



Technical Introductions of Kawasaki

13 January 2012

1. Company Profiles and Products

1.1 Company Profiles

Established: 15 October 1896

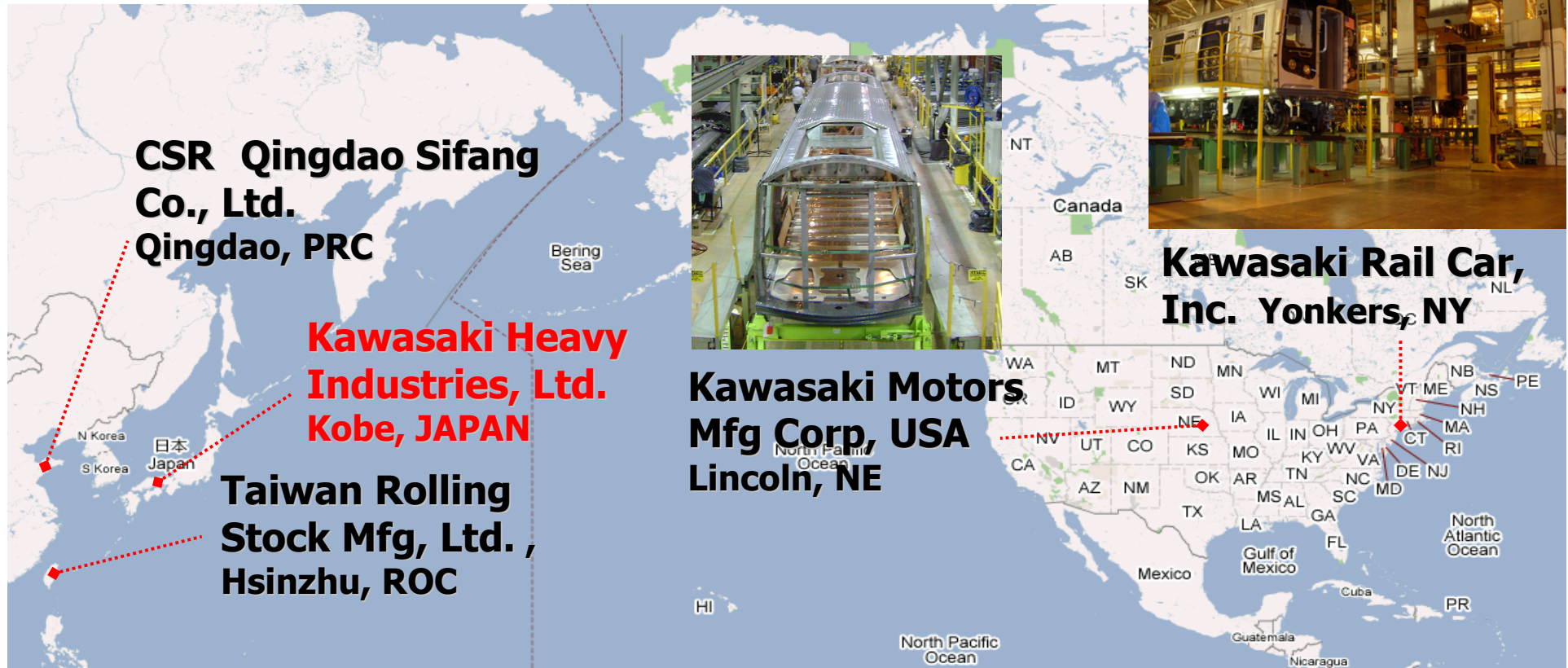
Capital: USD \$1,254 million (as of 31 March 2011)

Net Sales: USD \$14.8 billion (FY ending 31 March 2011)

Employees: 32,706 (as of 31 March 2011)



1.2 Global Business Operation of Kawasaki

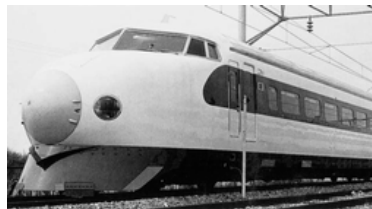


Kawasaki has sufficient achievements and experiences in indigenization and/or transfer of technology and will pursue long-term “win-win” relationship in respective countries/regions.

