Switzerland is well known for the high performance and good quality of service of its public transport system. In December 2004 the service was brought to a new level by the national Rail 2000 concept, with a regular interval timetable creating systematic connections in a tightly knit network. After one year of commercial operation, the results are positive beyond expectation.

Signalling has played a significant role in achieving this success by adapting the line speed and reducing headways. The train control system was re-oriented, to ERTMS/ETCS Level 2 with cab signalling on new lines and level 1 with limited supervision on the conventional network. For traffic control, a network wide concept helps to decrease operating costs and increase capacity. Nevertheless the system of control and operation has reached a critical limit. A systematic analysis of all the processes involved is being undertaken in order to stabilise the whole control system.

Switzerland, as a land-locked country in the south-west of Central Europe, has some distinctive characteristics:

- It has seven million inhabitants, similar to the population of London, and they speak four different languages;
- It has a surface area of 41000 km², roughly half the size of Scotland, 50% of which is at an altitude greater than 1000 m above sea level;
- The maximum distance from east to west is 350 km, and that from the southernmost to the northernmost is 220 km.

The central Alps cover 60% of the country and the Jura Mountains a further 10%. The remaining 30% is the Midlands and is where 60% of the population live.

One very distinctive characteristic is the significant role played by public transport: The market share is 35% for freight and 24% for passengers, with an increasing trend for the last twenty years. The backbone of the transport network is the 3000 km of fully electrified lines (15 kV a.c. 16.7 Hz) of the Swiss Federal Railways (SBB). More than fifty private railways add a further 2000 km. On the SBB network 387 000 route-km are generated daily.

In 2004, 95.5% of passenger trains arrived within five minutes according to the timetable.

This paper treats some aspects of the Swiss public transport system with its frequent and regular services, as well as some major projects and their implications for signalling.
check in at the hotel, he will have the same timetable possibilities half an hour later.

The infrastructure for Rail 2000 was determined to suit the timetable, and not the other way round. The measures put in place follow the principle of "as much as really necessary." They take into account rolling stock capacity, traction power, line capacity and line characteristics. Different measures to decrease travel times between hubs have been used - construction of new lines on the one hand, and faster rolling stock on the other. The investment in infrastructure over the past 15 years reached four billion Euros. Of this 50% was invested in new lines, 35% in capacity improvement (such as shorter headways with additional signals) and 15% in network adaptations (such as loading-gauge expansion to allow for double-decker rolling stock).

On the approach to and departure from the hubs, trains follow each other with short headways, as low as two minutes. The new line between Bern and Olten was designed for this time interval at a speed of 200 km/h over a distance of 45 km.

Rail 2000 has been in service since December 2004. It has brought 12% more trains and a new design for 90% of the paths. Looking at the complete network after one year, 8% more passengers use the railway producing 12% additional passenger kilometres. The growth of the public transport market exceeds that of private transportation.

ALPTRANSIT

One-fifth of the train kilometres on the SBB network are generated by freight trains transporting 58 million tons annually. Nearly half of the load is north-south transit traffic, Germany and France to Italy and vice versa, on the two Alpine lines, the Gotthard and Lütschberg-Simplon. There is pressure from the market as well as from European Union politics to increase the capacity for transit traffic. The Swiss response is the building of two new Alpine railway lines (Figure 2).

Currently the summits of both lines are at over 1300 m above sea level, and the trains have to lift the load to this level.

Two tunnels with summits at about 500 m form the new lines, the 34 km long Lütschberg and the 57 km long Gotthard. They will form the backbone of an efficient and ecological transport system.

In the Lütschberg tunnel, civil works are complete and fitting out with railway equipment is currently under way. The tunnel will cost two billion Euros, and commercial traffic is intended to start in 2007. On the Gotthard site, 50% of tunnel boring is finished and the tendering process for the railway equipment is under way. Opening of this route is planned for 2014. For these two lines the Swiss government is investing over eight billion Euros out of a special budget for the promotion of public transport.

For ordinary transport business, SBB has a performance contract with the federal government lasting four years. This defines the required performance and the quality of service of the railway. For the government, this fixes the subsidies for investment and operations in advance. This enables SBB to run its business according to defined rules and keeps the risk of unexpected costs for the government under control.

THE ROLE OF SIGNALLING

Signalling is very relevant to achieving the goals of Rail 2000. Well-defined travelling times between hubs are required in order to make matched connections possible. Some travelling times have been reduced by running tilting trains at higher speeds on existing tracks. This meant changing the distance between the advance and main signals. The trains are controlled by a speed signalling system, of which two versions exist. There is an older version with speed indication by colour code, and a newer one with digital speed indication.

