

A CENTURY OF RAILWAY DEVELOPMENT – THE HONG KONG STORY

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SUMMARY

The aim of this paper is to give the reader a comprehensive picture of the development of the railway network in Hong Kong in the past 100+ years, from a single track railway to a network serving a metropolitan of over 7 million inhabitants.

It is mainly divided into two parts. The first part is a historical account of the development of the railway system, from the inception and construction of the first railway line, the Kowloon-Canton Railway (KCR), in the early 20th Century, to the present day network of 8 metro lines, still growing. Some of the significant dates and events in these 100+ years are mentioned.

The second part is a review of all the different S&T systems employed in the Hong Kong railways throughout the century. One can see the different stages of evolution from mechanical to electrical to electronic and finally computer-based systems. This is also the way our profession has evolved in the past century.

1 INTRODUCTION

Before going into the main story, it is appropriate to provide some background information on the position of Hong Kong in the setting of the whole world, especially in the relation between China and Great Britain.

Hong Kong is situated on the southern coast of China. It was first ceded by the Imperial Chinese Government (Qing Dynasty) to Britain as a colony in 1842, and the region further expanded by a leased territory in 1898. By the Sino-British Joint Declaration signed in 1984, Hong Kong returned to Chinese sovereignty on 1 July 1997. Of the 100+ years of railway development in Hong Kong, nearly 90 years are under British administration. So as one can readily see from this paper, there is a strong British influence in the systems employed and the way of operation of the Hong Kong railways.

2 NOTATION

The names of some Chinese cities and places mentioned in this paper have two different forms. The “old form” was used from early days up to the middle of the 20th century. The “new form” is the standardised form used after the establishment of the People’s Republic Of China, as the “Romanised” spelling of Putonghua. These are listed below for the benefit of readers.

Old Form	New Form
Peking	Beijing
Canton	Guangzhou
Shum Chun	Shenzhen
Kwong Tung Province	Guangdong Province

3 A CENTURY OF RAILWAY DEVELOPMENT – THE HONG KONG STORY

3.1 Beginning of the Railway Age

The beginning of the railway age was marked by the opening of the first railway in the world, the 9-mile (14.4km) long Darlington-Stockton Railway in England, which opened for service on 27 September 1825.

Since then there was a rapid growth of railway networks in Great Britain, Continental Europe, North America and the Indian Sub-continent in Asia.

However, there was a lag of more than 50 years before the first railway appeared in China. After several unsuccessful attempts by foreign companies to gain permission to build a railway, rejected mainly by the suspicious Imperial Chinese authorities, the first railway in China finally came into being – the 7-mile (11.2km) long Kaiping Railway near Peking (now Beijing) – on 9 June 1881. It was a standard gauge (1,435mm) line using steam locomotives, the first one being called the “Rocket of China”.

3.2 Inception, Construction and Opening of the KCR

Soon after the first railway was opened in China, foreign companies were more successful in obtaining concessions from the Imperial Chinese Government in the building of railways. One of them was the British and Chinese Corporation (BCC), a joint venture in Hong Kong, who got the concession to build the railway line from Canton (now Guangzhou) to Hong Kong.

Agreement was granted in May 1898, just one month before the British got the leased territory to the north of the city of Hong Kong (The New Territories). Preliminary survey commenced in the following year, and the route alignment fixed in 1901. It followed roughly a south-north direction within the territory of Hong Kong, entering Chinese territory at the town of Lo Wu, then gradually turning north-west before approaching Canton from due east. The total route length is 110 miles (176km), of which 22 miles (35km) is within Hong Kong.

This railway actually has two different names, depending which way you look at it. In Hong Kong, it is called Kowloon-Canton Railway (KCR), whereas in Canton people prefer to call it Canton-Kowloon Railway.

Although the survey and planning was completed in 1901, construction was delayed due to funding problem. After years of negotiations, it was finally decided that the section within Hong Kong (called the British Section) would be financed directly by the Hong Kong Government, whereas the section within Chinese territory (called the Chinese Section) would be financed by a loan raised by BCC in the market on behalf of the Chinese Government.

Construction finally started in 1906 for the British Section. Although only at 22 miles (35km) in length, the difficult terrain meant that progress was very slow. There were a total of 5 tunnels, of which the longest was the 2,400 yards (2,180m) Beacon Hill Tunnel, 48 bridges, 66 culverts and considerable sections of embankments along the shore.

