Las Vegas
October 3, 2011

Content

- Talgo company profile
- Experience
- Talgo Innovation
- Product descriptions
- Q&A

TALGO COMPANY PROFILE

Profile

- Year established: 1942
- Employees in 2010: 1,232
- Revenues 2010: $467 million

Core Business

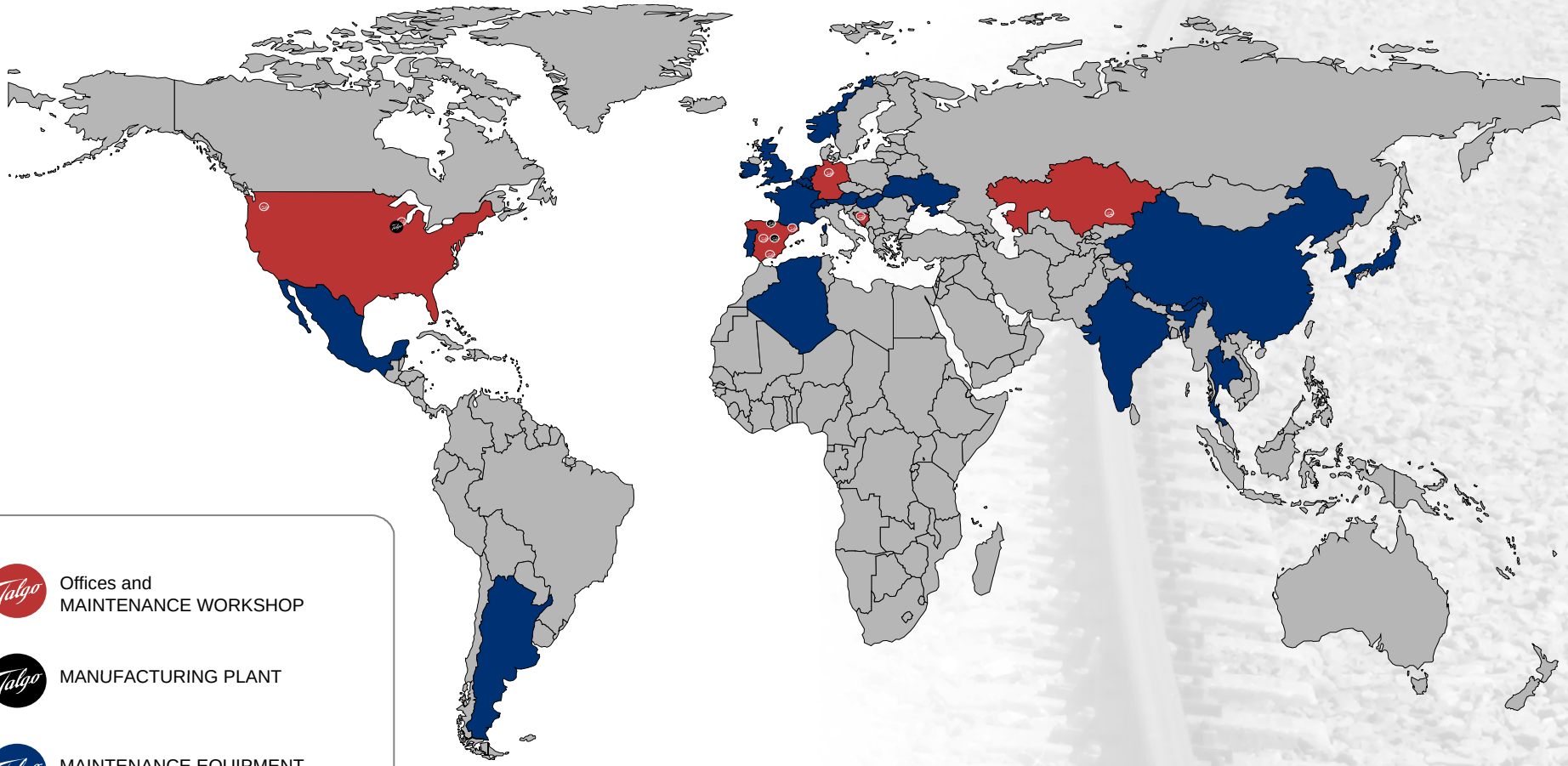
Design, Manufacture, Maintenance of:

- Passenger Trains
- Maintenance Equipment
- Automatic Dual Gauge System

History

- Over 60 years in business
- Over 3,000 vehicles built
- High speed applications
- Built in the U.S. in 1950's
- Continuous service in the U.S. since 1994
- Safety record (accidents demonstrated crashworthiness; minimal injuries/deaths)

Talgo Worldwide



Offices and
MAINTENANCE WORKSHOP

MANUFACTURING PLANT

MAINTENANCE EQUIPMENT

TALGO ROUTES

SPAIN AND EUROPE

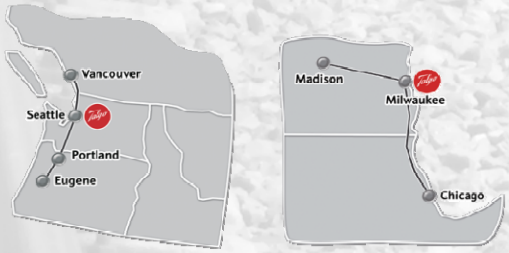
Long distance, Intercity and International services

SPAIN High Speed

KAZAKHSTAN

UZBEKISTAN

BOSNIA AND HERZEGOVINA



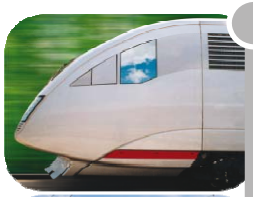
UNITED STATES

TALGO EXPERIENCE

Talgo's portfolio

Very High Speed -220

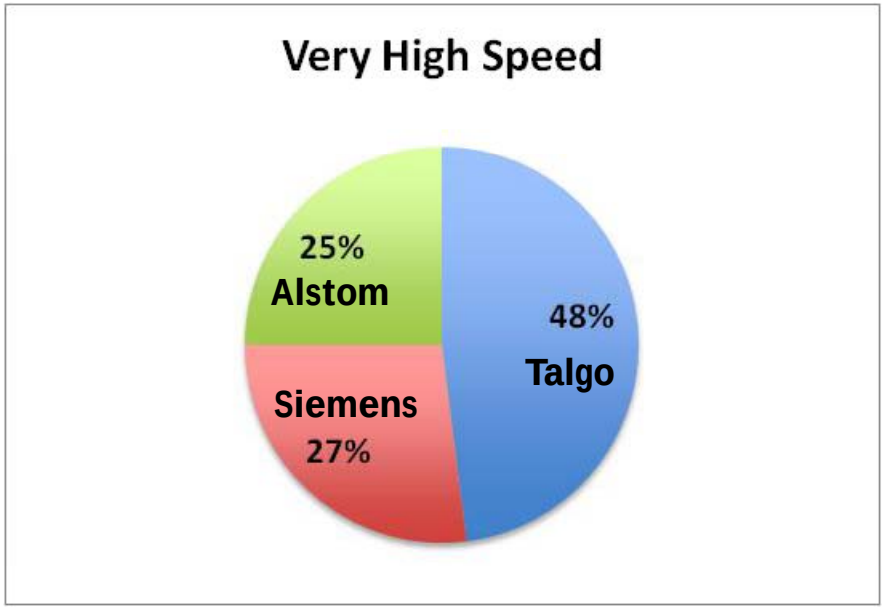
High Speed-150

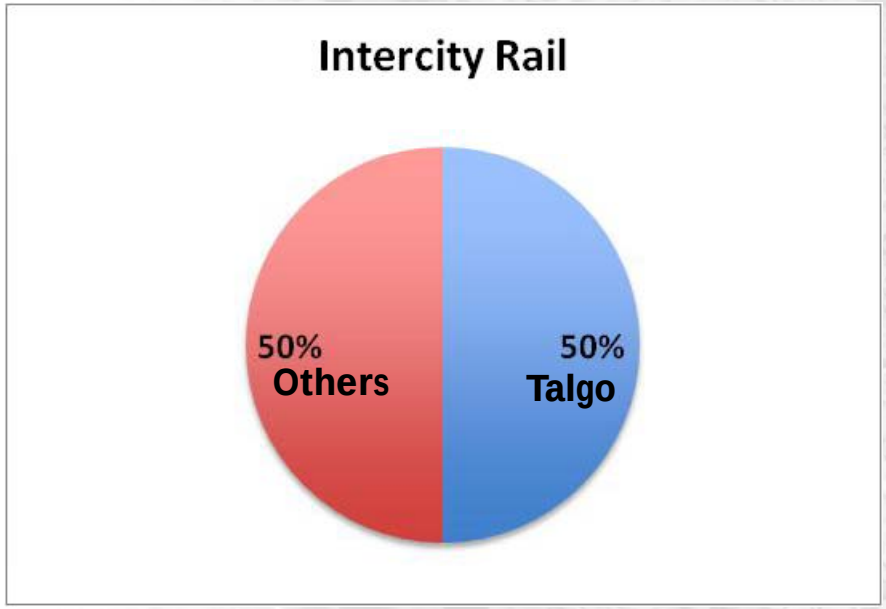


Intercity-125

Locomotives-150

Market Share High Speed Rail Spain





Talgo High Speed Trains in Operation & Backlog

Country	Customer	Series	Desing Name	Max Speed mph	Max Speed kph	No. Cars	No. Powerheads	No of Traisets built	Production Timeframe
Spain	Renfe	Series 3-RD	Series 3-RD	113	180	14	0	1	1964-1981
Spain	Renfe	Series 4	Series 4	125	200	274	0	24	1979-1987
Spain	Renfe	Series 5	Series 5	125	200	51	0	5	1989-1991
Spain/France	Renfe/SNCF	Series 6	Series 6	125	200	382	0	25	1989-2003
Germany	Deutsche Bahn	Series 6	Talgo Intercitynight	138	220	150	0	6	1994-1996
Kazahkstan	Themir Zholy	Series 6	Talgo Kazakhstan	138	220	54	0	3	2003
USA	Amtrak-WSDOT	Series 6	Talgo USA	138	220	67	0	5	1998
Spain	ADIF	Talgo XXI	Talgo XXI	138	220	6	2	2	2002
Spain	Renfe	Series 7	Talgo 250	156	250	495	90	45	2007-2009
Spain	Renfe	Series 7	Talgo 350	219	350	192	32	16	2004
Spain	ADIF	Series 7	Talgo 350	219	350	3	2	1	2007
Spain	Renfe	Series 7 Hotel	Talgo S7 Hotel Train	138	220	203	0	10	2008-2009
Spain	Renfe	Series 7	Talgo 350	219	350	360	60	30	2008-2011
Bosnia Herzego.	BIH Railways	Series 7	Talgo S7 Hotel Train	125	200	81	0	9	2010-2011