2. Record of High Speed Train Production

2.1 Chronicle of Shinkansen Development

Kawasaki has been involved in development of all Shinkansen trains



**1964: 0 Series
(210km/h)**



**1982: 200 Series
(240km/h)**



**1985: 100 Series
(230km/h)**



**1992: 300 Series
(270km/h)**



**1992: 400 Series
(130 or 240km/h)**



**1994: E1 Series
(240km/h)**



**1997: E2 Series
(275km/h)**



**1997: E3 Series
(130 or 275km/h)**



**1997: E4 Series
(240km/h)**



**1997: 500 Series
(300km/h)**



**1999: 700 Series
(285km/h)**



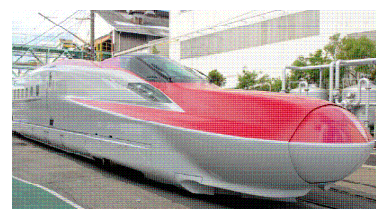
**2000: 700-7000 Series
(285km/h)**



**2007: N700 Series
(300km/h)**



**E5 Series
(320km/h)**



**E6 Series
(130 or 320km/h)**

Kawasaki supplied 3,407 cars as of 30 November 2011.

2.2 Taiwan High Speed Rail Series 700T



Train consist:	9 Motor cars plus 3 Trailer Cars
Electric power supply:	AC 25,000 V (60 Hz)
Max. operating speed:	300 km/h
Propulsion system:	IGBT Inverter Control
Traction motor:	285 kW x 4 x 9 cars, 3-phase Induction Motors
Dimension:	25,000 mm(L) x 3,380 mm(W) x 3,650 mm(H)
Delivery:	FY2004-2005
Supplied Q'ty by Kawasaki:	360 cars
Fire safety standard:	BS6853 Ib (Material, Fire Barrier, etc.)

2.3 Ministry of Railway, China CRH2



Train consist:	4 Motor Cars plus 4 Trailer Cars
Electric power supply:	AC 25,000 V (50 Hz)
Max. operating speed:	200 km/h
Propulsion system:	IGBT Inverter Control
Traction motor:	300 kW x 4 x 4 cars, 3-phase Induction Motors
Dimension:	25,000mm(L) x 3,380mm(W) x 3,700mm(H)
Delivery:	FY2006-2007
Supplied Q'ty by Kawasaki:	480 cars

2.4 efSET – Original High Speed Train of Kawasaki

efSET = **e**nvironmentally **f**riendly **S**uper **E**xpress **T**rain

Proven Shinkansen Technology

+ Particular Requirements in each Country/Region



Now ready for supply.

Safety

Reliability

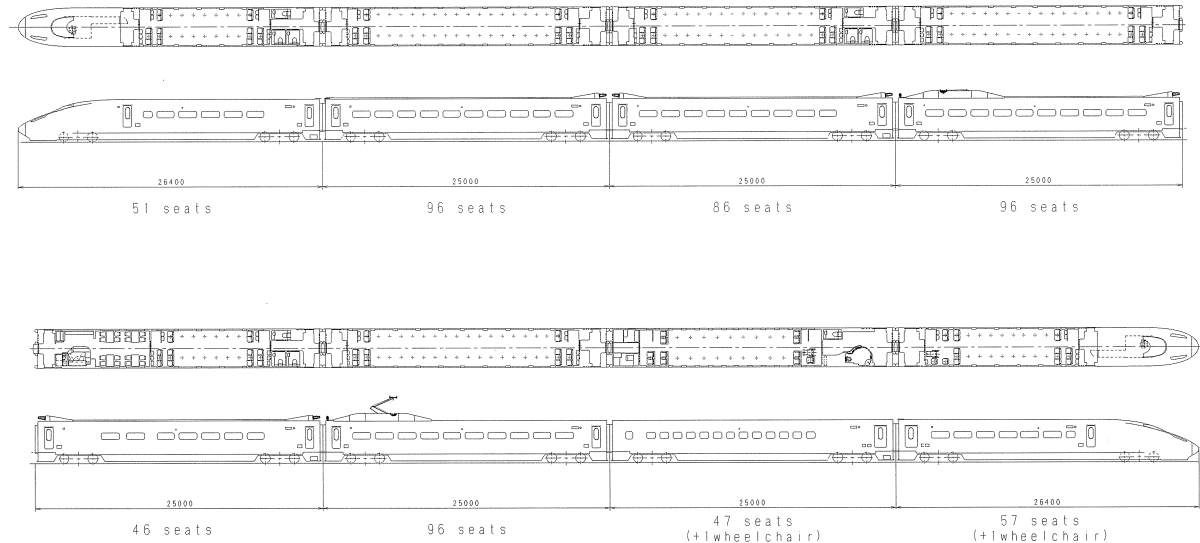
Energy-Saving

Comfort

**Environmental
Performance**

2.5 efSET – Main Specifications

Item	Value
Max. Service Speed	350 km/h
Motor/Trailer Ratio	6M2T
Total Traction Power	9,720 kW
Seated Passengers	575
Width	3,380 mm
Train Length	200,000 mm
Train Weight (Empty)	400 t
Max. Axle Weight	14.5 t