Construction was completed after 4 years of hard work, and the KCR British Section was finally opened on 1 October 1910. The Chinese Section, although much longer, took less time to complete, with construction commenced in 1908 and opening on 5 October 1911. From that day onwards, passengers could enjoy uninterrupted through train services between Hong Kong and Canton.

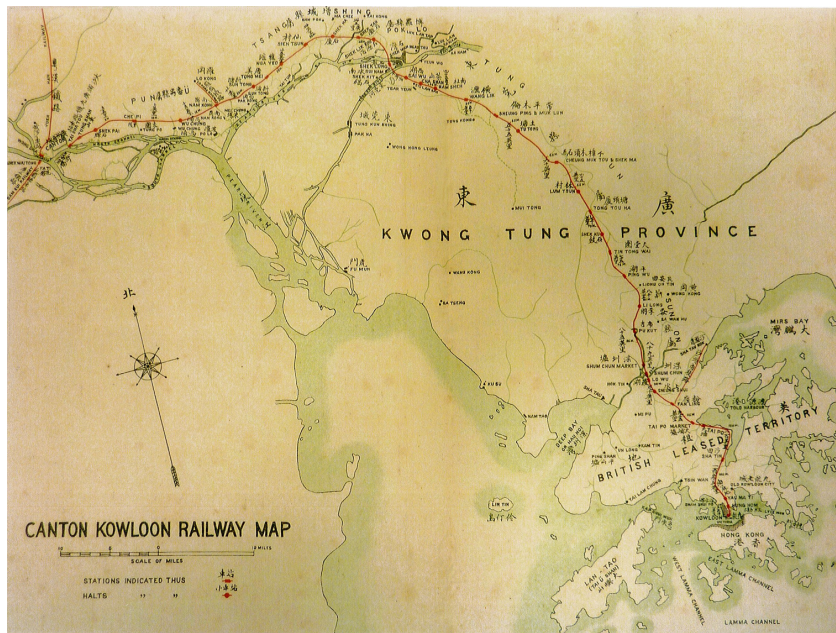


Figure 1: Canton-Kowloon Railway Map from the Annual Report of Canton-Kowloon Railway 1925

3.3 The Early Years – 1910 to 1941

The opening of the whole KCR line from Hong Kong to Canton on 5 October 1911 should have been a cause for celebrations. But this was not the case for the Imperial Chinese Government, which was overthrown by the Revolution Army led by Dr. Sun Yat Suen just 5 days later, on 10 October 1911.

The decades after 1911 saw continuous political instability within China, with warlords struggling for power, followed by the Japanese Invasion in 1937. Up to then, Hong Kong, being a British colony, was relatively unaffected, except for large numbers of immigrants from southern China fleeing the social unrest. The KCR continued to operate its domestic and cross-border services to Canton without much change. Because of lack of maintenance of the Chinese locomotives, British section locomotives had to cover the whole journey from Hong Kong to Canton from 1927 onwards until 1936, when new locomotives were delivered to the Chinese section with Hong Kong Government financial assistance.

The situation further deteriorated in 1938, when the Japanese invasion army captured Canton on 12 October, cutting off the railway line about 15 miles (24km) north of Hong Kong. Although Japan and Great Britain were not at war yet, the Japanese forces were standing guard right on the border of Shum Chun north of Hong Kong. Train services to Canton were completely suspended.

Three years later, on 8 December 1941, Japan declared war on Great Britain and attacked Hong Kong immediately. Within 18 days Hong Kong was completely overrun, and on 25 December 1941 (Black Christmas) Hong Kong surrendered to Japan.

During a short period of 16 years, 1912 to 1928, there was a narrow gauge (0.6m) 7.25 miles (11.6km) long branch line connecting Fan Ling to Sha Tau Kok. It was built with the left-over materials from the construction of the main line KCR, and operated by two works locomotives. However, with the opening of a new road on a similar alignment in 1928, patronage fell so much that the railway had to be closed.

During this whole period, the KCR had not changed at all. It was primarily a rural railway line running steam locomotive hauled trains, single track with passing loops at some stations, operated with mechanical signalling and station-to-station block working. One can compare it with a typical rural line in 19th century England.