The tilting trains normally travel in tandem and have a power consumption of 10.4 MW. The resulting return current in the rails was too great for most of the existing d.c. track circuits. Systematic replacement was one of the relevant cost levers. The simplest solution would have been to add 16.7 Hz filters. A carefully constructed business case showed a way to lower life cycle cost by using a new type of track circuit that allowed a significant reduction of isolated rail joints in conjunction with axle counters. The other specific demand placed on signalling by Rail 2000 results from the running of flights of trains at short intervals on lines as well as on approach to hubs. Specific headways were defined and allocated systematically to the lines and approach tracks. Between Bern and Zurich the defined operational headway between identical train classes is two minutes, or 90 seconds on the technical level.

These adaptations were another important part of the infrastructure program (see Figure 3). In total these activities formed over 20
CHINA INTERCITY RAIL SUMMIT 2006

September 7th and 8th, 2006     Grand Hyatt Shanghai, China

High Level Exposure to 300+ Powerful Decision Makers!
Do Business with Ministry of Rail, PRC and Project Teams of the Three Biggest China Intercity Rail Networks!
It is one 45 Billion US Dollars VERY FRESH market here in China!

Distinguished Speakers

- Le Changqing, Deputy General Secretary, CHINA RAILWAY SOCIETY
- In Hongyi, Director, SHANGHAI RAILWAY BUREAU
- Jung Nis Yor, General Director of Engineering, SEOUL METROPOLITAN RAIL TRANSIT CORPORATION
- Patrick K. Gerard, President and CEO, ALASKA RAILROAD CORPORATION
- Marc Chamberlart, Senior Vice President, ASIA PACIFIC REGION, ALSTOM TRANSPORT
- Lewis Ayres, Senior Program Manager, SURFACE TRANSPORTATION AGENCY (METRO)

Key Issues

- Policy Trend for Intercity Rail Sector
- China Three Intercity Rail Network Development
- Planning and Integration of Intercity Rail Transit
- Investment Opportunities in China
- Privatization of Intercity Rail in Asia
- Hi-Tech Solutions of Intercity Rail
- Briefing of China Intercity Rail Projects

Organized by

Supported by

Endorsed by

Support Media

www.globaleaders.com
IRSE NEWS

Agenda

Table 2: Comparison of the application of limited and full supervision mode

<table>
<thead>
<tr>
<th>View point</th>
<th>Full supervision mode (for high speed lines and conventional lines)</th>
<th>Limited supervision mode (for conventional lines only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETCS interface to interlockings</td>
<td>Modern computer based systems required</td>
<td>Compatibility with current systems</td>
</tr>
<tr>
<td>ETCS interface to trackside equipment</td>
<td>Complete re-engineering required</td>
<td>Trackside equipment partially re-engineered</td>
</tr>
<tr>
<td>Safety</td>
<td>Potential increase of safety level</td>
<td>Current level is maintained</td>
</tr>
<tr>
<td>Operating rules</td>
<td>ETCS (International)</td>
<td>National rules</td>
</tr>
</tbody>
</table>

projects for over 50 million Euros. Two further fields of investment for Rail 2000 lie in train control and traffic control, and they are discussed in the following two sections.

The new 45 km-long line is currently operated at 160 km/h with lineside signals (the so-called fallback system). In parallel the ERTMS/ETCS Level 2 system is under test (see below). The normal length of signal sections is 1200 m. A total of 100 signals control the traffic, and 480 Eurobalises control the trains.

Three sets of moving-frog points with a speed of 200 km/h for both branches are controlled by eight motors for the points and three motors for the frog.

Train Control

From 1930 onwards Swiss main signals were equipped with an automatic warning system known as SIGNUM. It was supplied by a company of the same name which was in fact a subsidiary of Siemens Schuckert GmbH. It was limited to supervision of the driver’s vigilance after passing a signal at danger. In 1980 a new phase started, to equip the most dangerous locations in the network with an automatic train protection (ATP) system, type ZUB 121, again from Siemens. This system supervises the correct reaction of the driver to the signalled speed. The places to be equipped were chosen by network-wide risk analysis. Most of the locations are junctions and departure signals, mainly on single-track lines. At the end of 2005 20% of all main signals were protected by ZUB, assuring an acceptable level of safety for current running up to a speed of 160 km/h. Both the SIGNUM and ZUB 121 systems have now reached the end of their technical lives.

The biggest investment for Rail 2000, the new line between Mattstetten (Bern) and Rothrist (Olten) (see Figure 4), initiated a review of train protection strategy.

The maximum speed on that line is 200 km/h with a headway of two minutes, and the Federal Department of Transport demanded cab signalling. A careful review of existing and future systems for these specifications resulted in the choice of ERTMS/ETCS Level 2.

As a first step the System Requirement Specification (SRS) Version 5A system was developed by Bombardier. In service during 2002 and 2003 on a pilot line between Lucerne and Olten, this was the first commercial operation of ERTMS anywhere in the world. The operating principles were tested there and prepared SBB for a Level 2 application on the core part of their network.

