
1996	コペンハーゲン(デンマーク)	2014	リガ(ラトビア), ユーメオ(スウェーデン)
1997	テサロニキ(ギリシャ)	2015	モンス(ベルギー), ブルゼニウ(チェコ)
1998	ストックホルム(スウェーデン)	2016	サンセバスティアン(スペイン), ワルシャワ(ポーランド)
1999	ワイマール(ドイツ)	2017	オーフース(デンマーク), ハボス(キプロス)
2000	ブラッセル(ベルギー), アビニョン(フランス), サンチャゴ・デ・コンポステラ(スペイン), ボローニャ(イタリア), ベルゲン(ノルウェー), クラクフ(ポーランド), ヘルシンキ(フィンランド), レイキャピク(アイスランド), プラハ(チェコ)	2018	ヴァレットタ(マルタ), (オランダ)
2001	ロッテルダム(オランダ), ポルト(ポルトガル)	2019	(イタリア), (ブルガリア)
2002	サラマンカ(スペイン), ブルージュ(ベルギー)		

Table 5-1. In the year of 2000, nine cities were chosen commemorating the millennium. At the moment, partly because of the increased number of EU members, each country takes turn in hosting the event. In 2015, Pilsen and Mons in Belgium were selected as the host cities. This event is run with large financial support by the EU, the government and community of the host country, and foundations and companies. According to the case examples of the host cities in the past, this event contributes to the city's subsequent development, as well as to economic success. Because of this, many cities desire to host the event and it is never easy to be selected as the host city. Being selected as a host enables the city to raise its profile, and by sending a strong message on its traditional culture and history, the city captures a great opportunity to develop much further.

At the beginning, European Capital of Culture had been cities that represent the host country or where historically well-known, such as Berlin, Germany. However, since after 2000, cities anticipating economic development have been taking a role and by countries taking turns among EU members.

5-2 Significance of hosting the 2015 European Capital of Culture, Pilsen

Pilsen has been flourishing since the old days as a city of industry and beer. Pilsen has an abundance of groundwater and is located at the confluence of four rivers in the city centre. Incorporating the blessing of nature and craftsmanship, manufacturing has been developing in Pilsen through the ages. The city also has an aspect of a culture city, with the fact that Pilsen is the first place in the world to develop a puppet show into popular culture, and puppeteers from all around the world had visited the place. In addition, Pilsen has very unique history. As one example, Pilsen was liberated mainly by the hand of the United States and western countries, whereas Prague was liberated mainly by the Soviet Union. Therefore, Pilsen has an atmosphere a little different from that of Prague and Slovakia. Having such backgrounds, Pilsen was selected as the second European Capital of Culture in Czech Republic following Prague, and shows a strong presence as a city symbolising democracy. Not only sending messages on its unique history and cultural heritage, Pilsen has also been demonstrating its new potential as European Capital of Culture, by sending a strong message of creative values that arise from its heritage, as you can see in the collaboration of Czech artists and artists from overseas, comparison of old traditional culture and new art,

and techniques to harmonise nature and life.

Regarding the details of the events of European Capital of Culture, many plans in various fields are held all over the city, such as plays, dancing, displays, movie shows, live music performances, presentations, and various kinds of communication events. On the other hand, many projects are also organised. As an example, on 'Flagship project: Imagination Factories', more than five companies collaborated and opened their facilities to the public as creative spaces. These projects clearly show that the success of Pilsen as an industry city is related to openness, creativity, and an environment to nurture art and education. There are plenty of other projects put on during this event. To get further details, please look at the web-site. (Fig.5-1, 2)



Fig.5-1 Poster of 2015 Plzen European Capital of Culture



Fig.5-2 The Opening Ceremony of 2015 Plzen European Capital of Culture

5-3 Sense of Affinity Felt at the ‘Japan Fest’

As one of the main events for the European Capital of Culture, to my delight, ‘Japan Fest’ is held in 2015. As you can see in Table 5-2, many Japanese people participated in the event to advance cultural communication. For example, ‘Light Festival Pilsen’, the 5th in the table, is an event where ten artists of Light Art exhibit pieces of work and displayed those works at the river bank of the largest rivers of the four rivers which flow through Pilsen. (Fig.5-3) Among those works, there were two pieces made by Japanese artists. At this event, you can enjoy works such as works in which the nature of the river and river bank were incorporated, and works which utilised light and space and displayed in the church, on the bridge or in the company. Japanese works were quite popular with a warm and soft image, being displayed among energetic western works and the latest projection mapping displayed on the wall of the museum. Although this event starts after dark in the evening and it takes more than three hours if you look through leisurely, the site was bustling with spectators, each enjoying walking along the riverside and light art. The 19th entry in the list in Table 5-2 is ‘Kawamoto meets Trnka in Pilsen

again’. This event is a joint work of a leading Japanese puppet maker, Kihachiro Kawamoto, and a Czech puppet maker and director of puppet animations, Jiri Trnka – both of them have already passed away. Mr. Kawamoto moved to Czechoslovakia in 1963 in order to study under Mr. Trnka, and developed a deep relationship with him. (Fig.5-4) Not only limited to this example, cultural communication between Czech and Japan has been advanced on a deep