Wide Interior

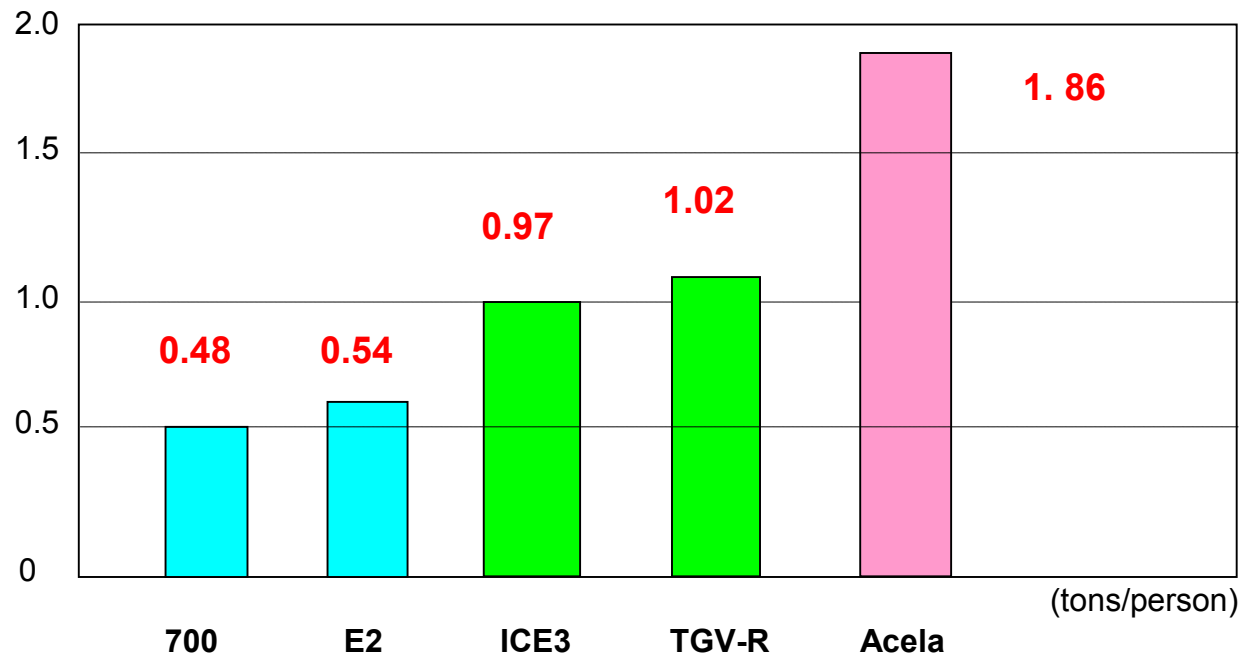
Light Weight

3. Important Factors for Planning High Speed Rail Trains

**Total System Safety and
Low Operation Cost**

3.1 Light Weight Design

Weight Comparison of High Speed Trains

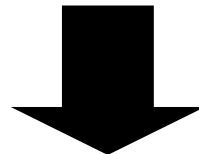


- Wide carbody to accommodate 5 seats abreast
- Light weight design of body and bogie
- Total system safety approach

3.2 Total System Safety

Series	Japanese HSR	ICE3	TGV-R	Acela
Train Weight / Passenger (tons / person)	0.48-0.54	0.97	1.02	1.86
Required Compression Load (tons)	Japanese Standard 100tons	UIC 150tons		49CFR Tier II 360tons (Coach) 945tons(Power Car)
Track	Fully Dedicated Track	High Speed Section-Dedicated Track Low speed Section-Conventional Track		Conventional Track

Light weight train can be realized by total safety approach, with fully dedicated track, sophisticated signaling system and other wayside systems.



Total system approach realizes safe and efficient high-speed rail.