The operation of the new Rail 2000 line is based on version SRS 2.2.2c and it was equipped by ALSTOM. At the present time more than 450 vehicles are running with ETCS trainborne equipment at a maximum speed of 160 km/h under lineside signals. In parallel the new system is being brought to an acceptable level of availability by systematic tests. December 2006 will see all trains running at Level 2 and 160 km/h, and a year later the speed will be raised to 200 km/h. This stepwise approach reduces the risks of negative drawbacks to the whole Swiss public transport system on account of the central function of this line.

The next Level 2 application will be the Lotschberg base tunnel, to be commissioned in 2007.

The decision to operate the new line with ETCS Level 2 initiated a review of the strategy for train control on the entire network. SBB and the Federal Department of Transport decided in 2002 to base train control in Switzerland on ETCS. There are four reasons behind this decision:

- the need for cab signalling on new lines with speeds of 200 km/h or more (Mattstetten to Rothrist in 2006, the Lotschberg in 2007 and the Gotthard base tunnel in 2014);
- the need to replace the two outdated systems (SIGNUM and ZUB 121);
- the obligation to provide interoperability (mainly for international freight traffic);
- the need to increase capacity of lines and nodes in a cost effective way.

The current strategy is to equip the new lines with Level 2, and the rest of the network with Level 1 Limited Supervision (LS). LS provides the same functions as the existing ATP but based on ETCS technology. A change request for a future system release is in progress. Table 2 summarises the main differences between LS and full supervision mode (Level 1 and Level 2) for an application.

Thanks to LS, ETCS migration on the Swiss network will cost roughly only one third as much as full supervision. After 2014 the trainborne equipment needed by the train operating companies will be limited to ETCS. The current main challenges are to achieve real technical interoperability at the same time as a sufficient level of reliability, and a concept for high track slot capacity in nodes.

Fig. 4. The new line between Bern (Mattstetten) and Olten (Rothrist)
TRAFFIC CONTROL

Interlockings form the basis on which traffic control is built, in Switzerland as elsewhere. At the present time there are 630 interlockings of different technologies in service, of which 2% are mechanical, 16% electromechanical, 68% relay and 14% computer based systems. The last-mentioned control 26% of the relevant elements (such as signals and points) in the network.

Figure 5 shows how the various technologies have developed in the last sixty years in quantitative terms. Relay technology started off with Lausanne Sebeillon in 1954, and reached its culmination at the beginning of the 1990s. Currently two-thirds of the network are controlled by relay technology.

The computer era started in 1989 in Chiasso with a SIMIS-C from Siemens. Sixteen years later 90 modern installations from Siemens and Alcatel are in operation. The most recent types are SIMIS-W from Siemens and Electra II from Alcatel.

The extent to which interlockings have become overdue for replacement can also be seen from Figure 5. A systematic renewal programme started in 2003. The aim is to reduce the costs of managing network operation of the network by means of automation, while at the same time eliminating the backlog of renewals. A total of 140 interlockings dating back to before 1960 (mechanical, electromechanical and early relay types) will be replaced. The more recent relay installations will be automated, that is they will be brought under remote control, with the addition of train describers. The whole undertaking will cost 1.1 billion Euros. It will result in a reduction of personnel for operations management by one third, that is 950 people, in the coming ten years, resulting in a cost reduction of over 70 million Euros per annum.

In parallel, the current control and information system called "lltis" (a Siemens brand name) will be renewed and modernised under the "lltis net" project. This provides a tool for the operator to control routes either manually or by an automatic route-setting function, as well as the optical process interface using flat screens. The new product creates operational cells and increases the availability of the whole control system as well as the flexibility of operations. It is to be based on Windows technology.

Tests will start in mid-2006, and roll-out will be in 2008.

During the same period, the current national train scheduling system will be renewed under the "Rail Control System" project. A new timetable tool is also being developed.

With all these activities the entire Swiss system for control and planning of running paths is under review. At the same time there is a surge in demand in Switzerland for running paths. Infrastructure must put itself into a position where it can meet this demand in a flexible yet cost-effective manner. The quest for a response to this challenge has led to the PULS90 project, under which long-established production processes will be subjected to thorough examination. This will create new capacity in the network in a cost effective way, with operational processes being modified where relevant. There will also be new specifications for all the elements of the control system.

CONCLUSIONS

Public transport in Switzerland is characterised by its recognised quality and level of service. Signalling has played a significant role in achieving this success. The market for running paths demands higher performance, and the financial situation of the infrastructure owner demands cost-effectiveness. The control system for path production is undergoing a process of change in order to fulfill these expectations. This creates a challenge therefore for all parts of the signalling industry in Switzerland, over and above those of shorter headways, higher speeds, ETCS migration/interoperability and the new Alpine lines. A network wide concept will decrease operating costs operation and increase capacity. Regardless of the control system, operations have reached a critical limit. A systematic analysis of all the processes involved is in progress in order to stabilise the whole control system.

Fig. 5. Development of interlocking technologies in quantitative terms

REFERENCES


“For me a perfect premiere also includes a safe journey home by subway!”