Fig.5-3 The Light Festival

Table 5-2 Events of Japan Fest

	イベント名	開催日
1	京都交響楽団コンサート in Pilsen	2015.6.3
2	OPEN A.i.R. Pilsen Artist in Residence (Kyogo Matsumoto 他)	2014.7~2015.12
3	Czech Dance Platform Tanec Plzeň (Yukio Suzuki, Chinami Gentsu, 3 Japanese dancers)	2015.6, 7, 8, 10
4	Art Camp 2014 & 2015 (10 young artists and teachers)	2014.7, 2015.7
5	Smart Illumination Light Festival Pilsen (Light art artists, Cooperation with Zou no hana)	2015.2
6	Shoko Kanazawa Borders of Loneliness (書家Shoko Kanazawa) Accompanying exhibitions: Karen LaMonte- Ceramic and glass plastic of kimono	2015.9.11~2015.10.11
7	Japan – everyday festival Photography project (Daniel Šperl (main disciple of Jindřich Štreit))	2015.1, 9
8	Photograph Exhibition “European Eyes on Japan / Japan Today vol.17” in Mons2015 & Pilsen 2015 –European Capital of Culture	2015.10~2015.11
9	Shogi (将棋) International Shogi Popularization Society (Madoka Kitao and Manabu Terao)	2015.6.5~2015.6.7
10	映画祭 2015 (Festival of Japanese Film and Culture, Main guest: Takita Yojiro, Film Director)	2015.3.5~2015.3.11
11	WA WA project (Tohoku support program by artists exhibition “Making as a living”)	2015.9~2015.10
12	姉妹都市の高崎市による25周年記念プロジェクト(書道、茶道、生け花、盆栽など)	2015.9~2015.10
13	書道	2015.1.1~2015.7.6
14	狂言(茂山家)	2015.6.5~2015.6.7
15	Contemporary Dance Project (Ryuzo Fukuhara – Touch of Life/Nanohach – Suna no Onna)	2015.6.20~2015.6.26 2015.7.13
16	International Bonsai exhibition	2015.6.5~2015.6.7
17	Ryoji Ikeda – Test Pattern [N° 8]	2015.7.3~2015.8.16
18	合気道	2015.8, 9
19	Kawamoto meets Trnka in Pilsen again again	2015春
20	International Puppet Festival (Nori Sawa)	2015.9.3~2015.9.6
21	Manga & Animation Workshop/Animanie Festival Keiichi Hara “Miss Hokusai”	2015.11
22	落語(落語家 入船亭扇辰)	2015.7.8
23	Farm in the Cave	2015.2, 11



Fig.5-4 Kawamoto meets Trnka in Pilsen again

level since long ago. Likewise, Pilsen has been showing that culture nurtures technology and engineers. It could be said that Pilsen is demonstrating its possibility as a new European capital of culture, and this is realised by the very reason that Pilsen has a unique history and traditional culture and the generous and creative character of the people.

Chapter 6 : Stone House and Heating Technology

6-1 House made of Bricks and Stones

In the story of the Walt Disney animation 'The Three Little Pigs' in 1933, one of the three little pigs built a straw house, one a wood house, and the other a brick and stone house. While the straw and the wood houses got blown away by huffing and puffing of the wolf, the brick and stone house stayed as steady as a rock. At the end of the story, the wolf tried to come inside through the chimney, but the pigs dropped the wolf into boiling water and drove him away. As seen in this short story, you can see the presence and level of trust in brick and stone houses in Europe. Although they take longer to build, brick and stone houses have reached through the Central Europe as safe and comfortable houses. (Fig.6-1, 2)

In Czech Republic, a house built with piled-up brick and stone is the main stream building material, as it is in other countries in Central Europe. It is a traditional building method used by since long time ago. As well as old churches, cathedrals, and castles, common residential house, buildings, and apartment houses are basically made of piled-



Fig.6-1 A Stone house and A brick house of the Czech Republic



Fig.6-2 State Castle and Chateau Český Krumlov



Fig.6-3 Enlargement of a building

up bricks and stones. Common residential houses are plastered with cement on top of the piled-up brick structure. When a house becomes dilapidated and the plastered cement on the surface comes off, people can still live in the house for a long time as the brick used for the basic structure has considerable durability. As seen in Figure 6-3, when they

add the upper floors, bricks are piled up first and the surface plastered, reviving the building like a new construction.

6-2 Heating Technology

The Czech Republic has four distinctive seasons. As to the temperature, in Pilsen as one example, it is generally a little colder than Tokyo by 5 degrees C to 10 degrees C, but has many days of over 30 degrees C in summer time. However, because of the lower humidity, it does not become sultry as in Japan. Precipitation of the country is lower than in Japan. As the direction of the wind when it rains is almost always same all around the year, the directions of rain blowing in and not blowing stays the same, allowing you to leave the windows open on the side in which the rain does not blow in. If the windows on the both sides are open on a sunny day, moderate air blows inside the house. If you open the windows on the stairs, near the front door or a skylight, comfortable cold air, or warm air in wintertime, blows inside carrying the cold or the heat stored in the stones in the walls and floors. Indeed, it is a natural and comfortable air conditioning. Also, most houses have a small segmented room to store beer and vegetables such as potatoes and onions. Often times this little room has a small window on the wall in the direction which rain does not blow in, and by leaving this window slightly open or shut, you can keep the temperature and humidity about the same throughout the year. This is indeed a wonder of a stone house. In this way, natural energy is utilised for the cooling and ventilation system, air conditioning is mainly for heating. In Czech Republic, air-conditioning of vapour compression type, a commonly used type in Japan, is not so popular. Some of the reasons of this are; 1) air-conditioning is expensive, 2) cooling is not needed, and 3) natural gas is used for political reasons. As to the first reason, since air-conditioning makers including Japanese companies, have been developing marketing strategy focusing on the high-class goods, people have a fixed image that air-conditioning is expensive. Also, from the aspect of energy saving, heat-pumps are more desirable. Heating systems are mainly local heating, and most of them use a radiator under the window with circulate heated water from a boiler. (Fig.6-4) This system is used also in many large sized building and factories, where a huge boiler heats water and the water is delivered to multiple sites.

In old days, huge ceramic wood stove were used, and you can see these stoves as they were in many castles including the Cesky Krumlov Castle. (Fig.6-5) A wood stove is placed in the corner of the room and there is a space made



ラジエターには、天然ガス焼きボイラーで造られる温水が循環している。

Fig.6-4 The Typical Radiator



背面には壁越しに薪をくべるスペースと煙突がある

Fig. 6-5 Ceramics Firewood Stoves

for a fire watchman to work between the rooms. Even in recent times, ceramic stoves are used, but in the urban areas, natural gas stoves have been replacing wood stoves. In any case, chimneys are essential in the Czech Republic. Since a long time ago, chimneys were lined up above the roofs. Talking about the chimneys, although Japanese classical belief on Santa Claus is that he comes in from the chimney and delivers presents, I heard that in the Czech Republic he comes in through a window.

6-3 The Czech's Character – Make Everything Themselves

In the Czech Republic, many people have a weekend house, kind of small cottage to spend the weekend. (Fig.6-6) They are normally built in a beautiful place such as at the river bank, lakeside, or in the forest in the distance within about a one-hour drive from home. Typically, a weekend house has a small kitchen, small bedrooms and an underground shed, with a garden to plant flowers and fruit trees. People come here to spend a relaxing time enjoying barbeques and gardening with friends, or reading books. Most of the things there are built themselves – they build the shower room, kitchen, bedroom and also the fence



Fig.6-6 A beautiful Weekend House

between the neighbours. It is not a rare case that people just buy an apartment floor and build most of the interior trim and facilities in the room themselves. Therefore, it is common to see the front doors in an apartment house that are completely different from each other in size and colours. This shows how manufacturing has become established as one of the pleasure in the life of Czech people.