3.3 Operation Cost

Design to realize Low Operation Cost

Light Weight ⇒ **Low energy consumption**
⇒ **Less track maintenance**

Effective Regenerative Brake

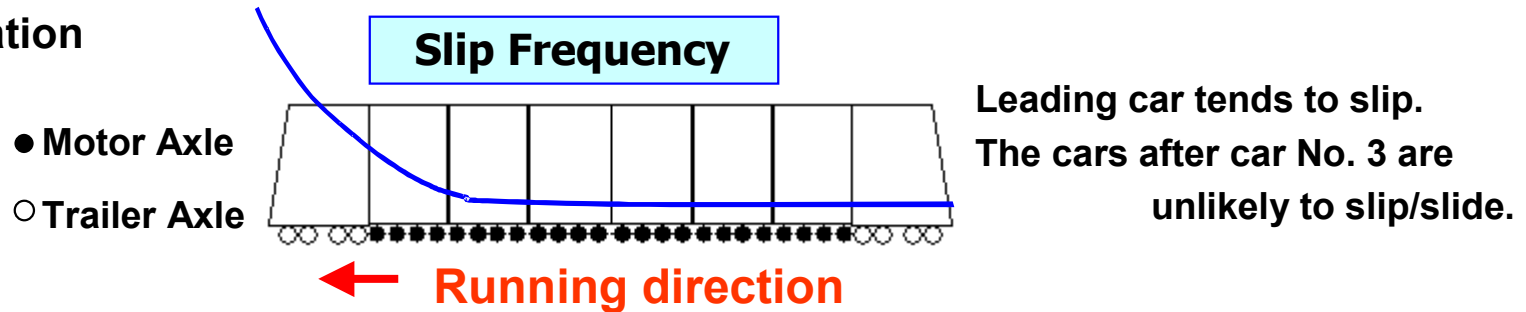
⇒ **Low energy consumption**
⇒ **Less brake pads wear**

High Reliability ⇒ **Less maintenance and spares**

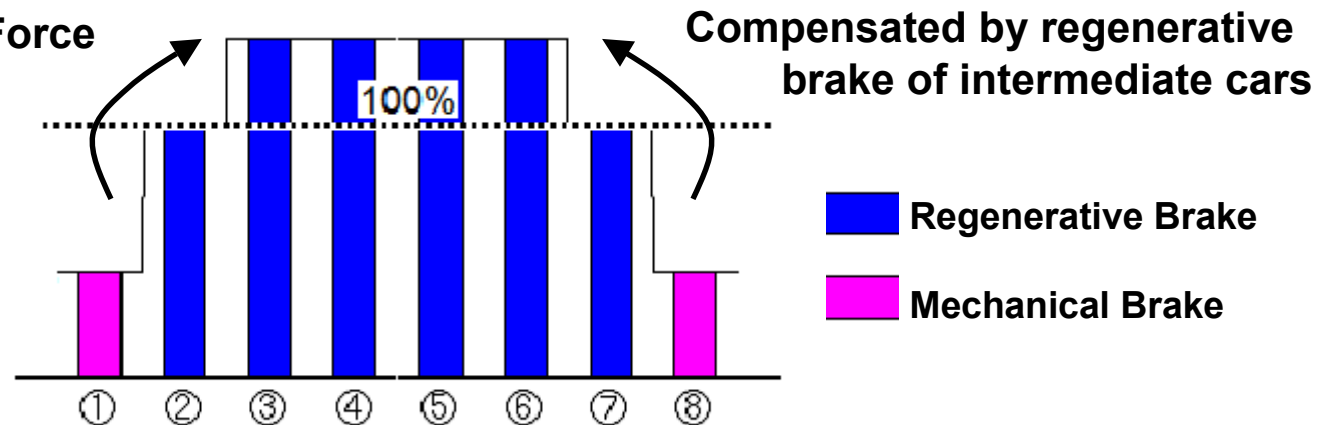
3.4 Efficient Regenerative Brake System

- 1) High Ratio of Motor Cars in a Train → **Stable and Efficient Regenerative Brake Under Rainy Conditions**
 2) Both Ends are Trailer Cars

Train Formation



Distribution of Brake Force



Reduction of Total Power Consumption and Wear of Brake Pad

4. Conclusion

Shinkansen-based high speed rail assures safe, reliable, environmentally friendly and cost effective high speed rail in India.

Kawasaki will keep cooperating with India for successful introduction of High-Speed Rail.



*Thank You Very Much
for Your Attention*