Frieda McKenzie, theater fan in New York City

More safety for stations, tracks, trains and people. With our RailCom Manager, we can combine ultramodern surveillance, automation, and information and communication technologies in transit systems with differing degrees of complexity the world over – whether in Hanover, Guangzhou, Hong Kong or New York.

RailCom from Siemens ensures “traveling at ease”, thus increasing acceptance by the passengers and profitability for the rail operators. And RailCom is a future-proof investment, because our systems are always open for anything new, e.g. automatic operation or telematic applications.

www.siemens.com/transportation

SIEMENS

efficient rail solutions
Establishing Metro Best Practices through Benchmarking

The more you know about international benchmarking, the more power you get!

History of CoMET

At the International Association of Public Transport (UITP) conference in 1982, London Underground and Hamburg Hochbahn initiated to benchmark their metro systems in depth, supplemented by 24 other metro systems. As the metros were widely varied in size, organisational structure and accounting practices, many figures were difficult to compare. However, once these barriers had been overcome, this benchmarking exercise had eventually led to a number of highly successful productivity improvement programmes and the innovative use of key performance indicators (KPIs).

In Hong Kong, the MTR Corporation also used KPIs successfully, showing a regular year-on-year improvement in the selected indicators. In 1994, believed that it would be of value to exchange performance data and investigate best practice amongst similar heavy metros (with an annual patronage greater than 500 millions), the Corporation proposed to metros in London (LUL), Paris (RATP), New York (NYCT) and Berlin (BVG) to form a benchmarking consortium, which became known as the “Group of Five”.

The control and cost issues of the benchmarking programme were managed by the Railway Technology Strategy Centre (RTSC) at Imperial College London. The centre, instead of offering a pre-determined programme, ran the programme as a venture under the control of the “Group of Five”. A president for the group was elected annually by participating metros, enabling them to direct efforts towards the areas that they believed would produce the greatest benefits, or the “hot topics” that were dictated by immediate issues arising from their
respective situations. Such issues included exploring reductions in maintenance cost and their relationship with reliability levels, as well as the impacts of fare regulation on metro performance.

The first task carried out under the programme was designing and selecting a system of KPIs, and case studies of best practices in line capacity, investment effectiveness and maintenance were successfully completed. As news of this sort of progress filtered out of the group, Mexico City STC, São Paulo Metro and Tokyo Metro joined the programme in 1996. With eight members onboard, the group was then formally named as the **Community of Metros (CoMET)**.

The membership of CoMET group expanded to eleven with the joining of Moscow Metro and Shanghai SMO in 1999 and 2005 respectively, and the formal transfer of Metro de Madrid from the NOVA group to the CoMET group in 2004 (see appendix 1 for the logos and websites of CoMET members). NOVA group is a benchmarking group formed under UITP auspices in 1998, following the success of CoMET. It currently comprises thirteen medium sized metro systems.

The following diagram shows the relation among CoMET, NOVA and Imperial College. All the information and reports are shared among them under the Confidentiality Agreement.

---

**CoMET 2005 Management Meeting**

**Hong Kong**

The CoMET group undertakes a number of activities on an annual basis. The group meets twice a year, once to set the agenda for the coming twelve months, and once to present and discuss the work that has been undertaken, as well as using the opportunity to share experience and visit the host metro.
Each year the metros collect a set of comparable data which is then analysed to determine the **key performance indicators**, and the results are presented in the form of structured comparisons.

In addition to the KPIs, the group also carries out a number of **case studies** each year, facilitating a more detailed, structural comparison and analysis of the participating metros’ performance on a particular operational or strategic function. Usually it takes about six to nine months to complete one case study. On the other hand, the **clearinghouse studies** facilitate central gathering of data, usually via simple questionnaires, so that areas of interest can be identified and referenced without detailed analysis taking place. The studies are usually completed in a short time, say three weeks, and the collected information will be collated, cleansed and published by the lead metro, and circulated to the members for review.

The CoMET group’s activities also include the establishment of **groups of experts** who meet to discuss a particular issue or function. General information exchange and **networking** are also actively encouraged within the group, so as to identify **best practices** for implementation.

Collectively, the diagram below exhibits the CoMET Process in a simple flow:

**Benchmarking Highlights**

- **Latest Progress**

**KPI Performance**

The CoMET KPI system has been refining throughout the course. It is now popularly adopted by metros and is the de facto performance metrics for metros benchmarking elsewhere. Basically there are twelve KPIs divided into four perspectives:

- **Customer**
  - C1 Asset Utilisation
  - C2 Passenger Intensity
  - C3 Customer Service

- **Safety**
  - S8 Safety Ratio

- **Efficiency / Reliability / Service Quality**
  - S4 Staff Efficiency
  - S5 Business Efficiency
  - S6 Service Reliability
  - S7 Trouble Free Journey

- **Financial Efficiency**
  - F9 Profitability
  - F10 Service Cost
  - F11 Costs per Journey
  - F12 Revenue per Journey
Wilson & Patrick Engineering Co. Ltd.