Chapter 7 : Pilsner – Beer Created by Craftsman's Enthusiasm in Pilsen

7-1 Pilsner – Beer Born in Pilsen and to Boast to the World

Do you know that the Czech Republic is the country of the highest beer consumption in the world? The Czech drink beer at the rate of 160 litres per person in a year, compared to 50 litres in Japan, even though Japan seems to have many beer drinkers. Also, the most consumed type of beer in the world is clear golden coloured beer called Pilsner, which has its origin in Czech.

There are many beer breweries in the world, and the most produced and overwhelmingly supported beer is the Pilsner type. Classified in terms of the fermentation procedure, Pilsner belongs to lager, or bottom fermentation style. Most of the Pilsner type beer has a label with the writing of 'pilsner' or 'pils'. This type of beer has a feature of moderate bitterness and is easy to drink. The main type of the four major Japanese beer brands is also Pilsner types. It is indeed the most loved beer in the world. Pilsen (Plzeň in Czech), an industrial city in the Bohemian region of Czech, is named Pilsen in German. As you can easily imagine, Pilsner beer around the world has its origin in Pilsen.

In Pilsen, beer brewing has been taking place since around the 13th century. Although beer brewing started before that time in Europe, the main type of beer was ale or

top fermentation type which is fermented at a temperature of around 20 degrees C. As the high fermentation temperature causes the growth of bacteria, the beer tended to become sour or easy to go off. To deal with these problems, various ideas such as using a large amount of hops or raising the alcohol content were used in brewing. In Munich, Germany, an attempt to brew in wintertime was made in order to suppress the growth of bacteria, and had come to produce lager or bottom fermentation beer by low temperature brewing. However, it was difficult to produce constantly stable high-quality beer. (Fig.7-1, 2)

At that time, in Pilsen, many small- scale breweries were producing beer. By 1842, some of those breweries dominated by Pilsen citizens founded a brewery company in order to produce constantly stable high-quality beer. For this purpose, they needed to build a modern brewery actively making use of the latest technology such as the steam engine, gas lights, electric lights, and telephone lines. They hired Josef Groff from Vilshofen, Bavaria as the first brewer, and invented the beautiful Pilsner Wilkel, a clear golden-colour beer with sharpness in the taste. This is the original of today's pale gold beer. I could possibly say that



ブルゼニスキュー・ブラズドレイ醸造所のゲートは、ブルゼニスキュー市のシンボルとなっている。

世界に誇るピルスナー・ウルケル

Fig.7-1 The gate of The Brewery



1900年頃のブラハ→
ビールは古くから生活に
欠かせないものであった



1:Josef Groll
2:1840年秋の醸造所
3:1928年の醸造所の修復工事

4:初期の頃の馬車によるビールの配送
5:鉄道の利用はブラハ・ババリア(1861年~62年)、ブルゼニスキュー(1870年)に始まった
6:1932年の頃、52台のトラックで配送していた

Fig.7-2 Pictures of The Brewery from the 19th to the 20th Century

this great invention was attained by the perfect combination of enthusiasm of Czech craftsmanship and the blessing of nature in Pilsen. Pilsen has all kinds of essential elements such as sand-stone cellars to allow low temperature brewing through the year, pristine soft water, and high-grade barley and hops, and combined with enthusiasm of Czech's craftsmanship a new thing was created in exercising their ingenuity.

7-2 Underground Passages in the City of Pilsen

In the city area of Pilsen, there are extensive underground passages stretching for 20 kilometres and looking like an underground city. The oldest part was started to be constructed around 976. Besides the main buildings such as churches and water towers along the riverbank, residential houses, shops and restaurants are also connected by the underground passages. This makes it possible for go around the township without going outside. Since there is food provisions stored and a pumping system to extract water from the Mze River and Dadobuza River in the underground passages, people could live without concerns about food and water. A part of the underground passages is an underground museum, and you can make a visit to look around. There are many wells providing good soft water that is rare in Europe. You can drink fine water from the taps in Pilsen. The perfect water for making Pilsner beer was only available in Pilsen. This underground passage is also used as a natural refrigerator. In old times the passage was used to store the beer by bringing ice in. It is also provided a stable environment for low temperature fermentation. The Bohemian region, including Pilsen, is rich farming land and produces high-quality barleys and hops for brewing as well. (Fig.7-3)



Fig.7-3 Plzen City for The Pilsner Beer

7-3 Plzensky Prazdroj Brewery

In Czech Republic there are many beer breweries and various kinds of local beers are produced. Some small-scale breweries also set up and run restaurants and resort inns, and some of them even have a beer spa where you can bathe in the beer. The largest and most famous brewery is Plzensky Prazdroj Brewery. Pilsner beer created by Josef Groff is now registered as a trademark under Plzensky Prazdroj or Pilsner Urquell, with A SAB Miller plc Company as its holder. Pilsner Urquell was founded in 1842 and produces nine lines of product in all, including Pilsner Urquell, Gambrinus, and Velkopopovický Kozel. The brewery in Pilsen organises tours to look at the manufacturing factory and the provision storage. Traditional procedures have been kept and continued here. Beer is stored in many large wooden barrels and stored to age under the mid-winter temperature in the freezer in the underground storage, and tour participants can drink beer from the wooden barrels on the tour.

Recently, Plzensky Prazdroj Brewery has been actively



Fig.7-4 Plzeňský Prazdroj Brewery



Fig.7-5 Typical Traditional Czech Beer

sponsoring cultural events planned by the city and nation, and has been enjoying overwhelming support by musicians, artists, writers, movie directors, painters and photographers. The company has been also dedicatedly working on environmental problems, and has established itself as one of the leading major companies in Czech Republic where efforts to considerably reduce carbon dioxide emissions and improve the percentage of resource recycling have been implemented. (Fig.7-4, 5)

Chapter 8 : ETD TRANSFORMATORY – A Company that Carries on Czech’s Tradition and History

8-1 Overview of ETD TRANSFORMATORY

The level of Czech’s manufacturing technology has been always high since a long time ago. As indicated earlier, this is attributed as much to Czech’s historical background, culture and climate, and their national characters. This tradition has prospered into the modern industrial technology of the 19th century.