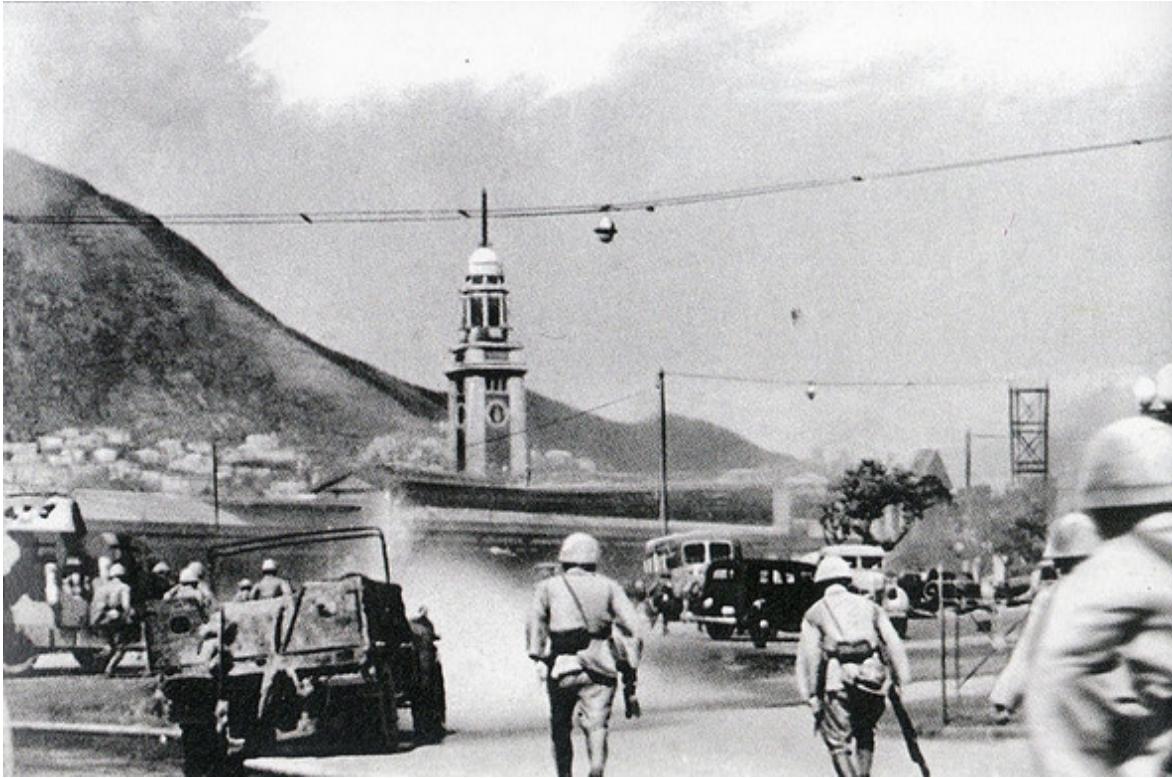


Figure 2: Japanese Forces Capturing Kowloon, with KCR Kowloon Station in the Background, 1941

3.4 Years of Social and Political Changes – 1941 to 1960

During the Japanese Occupation of Hong Kong, from December 1941 to August 1945 (known by Hong Kong people as "3-years-and-8-months") the railway was left to deteriorate. Expatriate employees of the KCR were rounded into detention camps, while local employees scattered or fled into mainland China. Much of the railway equipment and rolling stock were taken by the Japanese forces and used for military purposes, and subsequently lost.

When Japan surrendered in 1945, and British authorities resumed control of Hong Kong, the railway was in such a bad state that the military had to be called in to operate it. 12 military steam locomotives, called "Austerity", were acquired from the War Department to enable services to be resumed. Some of the original railway staff returned, and new employees recruited, to gradually take over the operation of the railway in 1946. Through train services to Canton resumed and everything was getting back to normal in 1947.

However, the normal scene was not to last long. Civil War in China broke out soon after the Japanese were gone, and by October 1949 the People's Liberation Army entered Canton, again suspending the through train services only a couple of years after its resumption.

Although Hong Kong, as a British colony, was not affected directly by the Civil War or the change in Chinese Administration, yet she was under extreme pressure as thousands of immigrants surged across the border every day. The KCR also experienced the pressure, because with Lo Wu Station at the northern end of the line as the only land border crossing point, this original railway line of the early 1900s was stretched beyond its capacity to cope with the increasing traffic. During peak seasons, e.g. Chinese New Year, tens of thousands of people were queuing up at the border crossing waiting to walk across the railway bridge into mainland China.