USA	Wisconsin DOT	Series 8	Talgo USA Lakeliner	138	220	31	0	2	2011
Srpska Rep	Ministry of Transport and Communication of RS	Serie 7	Talgo S7 Hotel Train	125	200	36	0	4	2012
Uzbekistan	Temir Zholy (Kazakhstan Railways)	Serie 7	Talgo 250	156	250	22	4	2	2011
USA	Oregon DOT	Series 8	Talgo USA Lakeliner	138	220	26	0	2	2012
Kazahkstan	Themir Zholy	Series 6	Talgo Kazakhstan	138	220	420	0	12	2011-2014
Russia	RZD	Series 7	Talgo S7 Hotel Train	138	220	140	0	7	2014-2018
Saudi Arabia	SRO	Series 7	Talgo 350	219	350	396	66	33	2014-2016
TOTAL						**3,403**	**256**	**192**	

Trains in current operation

Trains ordered

The latest very high speed rail award: Saudi Arabia

- Brand new Very High Speed line
- Design-Build-Operate-Maintain contract
- Duration: 12 Years
- 281 miles
- $9 Billion
- Competitors: China, France, Germany, Spain
- Winning Consortium: Spain
  - General Engineering: Indra
  - Infrastructure management: ADIF
  - Construction: OHL & Copasa
  - Electrification: Cobra
  - Signaling: Invensys (Dimetronic)
  - Operator: Renfe
  - Rolling Stock: Talgo

The latest very high speed rail award: Saudi Arabia

- 33 Talgo 350 trains
- Single-voltage 25 kV 60 Hz
- New interiors, according to customer demands
- Adapted for especially harsh conditions found in desert areas
- Talgo full integrator of the traction system

Talgo 250 Uzbekistan

- First commercial High Speed Train with Talgo as full integrator of the traction system
- Same train as Spanish Talgo 250 (single-voltage 25 kV 50 Hz and Russian gauge)

TALGO INNOVATION

FEATURES

- Lightweight construction
- Semi-monocoque construction
- Articulated union
- Guided axles
- Independent wheels
- Passive tilting system

BENEFITS

- Lower fuel costs
- Higher acceleration
- Increased safety
- Reduced wheel and track wear
- Lower maintenance costs
- Higher speed in curves
- Superior ride quality
- Increased resistance to derailing, overturning and telescoping