ETD TRANSFORMATORY, a.s. (ETD) is a company manufacturing mainly electricity transformers based in Pilsen, Czech Republic, and has been in business for 94 years in 2015. (Fig.8-1) The company manufactures single-phase transformers which support products with up to 1200MVA/420kV output, and three-phase transformers which support products with up to 410MVA/410kV output, and it covers most of the demand from the power stations and transformer stations in Czech Republic and Slovakia. The company also records large amounts of exports into the Euro zone. The company is a leading company developing its business into the Middle East, Russia, South America, and Africa, as the International BEZ Group. Representative products are transformers used at power stations and



Fig.8-1 Gate of ETD and Factory

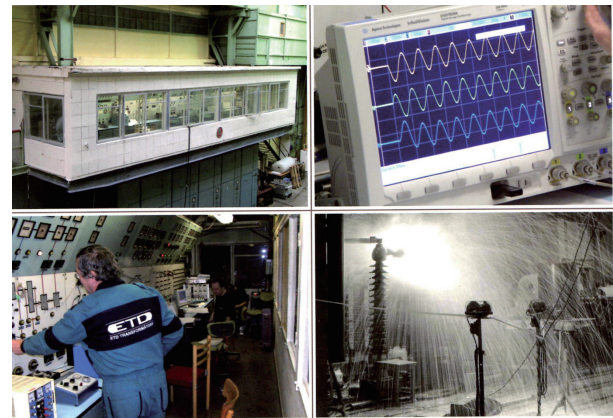


Fig.8-2 An electrical test laboratory

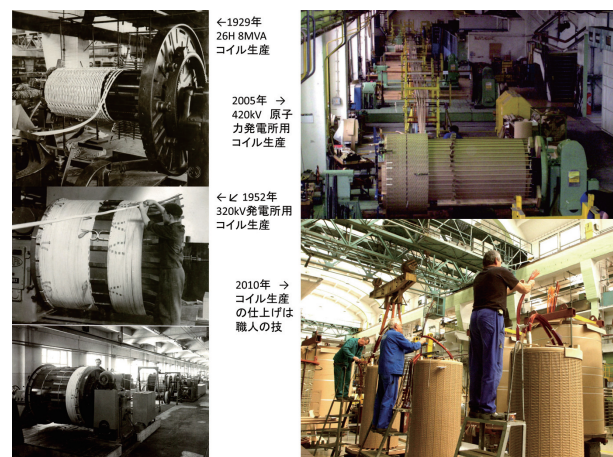


Fig.8-3 Winding manufacturing process

transformer stations, supplying huge transformers with oil-cooling systems by integrated manufacturing, according to requests from customers. The company is equipped with good test facilities and able to perform surge (thunderbolt) experiments. (Fig.8-2) Restoration and maintenance of decrepit transformers is also performed by them. The coils mounted on transformers are huge, and at the factory, the big lead wires are wound around a jig of cylindrical shape. The coil is wound in many layers and looks like intricately woven cloth, and finished by craftsman with remarkable skills using special jigs. Most of the formation process of the coils is done by machines, but some of the machines and the finishing of parts are performed manually. The company is of world standard obtaining not only ISO9001 and ISO14001 certificates, but also ISO1834-2 and ISO17025.

(1) From DC to AC

ETD has its origin as an electronic technology factory, which was built between 1918 and 1920, in a town in the south of Pilsen, Doudlevce, by a Czech company ŠKODA.

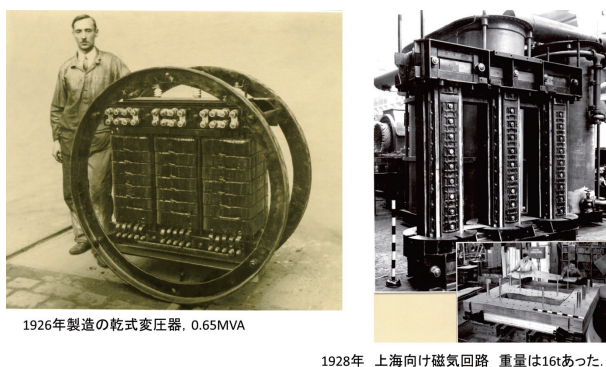


Fig.8-4 A transformer in the 1920s

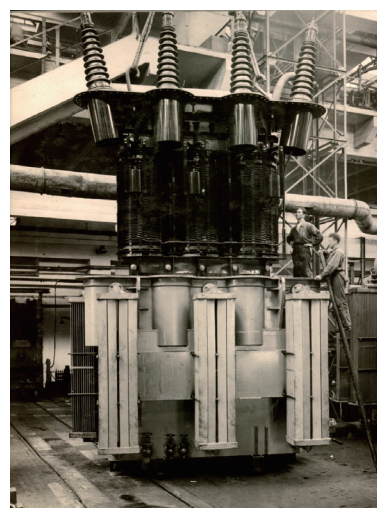
Since 1921, this company started to manufacture heavy electrical machinery, power-supply facility for trains, and power apparatus. (Fig.8-4) After the end of the World War I (1914 to 1918), this business contributed to bringing about the first full-scale electrification in urban areas, and started to supply alternating-current power. Before 1918, electricity was not commonly used, and, generally, low-voltage direct-current (DC) generators such as Dynamos were used in the villages. At the factory, private power generators were installed to supply the required amount of electricity. At that time, economical modern stable high-output power sources that were easy to use had been in demand. However, there were not many engineers in this field in the country, and it was a rocky path to realise success. Around that time, the convenience and economy of AC generator was re-evaluated and ETD quickly respond to the large output power demand by using AC generators. Transformers produced by ETD realised the long-distance power transmission to develop electrification.

(2) Realisation of Large-Output Transformers of Various Types

Entering the 1930s, ETD had expanded its markets at home and abroad. As a result, the company started to produce various types of transformers according to the customer's request, along with standard types. Around this time, the company was producing transformers of 100kV, 15 (10) MVA class for the power station in Moravia. This type of transformer can support 100kV, 23kV, and 6.3kV output under 10MVA. The 100kV class product became ETD's major line, resulting in promotion of high-output power supplies. For transformers of over 32MVA class, a cooling system utilising oil was adopted and the 40MVA class was equipped with a ventilating system. (Fig.8-5)

(3) Transformers during World War II

World War II, which lasted for six years from 1939, had



1931年 110/22 KV, 6 MVA

Fig.8-5 A transformer in a Tank

no small effect on ETD. During the war, there was a restriction on provision of copper which was used to make the windings and this impaired the production of transformers. In 1942, ETD used aluminium instead of copper due to lack of resources, and succeeded in producing transformers of 1250kV class. This product was made in the same sizes as the previous types except for the windings, with consideration of their versatility, and they were reported to have had 80% performance. This experience was utilised in techniques to connect copper and aluminium windings. Then, it became possible to perform variable outputs by using the on-load tap charger (OLTC), leading to production of three-phase transformers for use in power stations.

