Extending the Useful Life of the MR-73 Metro Cars

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• A few facts about STM
• STM’s metro fleet
• The MR-73 rolling stock
• How to keep the MR-73 in service for 60 years
• Conclusion
A FEW FACTS ABOUT STM

• 3rd biggest transit operator in North America
• Bus network
  – 220 lines
  – 1746 buses
• Metro network
  – 4 lines, 71 km, 68 stations, 756 metro cars
• 9 200 employees
• Operational budget : 1,4 B$ ($CND 2015)
2014 RESULTS

Record ridership and customer satisfaction at 87%
STM’s STATE OF GOOD REPAIR STATUS

- Total Replacement Value: 26 B$
- Investment back-log: 4 B$

Bus network; 4 B$; 16%
Metro network; 21; 80%
others; 1 B$; 3%
STM’s Metro fleet

- **MR-63**
  - Built by Canadian Vickers in 1966-67
  - 333 cars
  - Will be replace from 2016-2018

- **MR-73**
  - First ever metro cars built by Bombardier
  - Introduce between 1976 and 1980
  - 423 cars

- **AZUR**
  - Built by a Bombardier-Alstom Consortium
  - Will enter service progressively between 2016-2018
Montreal’s metro

- 100% underground
- Rubber tires rolling stock
- 3rd rail 750 volts

The steel rail is used only in switches and if a tyre deflate.
THE MR-73 : Major renovations

- 1992-99 : Minor steel body renovation
- 2004-2007 : Major interior renovation
- 2000 – 2014 : 10 systems modernization
- 2010 : replacement of the ATC system
MR-73 : useful life

- Originally : 40 years
- Now, a growing number of networks are refurbishing their rolling stock to extend them for a total life of 60 years.
  - Ex : Hong Kong, Santiago, Sao Paulo
Useful life : a theoretic notion

The Railway and Transport Strategy Center (London Imperial College) realized a case study about extending the useful life of rolling stock – A good reliability is an essential condition to go forward to an extension of the useful life.

« RSTC recommends that the more established metros which continue to replace their fleets close to design life, often in line with long held practice, should re-examine their strategies to test the merit of the newer practices for their own circumstances. It is important that metros realise that what applied in the past may not necessarily be the case in the future. »
MR-73

- Reliability is very good:
  - > 312 500 miles between rolling stock incident of 5 min or more

- Availability is very good: 90% of the MR-73 are ok for service each day

Benchmarking of RS incidents per million km
• Maintenance cost are low

Source: Railway and Transport Strategy Centre, London Imperial College.
How to keep the MR-73 in service

- Major overhaul program: 108 M$ (Can)
  - 6 systems need renovations and upgrades
- Constant monitoring the performance of every system and sub-system
- Foreseeing all obsolescence problem in advance
The future growth of ridership prevision until 2036 requires also,

- More trains would need to be purchase from our active AZUR contract or by tender
- Train garage would need to be extended
- All this, for approximately 500 M$
Alternatives: Maintain or replace the MR-73 fleet

- Replace: New trains and repair shop modernization will cost more than 2 B$

- Maintain the MR-73 in service until 2036 is less than 1 B$
  - Systems renovations: 0.108 B$
  - More trains and infrastructures to make it until 2036: 0.500 B$
Conclusion: We keep the MR-73 for another 20 years

- The 4B$ back log in renovation works must be addressed:
  - Financial resources are rare
  - Organizational capacity is a big concern

- The MR-73, with a reasonable investment, will be maintained until 2036:
  - Performances are good and will be maintained
  - Maintenance costs are low and in control
  - Systems renovations are ongoing
Thank you