Our Services:
E&M Engineering
Signal and Communications Engineering
Design
Supply
Installation and Commissioning
Maintenance
Through life support

Wilson & Patrick Engineering Co. Ltd.
Rm 25, 10/F., Goldfield Ind’l Centre,No.1, Sui Wo Road,
Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2384 9050       Fax: (852) 2690 1643
E-mail: wilson@w-n-p.com    Website: www.w-n-p.com
The latest 2004 KPI report revealed general improvement of MTR on service quality and reliability performance as compared with 2003. Continuous improvement on efficiency and cost effectiveness were also seen.

**Case Studies**

Throughout the course of CoMET study, more than 40 case studies were carried out (see appendix 2 for the list of case studies). In 2005, three case studies were concluded:

1. **Noise & vibration**

   The study looked at the practices of noise & vibration measurement, legislative norms & responsibilities, and the strategies adopted to reduce impact. Not surprisingly, most metro operators conducted noise measurement regularly in response to stringent environmental legislation. Less imminent was the vibration legislation, only London and Taipei measured vibration regularly.

   Strategies for minimising the impact of noise & vibration were summarised as:
   - reducing noise at source technically and operationally, e.g. insulator, and containing corrugation of rail, reducing speed, etc.;
   - reducing noise propagation, viz. noise barriers;
   - communicating with those affected; and some metros even
   - offering compensation.

   It was worthwhile to note the increasing concerns of noise in train and MTR might need to act proactively on this.

2. **Asset condition monitoring**

   The study compared practices employed by metros for monitoring mainly track and civil structure assets. A risk-based approach for determining frequency and necessity of condition monitoring was gaining popularity among metro partners.

   In summary, the practices were:
   - visual inspection of track ranging from daily to every 15 days;
   - ultrasonic test for track ranging from fortnightly to yearly;
   - track geometry inspection ranging from monthly to every 3 years (Montreal);
   - civil structure inspection ranging from monthly (Singapore) to 6-yearly.

   It was advisable to note the popularity of Geographic Information System (GIS) for the management of track and civil structure data, and the divergence of maintenance management systems of metros. Information from the report was useful for MTR to evaluate maintenance effectiveness and forming a basis for optimising the monitoring regime.

3. **Driverless metro**

   This study was managed by London Underground with support from CoMET. The study attempted to assess the possibility of driverless operation in London Underground using Piccadilly Line as a route-finder.
The following five issues were assessed for practical solutions:

- migration from manual to full automation operation;
- safety at platform train interface;
- dwell time;
- staff roles; and
- reliability.

In the report, London Underground commended the support of CoMET network and remarked how useful the experiences elsewhere were for the development of its case.

In addition, the case studies of Accident Precursors Monitoring and Procurement Management are now continuously exchanging information among metros.

**Clearinghouse Studies**

The CoMET/NOVA clearinghouse has encouraged much wider use of the benchmarking network for experience sharing. Up to now, CoMET and NOVA have conducted about 85 clearinghouse studies.

In 2005, MTRC initiated Measures to Prevent Malicious Damages or Terrorist Attacks and Key Business Process; London Underground sent out Environmental Control System, Remote Station Supervision and Management, and Train Radio System Failure; São Paulo studied Use of Recovering and Recuperation of Traction Energy; and Metro de Madrid tried Network Extensions/Multi-lingual Information, and Increasing Commercial Revenue through Marketing, Promotional and Other Initiates.

With a well-established set of KPIs, CoMET provides a platform for metros to truly exchange and compare themselves with the other members and to identify their strengths and weaknesses and, more importantly, areas for improvement.

MTRC actively adopts the KPIs, propose case studies, and initiate clearinghouse studies to address for small scale urgent matters. The benchmarking of metro performance and practices has been of growing importance in communication with the regulators and politicians not only in Hong Kong but also elsewhere around the world.

While the benchmarking process generates and accumulates wealth of knowledge on metro operations, maintenance and technology development, it brings long-term benefits to all participating metros.

KPI reports and anonymous reports of case and clearinghouse studie are regularly quoted in our Annual Reports, Sustainability Reports external presentations, and many consultancy credentials & proposal to demonstrate the Corporation’s strength in delivering high quality services. These reports together with CoMET updates and other relate information are available in the MTR Railway Benchmarking webpage on Operations Information Mall.
You can easily access the information by a few clicks.

Colleagues are welcome to initiate any case studies and clearinghouse studies via Standards and Performance Manager to benchmark or exchange information among CoMET and NOVA members.
We use unparalleled domain expertise and a system-based approach to deliver added value and risk management solutions for the rail industry.