By the way, the scenery and life style in and around Czech Republic during World War II is truly depicted in the Czech movie 'Dark Blue World' which was produced in 2001. You will be able to see how it was like around that time from this movie.

(4) Post-War to Today

While ŠKODA had been producing electric locomotives since before World War II, transportation networks of trolley buses and railways started to develop in the post war time. In the 1960s, while the demand from domestic electric railway companies increased, the export to member countries of Council for Mutual Economic Assistance (COMECON) had risen. Entering the 1970s, the use of 420kV variable transformers became common, enabling the company to respond to the demand for the fossil fuel and nuclear power plants within the COMECON region.

During the 1990s, Czech Republic experienced dramatic changes yet again. Starting with the Velvet Revolution in 1989 and collapse of the communist regime, the country departed from the socialist system in 1993 and Czechoslovakia separated into Czech Republic and Slovakia. This brought about a dramatic change in the market structure and privatisation of ETD. ETD implemented structural reforms including dividing the company into each specialised organisation. Subsequently, ŠKODA implemented several structural reorganisations that remain to this day.

While ETD went through two World Wars and several political changes, it has continuously supported the industrial technology and the life of the people of Czechoslovakia and Czech Republic over 100 years to this day. Even though, since a long time ago, Czech Republic and Slovakia Republic have gone through many hardships, EDT has stayed in the business in the same building as it did at the time of establishment, and kept manufacturing high-quality products. This is probably due to the high quality of the products produced by technology ahead of the times and the superb skills of engineers in manufacturing, as well as the efforts made by management. This tradition can still be

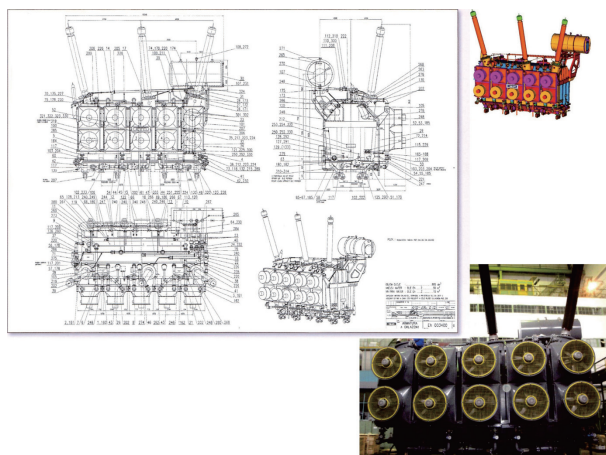


Fig.8-6 A 330MVA Transformer in 2011



Fig.8-7 ETD Engineers at the 90s Anniversary Foundation (2011)

seen in many Czech companies. (Fig.8-6, 7)

Chapter 9 : The University of West Bohemia

9-1 Overview of the University of West Bohemia

The University of West Bohemia has a strong presence as a knowledge hub with its integration of Czech tradition and innovation. (Fig.9-1) The university was established by merging The Institute of Technology and The College of Education in Pilsen, by the Czech National Council in 1991. Since it was 1993 when Czechoslovakia was dismantled to form Czech Republic and Slovakia Republic, the University of West Bohemia is one of the universities that represent Czech Republic born in the middle of the democratisation of the country. The Institute of Technology before the merger in Pilsen was established as a branch university of The Czech Technical University in 1946, and became independent as a university in 1953. Since it was 1945 when Czechoslovakia became independent after the end of World War II, the university obviously played a significant role in the social development after the war. In 1960 the Faculty of Mechanical Engineering and the Faculty of Electrical Engineering were set up, and promoted rapid improvements in basic technology for society by fostering many engineers. In 1990, immediately after the Velvet Revolution, the Faculty of Applied Science and the Faculty of Economics were set up. It seems that the faculties that were needed by society were added to the university by linking to their historical background. (Table 9-1)



Fig.9-1 University of West Bohemia

Table 9-1 Departments in faculty of mechanical engineering

Department of Power System Engineering
Department of Machine Design
Department of Material Science and Technology
Department of Industrial Engineering and Management
Department of Machining Technology
Department of Physical Education and Sport

Currently, the West Bohemia University has nine faculties; Applied Science, Economics, Electrical Engineering, Philosophy and Arts, Education, Mechanical Engineering, Health Culture, Applied Language Studies, and Ladislav Sutnar¹⁾ Art and Design, two research centres, more than 60 departments, and a division for promoting technology innovation with business-academia collaboration. Around 14,000 students are enrolled; doctoral students and international students are also actively studying. The internship program and exchange programs are well-developed and actively sending many researchers and students overseas, including international conferences. Many business companies are collaborating with universities, literally supporting the technology country, Czech Republic. (Fig.9-2)



↑ 学生食堂は、ボリューム満点の食事を ↑
格安で食べることができます。
スイーツメニューも充実しています。

ブルゼニューを中心とした喫茶店 ↑
のチェーン店「Cross Cafe」が機械
工学部棟にあります。
店内はゆったりとした吹き抜けで、
学生や研究者達の活発な議論と
談笑があちこちから聞こえてきます。

Fig.9-2 The Restaurant and The Cafe at UWB

9-2 Introduction of Faculty of Mechanical Engineering

(1) Regional Technological Institute - RIT

Regional Technological Institute (RIT) is set up to promote four main projects: (1) research on the latest vehicle structures and driving gear; (2) research on advanced machine tools; (3) research on forming techniques; and (4) research and development of machining techniques. The institute is consisted of 10 research centres and laboratories equipped with cutting-edge technology. With RTI as a core, many programs of business-academia collaboration are undergoing, actually bringing technological innovation to many fields such as tram cars and processing techniques. Dr Filip Tikai, a friend I admire, is a specialist in computer modelling and CAE. He is specialised in the practical structural analysis in casting and heat treatment processes, and has a number of achievements in research results in collaborative projects with researchers and companies from the EU countries such as Germany and Austria. (Table 9-2)

(2) Laboratories to Cover a Wide Range of Fields

The Faculty of the Machinery Engineering is composed of six departments, which have many laboratories covering a wide range of fields. (Fig.9-3) The laboratory I had been working in is the Department of Power System. Ms. Katarina Ratkovská, a friend I admire, is an excellent doctorate researcher specialised in hydraulic engineering.

