ECCO SYMPOSIUM # 5 – 14th Nov 12

Technology Transfers in China

ALTSOM Transport’s experience

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ALSTOM Transport
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1. Alstom & Alstom Transport
2. Technology Transfers in China
3. Conclusion
Four main activities

93,500 employees in 100 countries

Thermal Power sector
Equipment & services for power generation

Renewable Power sector
Equipment & services for power generation

Grid sector
Equipment & services for power transmission

Transport sector
Equipment & services for rail transport
Key figures*

Total sales 2011/12: €19.9 bn

Transport
Sales: €5.2 bn
26%

Power
Sales: €10.7 bn
54%

Grid
Sales: €4 bn
20%

*Alstom 2011-12 figures, Alstom Thermal and Renewable Power combined.
Orders 2011/12

Orders received by region and by activity

Asia-Pacific 25%
Europe 44%
Middle East / Africa 13%
North America 12%
Latin America 6%

Thermal
Renewable
Transport
Grid
Alstom Transport, railway multi-specialist

- Masters all businesses of rail sector
- The most complete range of systems, equipments and services:
  - Rolling Stock / Infrastructures / Signalling / Services / Turnkey transport systems
- N°1 in high and very high speed
- N°2 in urban transport (tramways, metros)
- N°2 in signalling
- N°2 in maintenance
Alstom Transport - A worldwide local company
A worldwide offer

Sales by region

- Latin America 7.3%
- Asia Pacific 11.7%
- North Europe 25.6%
- North America 3.9%
- CIS 0.8%
- South Europe 23.1%
- France 27.6%

Total sales
2011/2012

€ 5.2 bn

More than 200 customers
The second railway manufacturer in the world

- **Alstom**: 12%
- **Siemens**: 10%
- **China South Locomotive and Rolling Stock Corporation Ltd**: 10%
- **China Northern Locomotive and Rolling Stock Industry (Group)**: 10%
- **Bombardier**: 15%
- **General Electric**: 6%
- **TMH**: 7%
- **Others**: 32%
  - 0% Funkwerk
  - 1% Talgo
  - 1% Ansaldo Breda
  - 2% Other (Skoda, EDI Rail,...)
  - 2% Invensys
  - 2% United
  - 2% Stadler
  - 2% EMD
  - 2% Rotem
  - 2% Vossloh
  - 2% Ansaldo STS
  - 2% Balfour Beatty
  - 3% CAF
  - 3% Thalès
  - 5% Japanese players (total)
A wide range of products and services

Rolling stock: from trams to very high speed

DISTANCE

SPEED

Metro

Tram-Train

Suburban

Regional

Locomotives

High speed

Very high speed

Tram
A wide range of products and services

Infrastructure, signalling, services and maintenance

SIGNALLING
Atlas: Revolution in interoperable drive systems
Urbalis: Optimal and efficient monitoring of complex urban transport systems

SERVICES AND MAINTENANCE
Full Maintenance Management
Spare parts management
Renovation
Traintracer

INFRASTRUCTURE
Track laying
Electrification
Electric power supply
Electromechanical equipment
With leading technologies

- APS
- ATLAS
- URBALIS
- AGV (360 km/h)

Tram powered from ground-level
Revolution in “interoperable” drive systems
Global monitoring of complex transport systems
Fourth generation of very high-speed train
Designed with environmental concerns in mind

- **Less energy consumption**
- **Less CO2 emissions**
- **Less noise emissions**
- **Less impact on landscape**

**AGV:**
In petrol-equivalent terms, the AGV consumes only 0.4 of petrol/100 km/passenger, about one fifteenth that of a plane.

**Citadis tram:**
- 4 times less emissions than a bus, 10 times less than a car
- 4 times less noise than automotive traffic

**Very high-speed line:**
Footprint is 14 metres vs 40 metres for a 2x3 lane highway, so 3 times less.
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2. Technology Transfers in China

a) Alstom Transport background in China
b) 2004 – China context
c) MoR requirements
d) Competition
e) Alstom’ s EMU contract
f) Further evolutions
a - Alstom Transport background in China

- Alstom Transport: familiar to ToT in China:
  - 1956: First ToT for 26 (+ 40) locomotives CC 7100 type
  - 1973: 50 diesel locomotives ND4 type
  - 1986: Second ToT for 150 locomotives 8k type

Customer is rarely using the purchased technology neither for its own use nor for overseas competition
• In March 2003, Mr Liu Zhijun, a Chinese politician, is assigned Minister of Railways in the People’s Republic of China.[1]

• He then decides a policy of development by leap for the Chinese Railways infrastructure and Rolling Stock.

• In 2004 major foreign companies are invited to tender for supply and technology transfers of 200 kph EMU (Electrical Multiple Units) with the objective of bringing Chinese railways Industry to the top level of worldwide technology.