BECAUSE SAFETY MATTERS
Appendix 1
- Logos and Websites of CoMET Members

## Logos:

### Europe
- Berlin, BVG
- Paris, Metro & RER
- London, LUL
- Madrid, Metro de Madrid
- Moscow, Moscow Metro
- Mexico City, STC
- New York, NYCT
- São Paulo, MSP
- Hong Kong, MTR
- Tokyo, Tokyo Metro
- Shanghai, SMOC
- CoMET

### North & South America
- Mexico City
- New York City Transit
- São Paulo

### Asia
- Hong Kong, MTR Corporation
- Tokyo, Tokyo Metro
- Shanghai

## Websites:

<table>
<thead>
<tr>
<th>City, Metro</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin, BVG</td>
<td><a href="http://www.bvg.de">http://www.bvg.de</a></td>
</tr>
<tr>
<td>Madrid, Metro de Madrid</td>
<td><a href="http://www.metromadrid.es">http://www.metromadrid.es</a></td>
</tr>
<tr>
<td>Moscow, Moscow Metro</td>
<td><a href="http://www.metro.ru">http://www.metro.ru</a></td>
</tr>
<tr>
<td>Mexico City, STC</td>
<td><a href="http://www.metro.df.gob.mx">http://www.metro.df.gob.mx</a></td>
</tr>
<tr>
<td>New York, NYCT</td>
<td><a href="http://www.mta.nyc.ny.us/nyct">http://www.mta.nyc.ny.us/nyct</a></td>
</tr>
<tr>
<td>São Paulo, MSP</td>
<td><a href="http://www.metro.sp.gov.br">http://www.metro.sp.gov.br</a></td>
</tr>
<tr>
<td>Tokyo, Tokyo Metro</td>
<td><a href="http://www.tokymetro.jp">http://www.tokymetro.jp</a></td>
</tr>
<tr>
<td>Shanghai, SMOC</td>
<td><a href="http://www.shmetro.com">http://www.shmetro.com</a></td>
</tr>
<tr>
<td>CoMET</td>
<td><a href="http://www.comet-metros.org">http://www.comet-metros.org</a></td>
</tr>
</tbody>
</table>
Appendix 2
- List of CoMET Case Studies

**Operations**
- Reducing Station Operating Costs (2004 NOVA)
- Incident Management (2003 NOVA)
- Station Management (1998-1999 CoMET)

**Engineering / Technology**
- Asset Condition Monitoring (2005 CoMET)
- Driverless Metros (2005 CoMET)
- Noise and Vibration (2005 CoMET)
- Energy Saving Initiatives (2004 NOVA)
- Infrastructure Maintenance Possession Management (2003 NOVA)
- Asset Management (2002-2003 CoMET)
- New Lines/New Technology Implementation (1999 CoMET)
- Escalator Management (1999 CoMET)
- Signalling Equipment Reliability (1999 NOVA)
- Rolling Stock Reliability (1998 NOVA)

**Safety & Productivity**
- Accident Precursor Monitoring (2003-2005 CoMET)
- Initiatives for Increasing Primary Revenue (2004 NOVA)
- Energy Saving (2004 NOVA)
- Fares, Funding and Financing of Metros (2003 CoMET)
- Ticketing (2003 NOVA)
- Driver Productivity (2003 NOVA)
- Metro Productivity (2000 CoMET)

**Management**
- Procurement Management (2004-2005 CoMET)
- Communications of Metros (2004 CoMET)
- Capability Upgrade (2003 CoMET)
- Knowledge Management (2001 CoMET)
- Cascading Measurement - Business Indicators (2001 CoMET)
- Contracting out Maintenance (2000 CoMET)
- Organisation Effectiveness (1998 CoMET)

**Customer Service**
- Service Quality Measurement (2003 NOVA)
- Train Service Reliability, Regularity and Punctuality (2003 CoMET)
- Dynamic Passenger Information (1999 NOVA)
AsiaRail 2006 International Congress

14-17 November 2006
Kowloon Shangri-La Hotel, Hong Kong

Asian Rail Outlook – Challenges, Issues, Obstacles, Opportunities and Innovations

- A 3-day high level congress for rail decision makers in the Asia Pacific region
- Asia’s premier and definitive rail congress addressing critical issues on the latest developments, current and proposed projects, corporate restructuring and new technology

AsiaRail 2006 International Congress will examine the latest developments in the following areas:
- Regional rail projects
- Finance and investment including corporate restructuring
- Management and operations
- Planning, construction and maintenance
- Equipment and products to the rail sector
- Safety and security in rail
- Rail freight
- Branding the new railway

PLUS!!
Full Day Site Visits (optional)
- MTR Tsing Yi Station, Maritime Retail Centre and Disney Line at Sunnybay Station
- KCRC Ma On Shan Rail and tour of Tai Wai Maintenance Depot

For detailed program agenda and event updates, visit www.AsiaRail.com. IRSE members can register with a preferential 15% rebate for the Congress using the following registration code: 458IRSE. Contact Beacon now to reserve your seat on +852 2219 0111 or info@BeaconEvents.com.

www.AsiaRail.com
Interesting Signals No.82

Newtonhill

By J D Francis

Apart from in and around the cities of Dundee and Aberdeen, the east coast route from the fringe to Edinburgh at Cupar, through to Forres on the line to Inverness, Scotland, is controlled by mechanical signalling.