Table 9-2 Laboratories in RTI

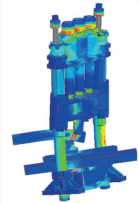
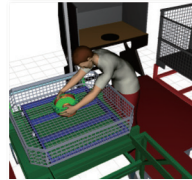



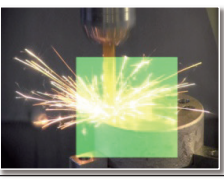

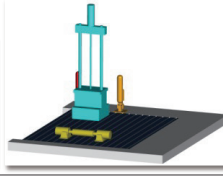

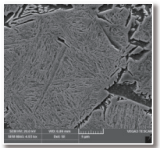
Virtual Prototyping Shop 	Manufacturing Technology Planning Laboratory 	Experimental Forming Laboratory 	Experimental Machining Laboratory 
Metrology Laboratory 	Laboratory of Experimental Methods for Mechanical Engineering 	Strength and Fatigue Life Testing Laboratory 	Transport Vehicle Components Testing Laboratory 
Mechanical Testing Laboratory 	Metallographic Laboratory 		



Fig.9-3 A view of a laboratory

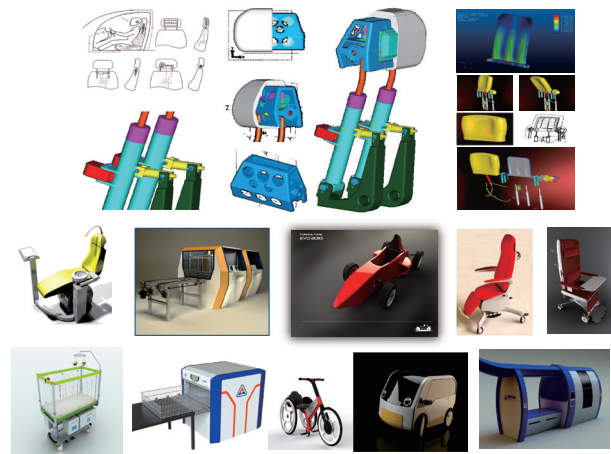


Fig.9-5 A practical design example full of originality



Fig.9-4 A laser analyzer and a wind tunnel



Fig.9-6 A view of Lecture

Ms. Ratkovská loves jet engines, and she conducts experiments using a wind tunnel and laser beams, to accurately specify the location of energy dissipation by image analysis. (Fig.9-4) Her work on the optimisation of the aerofoil shape and the related computer analysis technology is also useful for student's training experiments, and she teaches the students in her faculty every week, using her self-built experiment equipment and analysis programs.

Prof. Stanislav Hosnedl of the Department of Machine Design has worldwide proven records in design methodology, and is one of the scientists I respect. Among many business-academia projects, he has been creating a new value full of originality. (Fig.9-5)

As seen above, many local business organisations cooperate in university research projects, and the university students also participate in practical research projects. The University of West Bohemia and its faculties and research institutes are the places that contribute to local society and



Fig.9-7 A Finding employment fair

the place desired for collaboration by local companies. (Fig.9-6, 7)

9-3 The International Office

The University of West Bohemia is a very attractive university. Many people might have become interested in the university. The university has an International Office



Fig.9-8 International office of UWB

which facilitates international communications in general, including organising international communication programs, overseas study programs and exchange programs for international students, language courses, summer schools, and the support for researchers from overseas. You can also see the photos of exchange programs for international students on the web site. (Fig.9-8)

Chapter 10 : Casting Technology and Tank Museum

10-1 Czech Precision Forge (CPF), Development from ŠKODA

Czech Republic receives high recognition for its heavy industry and high industrial technology. As an example, Germany and the Soviet Union had been using many Czech-made army tanks. Also, it is said that the parts of engines and steering gears of a Japanese battle ship, the Mikasa, were also Czech-made products. A leading Czech company, ŠKODA, is based at Pilsen, and was one of the major companies in Europe during the 19th and 20th centuries. The company produces heavy industry machining parts such as military arms, including tanks and gun barrels, trams and locomotives, aeroplanes, ships and ship engine parts, automobiles, power plant facilities and steam turbine, and machine tools. Under the communist state rule after World War II, it was separated and nationalised, and then privatised again after the Velvet Revolution. Currently, the company is divided into four major organisations, and although partly financed by foreign capital, it is still enjoying a reputation as the country's leading company in heavy industry business. The Czech Precision Forge (CPF) has its origin among the transition of ŠKODA, derived from the casting division founded by Emil ŠKODA in 1882. (Fig.10-1) CPF produces machining parts as its major products, using die casting and mold casting methods. In 1906, CPF started to manufacture



Fig.10-1 CZECH PRECISION FORGE (CPF)

artillery, and started manufacturing the parts of mold and die for automobiles after merging an automobile, bike and motorbike manufacturing company, Laurin and Klement Company in 1925. Later in 1937, CPF was amalgamated with a German arms manufacturing company. Although the company had rehabilitated from World War II and modernised in 1947, it was nationalised under the communist rule the following year. After the Velvet Revolution in 1993 the company become privatised and transformed to the current CPF in 2003. Besides manufacturing forged products made of steel, aluminium alloy and copper alloy, the company does mold manufacturing and heat treatment. A forging machine of more than 80 year-old is still operating at full capacity at the factory, manufacturing huge connecting rods and bearings, making a bustling loud noise. Although ŠKODA has been playing a central role in the Europe's heavy industry since the beginning of 20th century both nominally and virtually, the name of ŠKODA seems to be little known in Japan. However, it is no exaggeration that it was ŠKODA and its affiliated companies that have been firmly supporting companies in Europe including Germany. Even the Nazis were relying on ŠKODA's technology, and the Czech's traditional technology that many foreign companies rely on is Czech's pride. In the factory's warehouse, products for Ukraine, Russia, and various other countries in Europe were piled up waiting for delivery. From what I heard, those vessel parts for Japan are sometimes shipped to Kobe port. (Fig.10-2, 3)