• April 2007: Start of Revenue Service with first time introduction in China of Chinese High Speed Trains, based upon 3 different foreign technologies.
c – MoR requirements

- Partner with one MoR subsidiary (CSR or CNR)
- Supply a first batch of trainsets fully manufactured overseas while training MoR engineers to trains technologies
- Supply full kits from overseas to be assembled in China to train MoR engineers and staff
- Provide assistance during manufacturing and commissioning of subsequent train sets
- Partner with key suppliers to transfer component technologies manufacturing
d - Competition

- First round: 200 kph

ALSTOM  BOMBARDIER  Kawasaki

- Second round: 300 kph

SIEMENS  Kawasaki
The Alstom EMU contract

- 60 Trains
  - with 8 cars with 5 motorized trailers speed 200 kph
  - 3 fully imported trainsets.
  - 6 Completely Knocked Down (CKD) trainsets with 100% imported equipment and assembled in China.
  - 51 Domestic trainsets with a localisation rate of 65% on last batch.

- Technology Transfer:
  - 10 ATSA Key technologies covered.
  - Training: 500 Trainees
  - Assistance by ATSA expert: 600 men/month
  - Documentation: ~ 25,000 References transferred

- Localisation:
  - Support to ATSA Chinese partners for localisation of 80 Train key components:
    - Selection, development and qualification of Chinese suppliers
    - Qualification of first product
e – The Alstom EMU contract
Sourcing localization of 80 Key components

Trainsets imported & CKD: Key Components in Europe

• Toilet
• Traction Motor
• Traction Converter
• Main Transformer
• Battery Box
• Seats
• Driver Desk

Components for Traction Motor, Traction Converter, TCMS, TCU, ACU & Battery Charger

• Components for Traction Motor, Traction Converter, TCMS, TCU, ACU & Battery Charger

• Brakes
• Gear Box
• PIS
• Air Spring
• C 1 items

– Interior
– HVAC
– Pantograph
– Gangway
– Coupler
– End Doors
– Cables
– Aerodynamic Nose
– Windows
– Lighting
– C 2 & C 3 items
e – The Alstom EMU contract

- MoR expectations (not expressed at the origin):
  - Operate trainsets at 250 kph instead of 200 kph
  - 6 months acceleration asked by client compared to contractual schedule
  - Design changes required during Design Liaison meeting
  - Training on Design -> Objective: “Enable to Acquire the capacity to improve EMU design”

- Unexpected acceleration required on localisation:
  - 4 Domestic trainsets out of the first 5 introduced in Revenue Service; CKD phase has been skipped.
f – Further evolutions

- MoR decided to operate the trainsets at 250 kph (instead of 200 kph)
- Low maintenance carried on the trains lead to technical problem (gearboxes etc...)
- In 2011, Mr Liu ZhiJun was revoqued
- Speed was reduced to 200 kph
- China did not sell any trains of this technology outside China

- Alstom was awarded further contracts:
  - 500 locomotives (double BoBo) with Datong
  - 350 locomotives (CoCo) with Datong
  - Additional EMU’s (kits with higher local content)

- Alstom refused to transfer Very high Speed technology and did not get further contracts on this segment

- Alstom continues to make business in China on Components and other segments
f – Alstom Industrial presence in China

- Alstom Yuli (Beijing) Disconnector
- ALSTOM (China) Investment Ltd Beijing
- ALSTOM Beizhong Power
- XAYEECO
- Wuhan Boiler Co. AWEC
- SEC Alstom (Wuhan) Transformers
- Alstom (Guangdong) Switchgear
- ALSTOM HK Ltd.
- ALSTOM Power Generation Ltd
- ALSTOM Power Service China Ltd. - HK
- AQREC
- ALSTOM Sizhou Group Companies
- Wuxi Alumin Casting Alstom (Wuxi) Disconnector
- Alstom Suzhou HV Switchgear
- Alstom (Yangzhou) HV Bus-Ducts
- Alstom Grid Technology Center (China)
- Alstom Grid System (Shanghai)
- SEC Alstom (Shanghai Baoshan)Transformer
- SEC Alstom (Shanghai Lingang)Transformer
- Alstom Shanghai Instrument Transformers
- Alstom (Guangdong) Switchgear
- SEC Alstom (Shanghai Baoshan)Transformer
- SEC Alstom (Shanghai Lingang)Transformer
- Alstom Shanghai Instrument Transformers
- Alstom Strongwish
- CASCO SATEE SATCO
- AOHAN
- ALSTOM Technology Service (Shanghai) Co., Ltd
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8 - Conclusion

• A real success: Start of Revenue Service with 5 trainsets of which 4 manufactured in China based, upon ATSA Technology Transfer, 30 months after Contract signature.

• Alstom differs from its competitor in technology transfers policy

• Alstom invests more than 600 M€ every year in R&D to remain leader on its technology

• Alstom is cautious in its technology transfer and does not intend to vary its strategy on this
THANK YOU