Change in the KCR started in the 1950s. First all the 12 military steam locomotives were replaced by diesel-electric locomotives. Starting in 1955, the complete replacement programme took 7 years, when finally in 1962 a fleet of 12 diesel-electric locomotives took over the operation of all trains.

However, the infrastructure remained unchanged, still the same single track line with passing loops. The use of new locomotives only ran the trains a bit faster, but did not help much in increasing the capacity of the line. Something significant had to be done to cope with the increasing demand.



Figure 3: Diesel-Locomotive-Hauled Train Approaching a Mechanical Signal on KCR, 1960s

3.5 Years of Rapid Railway Development – 1960s to 1980s

The continuous influx of immigrants from China in the 1950s swelled the population of Hong Kong to over 3 million by the early 1960s, resulting in the demand for accommodation and the associated transportation facilities rising acutely. The Hong Kong Government decided to develop several small communities along the KCR into “satellite” towns to accommodate the new comers, with the KCR taking up the responsibility of providing transportation to commute them back to the urban area.

The first step of change was to move the old Kowloon Station from the congested city centre to a new reclaimed site at Hung Hom, which was opened in 1975. As a result of the move, valuable land was released in the city for property development and community use. The only structure of the old station now remaining is the clock tower.

At the end of the 1970s, Sino-British relations improved and there was a breakthrough in the way of cross-border travel – resumption of the through train services between Hong Kong and Canton in 1979, after a suspension of some 30 years. Sir Murray MacLehose, Governor of Hong Kong at the time, boarded the first through train from Canton back to Hong Kong.



Figure 4: Resumption of Hong Kong-Canton Through Train Service, 1979

At the same time the Hong Kong Government decided to give the KCR a complete re-build – the Modernisation and Electrification Project. This involved double-tracking and electrification at 25KV of the whole line, rebuilding all existing stations and adding 5 new stations, a new fleet of electrical multiple units (EMU), new signalling, telecommunications and fare collection systems, and finally a new management – the KCR Corporation. The project started in 1978 and was completed in 1983, with the KCRC officially taking up the operations of the new railway in March 1983.

The new railway was totally non-recognisable when compared with the old. Just a few numbers of comparison – number of trains increased from 18 to 120 per day, train interval decreased from hourly to 5 minutes, journey time decreased from 70 minutes to 32 minutes.

Another significant change to the railway system in Hong Kong during the 1970s was the construction of the first underground railway. The idea of an underground railway system was first proposed to the Hong Kong Government in 1967, and further developed in 1970 as the “Hong Kong Mass Transit” report.

Approval was finally granted in 1972 and construction commenced in November 1975 for the first stage called the “Modified Initial System”, a total length of 15.6km. The Mass Transit Railway Corporation (MTRC) was also established in the same year. Both the KCRC and the MTRC were wholly owned by the Hong Kong Government, but operated on commercial basis under their specific ordinances.

In just less than 4 years after construction commencement, the MTRC opened its first line (section of Kwun Tong Line) in October 1979, bringing Hong Kong into the family of “Metro Cities”. Extensions of the network followed in succession without stop – opening the rest of Kwun Tong Line across the harbour in February 1980, Tsuen Wan Line in 1982, Island Line in 1985, and Kwun Tong Line Extension with the second harbour crossing in 1989. In a mere 10 years, Hong Kong had constructed 3 metro lines which together are termed the “Urban Lines” and form the backbone of the railway network within the city area.

Just to complete the family of railways, Hong Kong also constructed a new light rail system in the 1980s. In 1984, the KCRC was given the responsibility of building and operating a light rail system in the north-west of the New Territories, in the new towns of Tuen Mun and Yuen Long, which up to then had no railway access. The light rail

system was meant for short distance internal transport only, and would run on street level inter-mixed with other road traffic. The first stage was completed in 1988, with further extensions in early 1990.

So one can see that in the span of 30 years, Hong Kong's railway system has evolved from a single track rural line to a complete family of main line, metro and light rail systems.

3.6 A New Millennium – 1990 to 2012

Based on the backbone of the railway system formed in the late 1980s, Hong Kong continued to construct new railway lines in the 1990s right through the Millennium.