10-2 Introduction of the Tank Museum

(1) Overview of the Tank Museum

The Tank Museum, or formally, the Museum on the Military Demarcation Line, is located in a suburb of Pilsen,



Fig.10-2 Free Forging



Fig.10-3 Die Forging

about a 30 minute-drive from the city. Putting aside about the location for later, the outline of the place is as below. At this tank museum, the first tank that appeared in World War I is displayed. The fortress and the fences that were actually used have been preserved, and some part of the construction is open to the visitors to enter and look at. Also, there are displays of the state at the time of World War II, and by looking at photographs, visitors can see what life was like back then. The tanks are left intact as they were at the time for the visitors to see the transition of the tanks. There are arrays of military vehicles and tanks displayed, giving full impact to the visitors. Some of these vehicles were made by German automobile companies which are well known to Japanese, and some others were made in the Soviet Union. Among them are also Czech's tanks and German and Soviet tanks of Czech-made. (Fig.10-4)

(2) Significance of the Location of the Tank Museum

The Tank Museum is located in slightly closer to Pilsen in the middle of between Pilsen and Prague, the site where the



Fig.10-4 Tank Museum (VOJENSKÉ MUZEUM NA DEMARCAČNÍ LINII V ROKYCANECH)



Fig.10-5 A Parade of an anniversary of a Victory



Fig.10-6 The Ball Party

fence was built at the time. This is related to the historical background at the end of World War II and the liberation of Czechoslovakia. At this time, the allies led by the American army advanced towards the east from Belgium, and the Czechs moved from east to west while they became liberated. On the other hand, the Soviet army advanced from east to west. The allied army led by the Americans stopped around the place where the Tank Museum is and never

advanced further east afterwards, making this point the east end of the liberation by the American army. As a consequence, whereas Prague was liberated by the Soviet army, Pilsen was liberated by the America army. This difference had a great influence in later history. On the day of the Czech Release Anniversary or Czech Victory Day on May 8, due to being on the east side, the military parade of the American army of that time is held in Pilsen. (Fig.10-5) However, this is not the case in Prague, as the city was on the Soviet side. A strong influence of American culture subsequently continued in Pilsen. (Fig.10-6)

Chapter 11 : Development of Japanese Affiliated Companies in Czech Republic

11-1 Overview of Daikin Industries Czech Republic s.r.o. (DICz)

Daikin Industries Czech Republic s.r.o. (DICz) was founded in Pilsen, Czech Republic in 2003, with 50% capital from Daikin, and 50% capital from Dikin Europe (DENV). (Fig.11-1) At the time, there was a large area of land at the former site of military airport, and efforts to attract business companies had been ongoing. In this area, various companies including Japanese affiliated companies such as DICz have built a base for production and distribution, forming a large industrial area. DICz is manufacturing air-conditioning products for Europe, putting out 500,000 outdoor units and 910,000 indoor units. DICz recorded sales of 50 billion yen in 2014, and has 800 employees including both the staff and the workers, with 200 staff members among them. In the European region, Daikin has been developing products with original specifications for Europe, differing from the Japanese specifications. Although in Czech Republic there is an impression that the air-heat pump systems are expensive, there is a growing interest in highly efficient heat-pumps



Fig.11-1 DAIKIN INDUSTRIES CZECH REPUBLIC s.r.o.

among Czech people.

11-2 Marvels of the DICz's Human Resources Development Program

The merits of having a business base in Czech Republic include the following: (1) availability of high quality staff and workers; (2) excellent access to major markets; and (3) a high incentive for investments. As to the first point, as introduced earlier in the article, Czech Republic is one of the major industrial countries in the world. Czech has not only cheerful people it also has excellent manufacturing skills in performing creative and elaborate work. As to the second point, as Czech Republic is located in the centre of Europe, the country has good access to the major markets in Europe. Regarding to the third point, subsidies are offered as an incentive, for example, for investment for metal molds and new refrigerants. Also, the country is taking various measures for improvement, such as development of domestic production of components, cost reduction, and creation of new technologies. (Fig.11-2)

Returning to DICz, the company is manufacturing 160 models in 9 lines, applying 'a one-piece mixed flow production system and a synchronised production or streamlined production system'. In order to apply these production systems, the standardisation of production order instructions is necessary. To realise large items in small-scale production, it is necessary to have a good training program for improvement of each worker's skills, and for raising awareness on safety and risk prediction. DICz carries on a training program called DOJO, which was developed based on the Japanese training system. (Fig.11-3) In this training, workers can learn safety issues through experience and improve assembly skills by practical training. This training has been attaining a high education effect. The Work Skill



Fig.11-2 An air conditioner production line



Fig.11-3 A view of company training

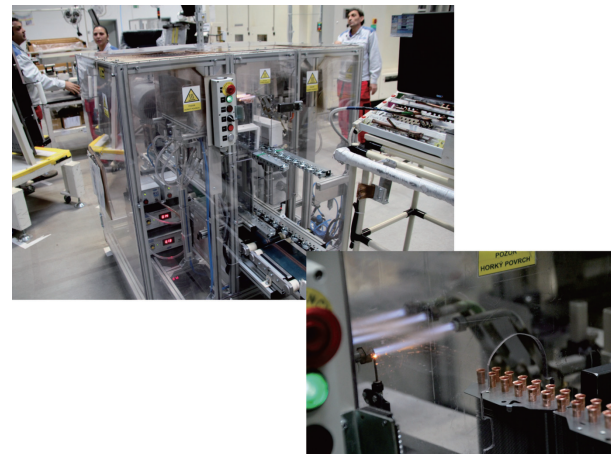


Fig.11-5 Hydrogen brazing



Fig.11-4 An ingenious device in a factory

Olympic is also held at the site of the Daikin's six affiliated companies in the Europe region, and the winners compete in the Global Work Skill Olympic held in Japan. Additionally, in order to foster Meister in work skills such as brazing, with collaboration with DENV, DICz facilitates participation in the intensive training program in Japan to foster their trainers. The company also organises a unique event named Karakuri (trick) improvement training. (Fig.11-4) At this event, various kinds of tricks with hand-crafted ideas, for example, equipment for the component delivery that works without electricity, by utilising the weight of pet bottles with water are set up in the factory. These tricks are ranked as the best 100 Karakuri. The factory has a pleasant feeling, filled with spontaneous, proactive and vibrant atmosphere.