At Newtonhill, some 10 miles south of Aberdeen between Stonehaven and Portlethen stations, is a mechanical signal box that fringes to Aberdeen panel. The line here is double track with the additional facilities of a trailing crossover, an up trailing refuge siding and a down facing refuge siding. The sidings had probably been loops earlier in the history of Newtonhill which also had once had a station.

The exit signal from the Down Refuge which reads to a Limit of Shunt on the own Main features as our interesting signal in this edition.

NH24, a lattice post dating from Caledonian Railway times that has lost its finial and which is positioned to the right hand side of the siding, carries a single elevated miniature arm. Of interest is the fact that this arm has, for as long as can be remembered, been painted in the style of a subsidiary arm with a horizontal white stripe on its red background.

A recent repainting perpetuated this presentation yet there is no main arm to be subsidiary to and the signal performs the function of a shunt signal. Red and green spectacles are provided. The colour scheme may be explained by the fact that the arm is, in effect, a backing signal, which once upon a time would have had a unique style, probably that of the bow tie variety.

Photo 1: shows the signal in earlier times complete with its finial. Note the original redundant balance weight pivot casting part way up the post. This has been replaced by a new pattern casting with balance weight lower down on the side.

Photo 2 shows the signal as it is today

Jokes of the Month

Thoughtful Sign

Fancy Ride

Smart Business Spelling
Located in the northwest of Sichuan Province and along the southeastern fringe of the Qinghai-Tibetan Plateau, the Aha Tibetan and Qiang Autonomous Prefecture has jurisdiction over 13 counties that are home to concentrated settlements of the two minorities. Aha Prefecture has rich tourism resources and is home to some of the few remaining giant pandas in the wild. The region also includes the Sleeping Dragon Nature Reserve, the mountaineer's paradise at Siguniang Mountains, the Miyaluo Maple Leaves Scenic Resort, Jiuzhai Gully, the Yellow Dragon Scenic Resort, and the Nuoergai Grasslands.

Jiuzhai Gully, situated some 450 kms from Chengdu, is named for the 9 Tibetan villages in the gully. The lake, waterfalls, snow-capped mountains, and virgin forests provide colorful views all year-round. Six scenic resorts have been opened in the gully. These are Baojingyan, Shuzheng, Rize, Jianyan, Changhai, and Zharu. In 1992, Jiuzhai Gully was listed by UNESCO as a World Natural Heritage.

Not far from Jiuzhai Gully, in Songpan County, the Huanglong (Yellow Dragon) Scenic Resort is 340 kilometers from Chengdu. Along a milky-yellow slope at 3,000 to 3,558 meters above sea level, thousands of small lakes have formed on the mountainside. The myriad colors, shapes, and sizes create a mysterious and fantastic impression. Included in the resort are the scenic districts of Huanglong, Mouni (Buddhism) Gully, Danyun (Red Cloud) Gorge, and Xuebao Pond. The UNESCO listed it as a World Natural Heritage in 1992.

Located at the juncture of Xiaojin, Lixian, and Liuchuan counties, the Siguniang Mountains (the Four Maidens Mountains) is the highest peak in the Qionglai Mountain System and lies on the eastern edge of the Hengduan Mountain Range. Four peaks span from the north to the south. Because Tibetans revere mountains as sacred and female, these peaks have been long regarded as four beautiful maidens, and their snow covering is thought of as a delicate white veil. The tallest peak is snow-capped year-round, and the second tallest is surrounded by a glacier-fed river.
Maoxian County is home to a large group of Qiang. The high watch tower is unique Qiang architecture. During the Qiang New Year and other native festivals, the locals enjoy horse racing, drinking locally-produced wines, and dancing. The Qiang women are known throughout China for their skill in embroidery.

**Itinerary:**
Day 1: Chengdu Metro Visit  
Day 2-4: Aba Tour  
Day 5: Chengdu back to Hong Kong  
- Please note the tour is traveled by Four Wheel Vehicle

Tour 1’s date: 8 - 12 July 2006  
Tour 2’s date: 23 - 27 August 2006  
Tour 3’s date: 4 - 8 September 2006

**Tour size**: The visiting group is limited to 15 – 20 persons. Please make your registration in advance. First come first served basis.

**Registration Fee**: HK$200  
**Price**: On cost sharing basis.

**Booking Arrangement:**
Kindly post your cheque payment to IRSE HK at the below address. Please make payable to “The Institution of Railway Signal Engineers HK Section”. Deadline for booking is one week before the departure date.