One of the biggest construction projects ever undertaken in Hong Kong was the building of a new international airport at Chek Lap Kok, to replace the old Kai Tak Airport in the city centre. The "Airport Core Programme", as it was known, consisted of 10 major projects, one of which was the construction of the Airport Railway. Other projects included the Airport itself, 2 new highways, 3 new bridges, an undersea tunnel, a new town at Tung Chung to support the airport, etc.

The MTRC was given the task to construct this new railway, known as the Lantau Airport Railway (LAR). It is 34km long, mostly on ground level, with 4 tracks except on the bridges and through the undersea tunnel. Construction started in 1994, and the line opened for service in 1998 at the same time as the new Airport. Two different services run on the new line : the Airport Express with limited stops on the way, and the Tung Chung Line metro serving the Tung Chung new town.

Immediately following on the Airport Railway, the MTRC started to construct another new metro line to the new town of Tseung Kwan O. The first stage consisting of 5 new stations was opened for service in August 2002, with a branch line to a new property development above the railway depot opened in July 2009.

At about the same time as the MTRC completed the Airport Railway, the KCRC started to construct the West Rail, a new line linking the north-west of the New Territories to the city centre, serving the towns of Tuen Mun and Yuen Long which had no railway access before. It is 30.5km long, with 9 stations, about half underground or in tunnels, and the rest (44%) on viaducts. Construction started in 1998, and the first stage opened for service in December 2003. A further extension, the Kowloon Southern Link (KSL) of 3.8km and two stations, was constructed from August 2006, and opened for service in August 2009, to connect up with the KCR line (now renamed East Rail) at Hung Hom, thus completing the link between these two important lines.

The KCR line (renamed East Rail) was also extended from Hung Hom back to its original destination – Tsim Sha Tsui. It was an underground section with one station, and opened for service in October 2004. This line was subsequently converted to West Rail system and incorporated into West Rail when it was connected to Hung Hom in 2009. A spur line was also constructed from East Rail's pen-ultimate station, Sheung Shui, to a new station at Lok Ma Chau, providing a second rail border crossing point in addition to Lo Wu. It was opened for service in August 2007. Lok Ma Chau Station is the largest station building in the whole KCRC network.

To complete the list of new lines constructed in the start of the new Millennium, there is the Ma On Shan Line. It is a medium capacity railway line connecting the new town of Ma On Shan to Tai Wai Station on the East Rail line. Construction started in 2000 and the line opened for service in December 2004.

One will find it amazing that among all these high and medium capacity railway lines, the MTRC has constructed a new single-track line with a passing loop. It is the 3.5km long Disneyland Resort Line, connecting a new station on the Tung Chung Line to the Disneyland Resort Station. It was opened for service in August 2005. The most significant point to note is that it is the first fully automatic, driverless railway in Hong Kong.

In addition to the development of the railway network, there are two other changes in the management of the railway corporations during this period. First, the MTRC was changed from a wholly Government-owned corporation into a publicly list company in 2000. 23% of MTRC's share capital was sold to private investors and the company listed on the Hong Kong Stock Exchange from 5 October 2000.

Second, under the initiation of the Hong Kong Government, the operation of the two networks of KCRC and MTRC was merged into a single network managed by MTRC on 2 December 2007. The arrangement was by KCRC granting a Service Concession to MTRC for 50 years to operate the KCRC network, in exchange for annual payments of a Concession Fee. KCRC remains as the asset owner of the KCRC network, responsible for

depreciation and any capital expenditure. To the benefit of passengers, this means a single fare system with smoother interchange between lines.

3.7 Future Development of Hong Kong's Railway System – Beyond 2012

The MTRC is now undertaking 5 new projects in various stages of development.

3.7.1 West Island Line. This is an extension of the Island Line westward, 3km in length, with 3 new stations. Construction is now well in progress with all the underground tunnels completed. The programmed completion date is in 2014.

3.7.2 South Island Line (East). This is a new line linking the southern suburbs of Hong Kong Island to the city centre, 7km in length, with 4 new stations. It will be a medium capacity line. Construction is in progress with programmed completion in 2015.

3.7.3 Kwun Tong Line Extension. This is an extension of the Kwun Tong Line, 3km in length, with 2 new stations, one of which will be an interchange station with the Shatin to Central Link. Construction has started. The programmed completion date will be in 2015.