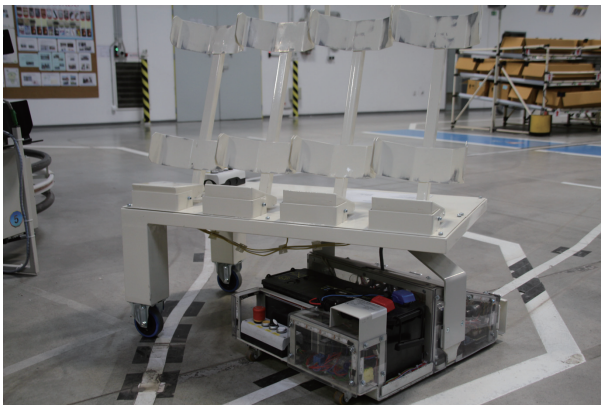
11-3 Developing Original Techniques

Czech Republic is playing a significant role as a development base as well as production base. DICz set up the European Development Center (EDU) as its sub office, to develop new models to better respond to the needs in

Europe. Europe is a region where the environment and greening are given a high priority. In 2010, DICz introduced pre-paint film treatment by zirconium which has been applied at automobile companies in Europe, and has achieved a reduction of sludge. DICz also has been making an effort in utilising solar energy and greening, and became identified as one of the Green Heart Factory, of the environment-friendly authorisation system organised with participation of all DIKIN group. Other than this, DICz has achieved reductions in the production lead time and reductions in financial investment, by increasing in-house production of components, and developing brazing techniques using hydrogen and a BOX style operation inspection equipment. (Fig.11-5) Also, by developing automation guided vehicles (AGV), the company successfully reduced investments cost by over 50% compared to when procuring vehicles in the market, and realised the introduction of AGV in the context of situation on the ground.

11-4 Collaboration with the University of West Bohemia and Communication with the Region

DICz has been actively collaborating with universities. With the University of West Bohemia, due to being located very close to the company, collaboration in multiple areas has been taking place since 2010, including employment, research and development, internships, and mutual cooperation in various events. Among those, achieving a significant result is organising the student's graduate work by selecting some issues in DICz as their thesis projects. This program has been contributing to the production technology at the factory, and the improvement of the production efficiency. Many different projects including 'digital factory', 'multi-directional pallet for brazing of



生産現場のニーズに合わせて西ボヘミア大学の学生が開発した「Smart AGV」.

Fig.11-6 The Original AGV produced by students

heat-exchanger', 'simulation program for component distribution', and 'robots for various tasks' had been carried out. (Fig.11-6)

DICz organises various events to deepen communication with the region. These events contribute to deepening the understanding of Czech's climate and culture and deftly integrating those elements into the company's business. This has had a great effect, resulting in the development of new lines of products and the improvement of production efficiency. Improvement exchange events are also organised with the Japanese affiliated companies in Czech Republic, including customers and cross-industrial factories in the EU region. At the improvement exchange events, presentations on improvements in the factory are made, and unfettered opinions among the engineers from the different fields are exchanged. Those events sometimes bring about unique ideas on improvements, or lead to finding new challenges. Although the investment by the Japanese affiliate companies is not large at the moment, after visiting DICz and developing relationships with the Czech people myself, I strongly feel the possibility of innovation in the context of this region.

Chapter 12 : Czech's Attractive Culture and Climate

12-1 World Heritage and Castles

Czech Republic still has many beautiful cultural heritage buildings. Although some were damaged by the ravages of war, helped by the support of EU reconstruction work has been gradually undergoing. There are more than a thousand castles and twelve UNESCO world heritage sites in the country. (Fig.12-1) For lack of the space, I have to leave out the introduction of details for later, but I would like to introduce some of them here.



13世紀に立てられたこの美しいお城はチェスケー・ブディエヨビツェ (České Budějovice) にあります
中は木製の美しい調度品や焼き物、狩りで仕留めた鹿の角などが飾られています.

Fig.12-1 Castle Hluboká



Fig.12-2 Castle Lednice

One of the heritage areas in Czech Republic is the Lednice and Valtice cultural landscape. (Fig.12-2) This beautiful castle is located in Morava, the region centering around Brno in the south of the country bordering with Austria. Around this area was also the site of a fierce battlefield, and has not yet been sufficiently developed. Therefore, the roads are narrow and there are no drive-ins for motor coaches to stop at. However, this could be the very reason why the beautiful scenery is preserved in this area. Since there is no fleet of coaches to bring groups of foreign tourists, the Czech-like scenery is intact. As this region is suitable for cultivation of vineyards enjoying a warmer climate than Bohemia region, there are many wineries of Morava wines scattered in this area.

12-2 Christmas Markets

On the last Saturday of November, the Christmas tree lighting ceremony takes place with a countdown, and a Christmas market opens in every city until 25th of



Fig.12-3 Christmas market at Plzeň



Fig.12-4 Christmas Marke at Prague

December. The Czech's Christmas markets are splendid and beautiful, attracting people from all around the world. In Pilsen, a competition of the decoration of Christmas trees takes place with many groups of businesses competing each other, and the winner takes charge in decorating the Christmas tree in the main square. Christmas markets are bustling with families and couples, drinking hot wine, warm honey wine called Medovina, and nibbling sweets called Trdelník. (Fig.12-3, 4)

12-3 Learning from Czech Republic

In this paper, I presented, by showing some examples, that people of Czech Republic have been adept at manufacturing since early times, and it is a leading industrial country with high skills today. Czech Republic is a member state of the Schengen Agreement and EU. The

country was subject to continual wars since the distant past, and was under the occupation of Austria, Hungary, Germany and the Soviet Union. Despite this historical backdrop, the country uses unique Czech Koruna as their currency and they speak Czech, not German or Russian, firmly keeping their own identity. The remarkable thing about Czech is not only the fact that they are highly skilled in technology and manufacturing skills but also: (1) Czech people basically love manufacturing; (2) Czech people cherish their skills and their workmanship; and (3) at the same time, Czechs foster successors and hand down their skills to future generations. Czech people are cheerful and loyal, and I am convinced that interaction with them leads to plentiful innovations. If you visit castles and Christmas markets in Czech Republic, you will definitely feel Czech.

I believe you will have a renewed recognition that there are plenty of things we Japanese people can learn from in Czech Republic, where culture and traditions are cherished.

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References

- 1) Ladislav Sutnar is an artist from Pilsen who was active in the mid-20th century.