**Postage Address**:  
Ms. Catherine Chan  
10/F., MTR Tower, Telford Plaza  
Kowloon Bay, Kowloon Hong Kong

**For Enquiry:**  
Mr. Sung Yuen Fat  - Mobile no. 98196106  
Mr. Francis Hui  - Mobile no. 94387293
### 2006 - 2007 Activities of IRSE (HK Section)

<table>
<thead>
<tr>
<th>Month</th>
<th>Event Details</th>
<th>IRSE</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 2006</td>
<td>Cheng Du Metro Visit and ABA 4WD Tour – 7 days</td>
<td>IRSE</td>
<td>Welcome all IRSE members</td>
</tr>
<tr>
<td>To be advised</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 – 12 Oct 06</td>
<td>Hainan Railway Ferry</td>
<td>IRSE</td>
<td>Welcome all IRSE members</td>
</tr>
<tr>
<td>December 2006</td>
<td>Annual Dinner</td>
<td>IRSE</td>
<td>Welcome all IRSE members</td>
</tr>
<tr>
<td>To be advised</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January 2007</td>
<td>Shen Zhen Nuclear Power Plant</td>
<td>IRSE</td>
<td>Welcome all IRSE members</td>
</tr>
<tr>
<td>To be advised</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hainan Railway Ferry Technical Visit

October 10-12, 2006

Itinerary:

10 Oct. – Bus from Shenzhen – Guangzhou
   - 10:26 pm Train Departure from Guangzhou – Haikou
11 Oct. - 10:30 am Arrival in Haikou
   Visit Haikou Railway Station, City Tour, stay in 4 stars hotel.
   游萬緑園; 假日海灘; 國家 4A 級熱帶海洋世界; 海南特產大世界.
12 Oct. – 10:20 am Departs Haikou Airport, Arrival to Shenzhen Airport at noon, then travel to Lu Wu,
   End of the trip.

Cost: HK$1,200.00 per person (Option: for single room additional of HK$400)

Standard: 3-4 stars hotel; including breakfast, lunch and dinner, normal sight seeing tickets and travel insurance.
The visiting group is limited to 36 persons. Please make your booking in advance. First come first served basis.

Booking Arrangement:

Kindly post your cheque payment to IRSE HK at the below address. Please make payable to “The Institution of Railway Signal Engineers HK Section”. Deadline for booking is on 1st of March 2006. In addition, please provide your Chinese name and Return Permit No. for flight booking.

Postage Address: Ms. Catherine Chan
   10/F., MTR Tower, Telford Plaza
   Kowloon Bay, Kowloon Hong Kong

For Enquiry:
Mr. Sung Yuen Fat - Mobile no. 98196106
Mr. Francis Hui - Mobile no. 94387293
Happy Birthday!

Our best wishes to the following IRSE (HK Section) members.

- TUNG TSE ON, TERRY 董子安 3-Aug
- CHO YAN MING, STEVEN 曹恩明 3-Aug
- WONG WING SUN 黃永新 4-Aug
- SINGH, MITRA 張海生 5-Aug
- LIU KA KIN 廖家健 7-Aug
- TSE HO YIN, LOUIE 謝浩賢 8-Aug
- LI TUNG WING 李東榮 10-Aug
- LEE CHUNG YU 李宗宇 11-Aug
- TSIM CHI WAI 詹志偉 11-Aug
- PANG FEI WONG 彭飛煌 12-Aug
- CHUI WAI KEI 郭子堯 13-Aug
- KWOK TSZ YIU 關子堯 14-Aug
- LAM KIN CHUNG 林健中 15-Aug
- LEUNG WING CHI 15-Aug

- HO CHI HANG 何志亨 16-Aug
- LEUNG KA WAI 梁家偉 17-Aug
- HO BECKY 何寶芝 17-Aug
- HON KWOK CHEUNG 韓國祥 19-Aug
- WONG YUK LUN 黃玉麟 19-Aug
- WONG TAK HUNG 黃德雄 20-Aug
- CHAN KOON WAH 陳冠華 22-Aug
- CHEUK CHUNG PUI 卓宗沛 22-Aug
- CHEUNG SHUI MOO 張瑞武 22-Aug
- CHOY SHU PO 蔡樹波 25-Aug
- CHEUNG YUK LEUNG 張玉良 25-Aug
- CHUNG WAI MAN 鍾偉文 26-Aug
- TAM CHUN PONG 譚振邦 29-Aug
- WONG MAN HO 黃文額 29-Aug
Corrosion Protection Coatings
High penetrative rust adherent anti-rust coatings; Acid, Alkaline, Salt & Sea water and Age Resistance; Reduce both labor tense and cost of project; No flake off and swell up

Tel: 86-757-86281536
Fax: 86-757-86281579
E-mail: vfsung@w-n-p.com

W&P (China) Company Limited
Add: Shop 1-2, Xia Xi Liang Xi Ind’l Zone, Gui Lan North Rd, NanHai, Foshan City, Guangdong, China
To all members:

If you have change address, employers. Don’t assume the IRSE knows where you are.

You can miss out on receiving institution mail because they fail to notify their change of address.

Please if you move drop a note, fax, call or email to the IRSE office.

Also for up to date information about the institution or its activities, or to download a membership application form log on to the IRSE (HK Section) website http://www.irse.org.hk

Myla Pilarta-Li
Editor