3.7.4 Shatin to Central Link. This will be a new line connecting with East Rail Line and Ma On Shan Line at Tai Wai Station, then passing through eastern Kowloon (where it will interchange with the Kwun Tong Line) to Hung Hom (where it will interchange with East Rail Line again and West Rail Line). Crossing the harbour at Hung Hom, it will terminate at Admiralty Station, connecting with the Tsuen Wan Line and Island Line. This project is still in design stage, with the programmed completion date in 2020. When fully opened, it will join up with the Ma On Shan Line and West Rail Line to become the East-West Corridor, while the East Rail Line will have through-running to Admiralty Station as the North-South Corridor.

3.7.5 Express Rail Link (XRL). This is part of the Guangzhou-Shenzhen-Hong Kong Express Rail Line. The part in Hong Kong is 26km in length, mostly in tunnel. It will connect with the 16,000km High Speed Rail network of Mainland China. Construction is now well in progress, with the programmed completion date in 2015. When opened, there will be direct through express trains to many cities in Mainland China, including Beijing and Shanghai. The designed operating speed in Hong Kong is 250km/h, with the whole journey to Beijing taking about 10 hours.

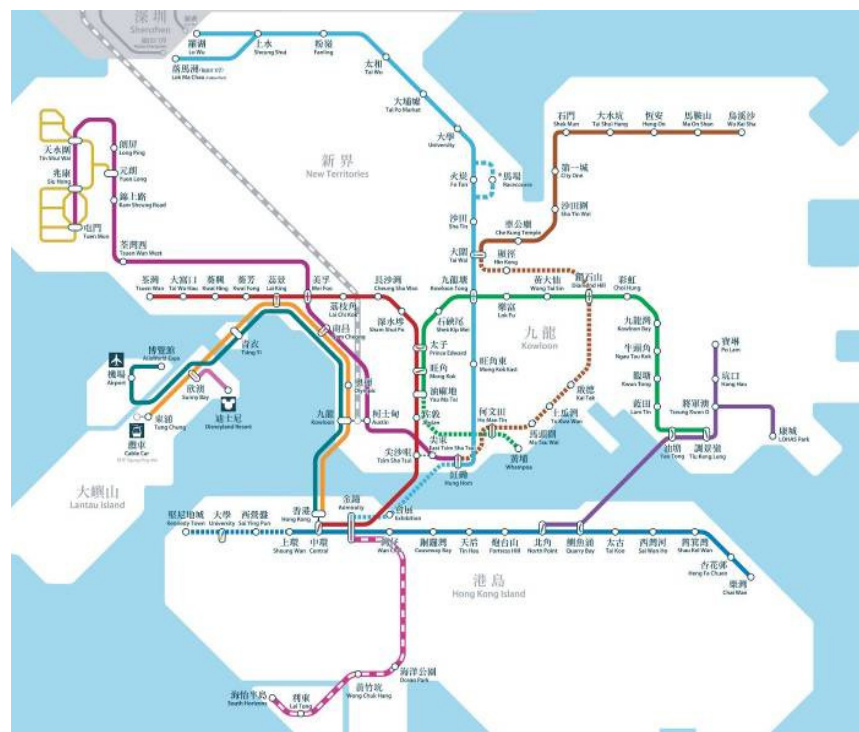


Figure 5: MTR System Map by 2020

4 THE SIGNALLING AND TELECOMMUNICATIONS SYSTEMS

As mentioned in the beginning of the paper, the first railway in Hong Kong, the KCR, was a single-track line with passing loops. It used mechanical (semaphore) signals operated from a lever frame, usually accommodated in a signal box at one end of the station. The points were also operated from the same lever frame, and were interlocked with the signals by mechanical locking. Train control was by station-to-station block working. Movement authority was controlled by tokens, ball or tablet type, with different types on adjoining sections to avoid accidental mixing up. This system of signalling and control was in use from 1910 right up to post-World War II.

The first electrical signals and point machines were introduced in the old Kowloon Station at Tsim Sha Tsui in about 1968. 2/3 aspect colour light signals, track circuits and electrical point machines were installed from the terminus station to near the railway workshops at Hung Hom. These were used until the terminus station was moved to Hung Hom in 1975.

There were a total of 9 level-crossings along the KCR line at this time, 6 public and 3 military. The public level-crossings were equipped with full-barriers and continuously manned during traffic hours. The military crossings were unmanned but locked. However, due to undisciplined operation by an army tank driver, there was a serious accident of a passenger train colliding with a tank stuck on the level crossing, resulting in the death of the tank driver and the train guard.

The first “modern signalling system” was introduced into KCR during the Modernisation and Electrification Project in 1979. 3/4 aspect colour-light signals, continuous track circuiting, and electro-hydraulic point machines were installed throughout the whole line. Route relay interlocking was installed at the relay rooms in some stations, and connected to the Operation Control Centre (OCC) by remote control system Westronic S1. The control panel was mosaic-tile type with entrance-exit push button control. A train describer was also installed to facilitate the Train Controller in route setting.

The first electronic interlocking, SSI Mark I, was commissioned in the Ho Tung Lau Depot area of the KCR in 1990. The first axle counter was installed inside the Beacon Hill Tunnel in 1986 to overcome the excessively wet conditions inside the tunnel.

Although AWS has been provided since 1979, there were several incidents of SPAD. In order to enhance safety and also improve the headway, the first ATP system was introduced into the KCR in 1996. It was the distance-to-go intermittent system, TBL, with track-to-train transmission by beacons, supplemented by infill loops in front of signals. The relay interlocking was also replaced by SSI Mark II Turbo. The ATP system was further upgraded to ATO in 2002 with radio infill. The original 3/4 aspect colour light signals are still retained for the China Through Train service and as a fall-back system, but the signal aspect is switched to blue in case the approaching train is equipped with ATP. The Lok Ma Chau spur line, opened in 2007, is equipped with the same system to facilitate through working.

The two newest lines of the KCRC network, West Rail Line (2003) and Ma On Shan Line (2004), are quipped with CBTC moving block system, Seltrac, with integrated interlocking and ATC. This also applies to the Kowloon Southern Link opened in 2009, which forms part of the West Rail Line.

Just to complete the picture of the KCRC network, the light rail system uses the Siemens Simatic S5/S7 PLC and IMU200 point controllers, with track-based detection loops in front of road junctions and points. The light rail signals are controlled by the same traffic controllers as the other road traffic signals. There is no track circuit, but the points areas are equipped with mass detectors to provide “dead locking” of points. The central system is WinCC.

When the MTRC system opened the first line in 1979, the train control system was quite novel at the time. It was the Westinghouse speed-code ATP system, with no trackside running signals. The interlocking was the route relay interlocking. Remote control, train describer and ATSS were also installed. Track circuits were a mixture of CVCM, HVI, 50Hz etc. and point machines were electro-hydraulic clamp locks. Axle counters were introduced at about the same time as the KCRC, in 1986. The first SSI in the MTRC system was installed in the Kwun Tong Line extension in 1989.

For the Airport Railway Project, a completely new ATC was adopted. It is the distance-to-go system, SACEM, with the latest version of SSI. Track circuits are CVCM and point machines MJ80. The same ATC system was

also chosen to replace the obsolete Westinghouse system used since 1979. The complete replacement programme took 3 years, 1996-98, working mostly at night time to keep the trains running in the day. However, the original relay interlocking of the Urban Lines still remains up to the present.

The Tseung Kwan O Line uses also the SACEM system, but from a different supplier from that of the Airport Railway. The interlocking is SICAS from Siemens. It is interesting to note some inter-operability issues with the SACEM systems in these three different projects. The Airport Railway and the Urban Lines SACEM systems have some software and hardware variations. Therefore even though they are from the same supplier, the trains are not readily inter-operable, whereas on the Tseung Kwan O Line the trains can run through to the other Urban Lines. As mentioned above, the Disneyland Resort Line is the first fully automatic, driverless line in Hong Kong. It uses the Seltrac Virtual Fixed Block ATC system.

For the new projects now underway, the West Island Line, as an extension of the Island Line, will use the same SACEM system. The same applies to the Kwun Tong Line extension. The South Island Line (East) will be the second fully automatic, driverless operation line. Contract has been awarded. The Express Rail Line is still under tender at the time of writing. Finally, the Shatin Central Line is in the planning stage, and the technical specifications are being compiled.

One can see from the above short summary that the signalling system has evolved a long way from very basic mechanical system to the present computer-based systems. It will be of interest to see what will be the latest systems on offer for the coming projects.

As for telecommunications systems, the first to appear with the KCR in 1910 was the telegraph transmitted by copper wires strung along the railway line. It was used to transmit the block telephone signals for the token machines. Later came land-line telephones of the public telephone network. In the Modernisation Project of the KCR in 1982, a system of signal post telephones was installed. A PABX system SL1 was also installed for internal use and outside connections. Short range radio was first used for shunting operations using hand-held transceivers. The first train-borne voice radio system was set up in 1987. Now all train sets are equipped with radio in the driving cab.

The first generation of telecommunications system of the MTR in 1979 was quite simple. There was an open radio system by which the Train Controller could talk to all train drivers at the same time. It was later replaced by a closed system for individual train drivers to be contacted. For trackside communications, the first system consisted only of a pair of telephone wires run along the tunnel, where the train driver could plug in with his portable telephone to call the Train Controller if required. It was later replaced by permanent direct-line telephones at strategic locations. The current system consists of digital radio and mobile phones with full coverage of all lines, stations and depots.

5 CONCLUSION

It is hoped that we have achieved the aim set out in the beginning to provide readers with a picture of the development of the Hong Kong railway system in the past hundred years. From the very meagre start of a single track railway, with 8 trains a day carrying about 1,000 passengers, it has developed into a world-class metro system of 8 lines, operating 19 hours each day and carrying over 4.3 million passengers.

A century ago, the first railway line in Hong Kong was built with the intention of providing the southern gateway to the vast interior of China. Today the Hong Kong railway system has not only fulfilled well this original intention, but also becoming one of the vital links to the 16,000km network of high speed railways in China. We do sincerely hope that you will visit Hong Kong some day in the not too distant future, when you can experience the excitement of travelling by High Speed Train departing Hong Kong after breakfast in the morning and arriving Beijing in time for dinner.

Finally, here are two photographs to conclude this paper. The first is a steam-locomotive-hauled train departing from old Kowloon Station in 1917. The second is a Chinese High Speed Train, CRH, which will depart from the new Kowloon Terminus of Hong Kong, bound for Beijing, expectantly in 2015.

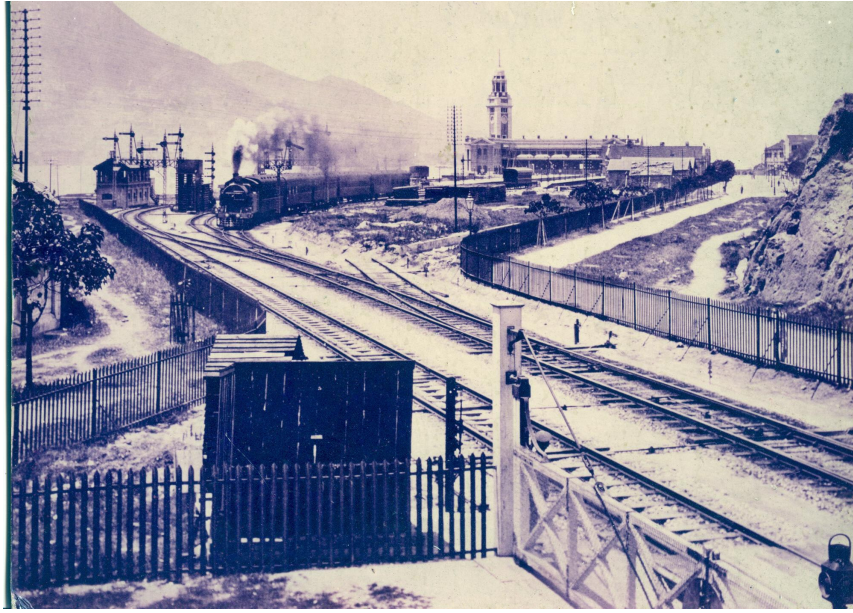


Figure 7: Steam-Locomotive-Hauled Train Departing From Old Kowloon Station, 1917



Figure 8: Chinese High Speed Train, CRH

Acknowledgement

The authors wish to express acknowledgement to the KCRC and the MTRC for permission to use material contained in the Corporations' publications, in particular the booklet published on the occasion of the exhibition "One Hundred Years of Railway Operations in Hong Kong" 2010.