A History of Innovation

1998 **TALGO XXI**

Speed: 125 mph

diesel 256 km

2012 **NEW TALGO HIGH SPEED PLATFORM "AVRIL"**

- ✓ TSI European Standards

Speed: 236 mph

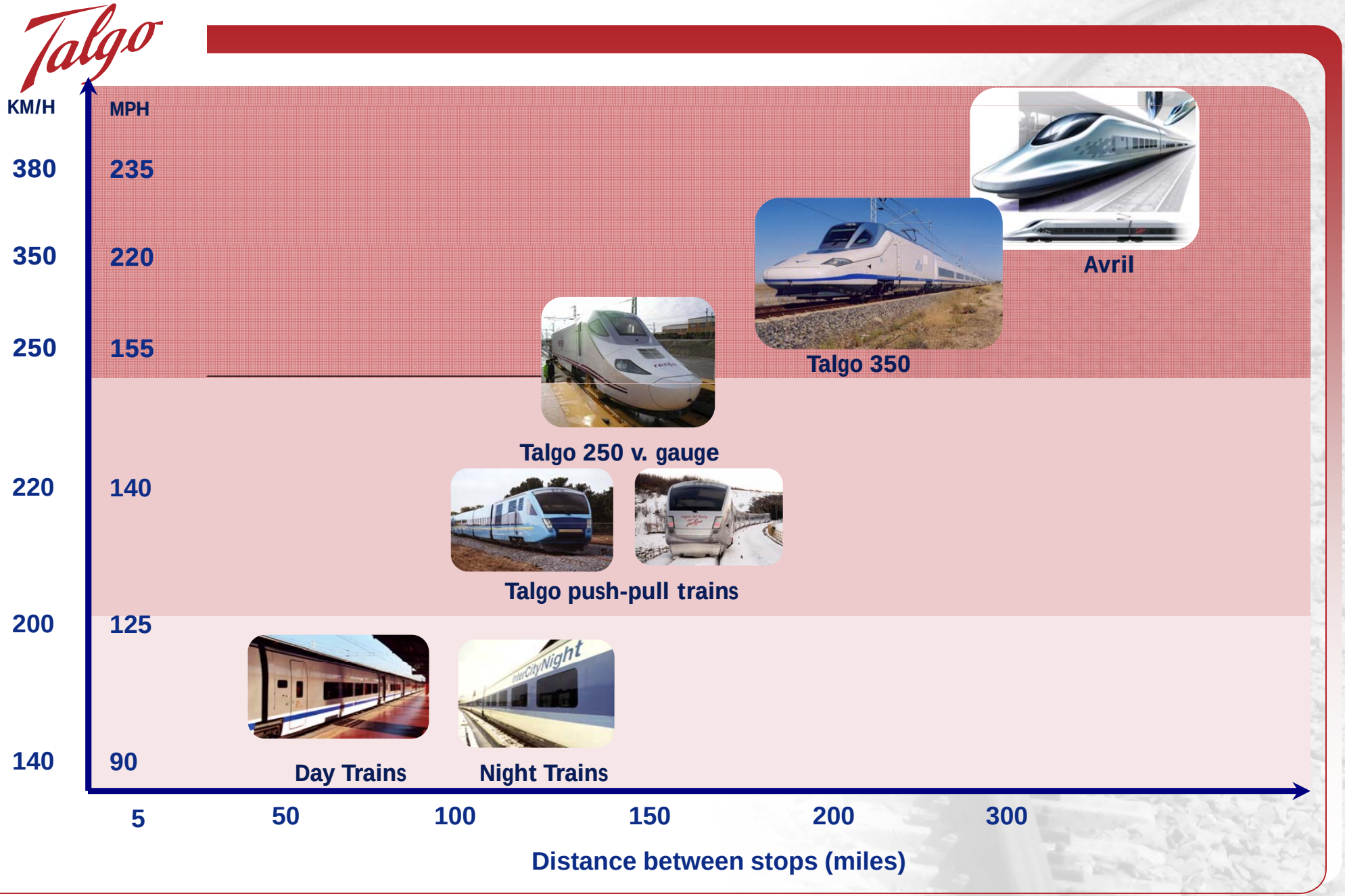
TALGO PRODUCTS DESCRIPTIONS

Definition of HSR

- Serving inter-city travel markets between 100 and 600 miles apart
- Time-competitive with air and/or autos
- Speeds from 90 to 200 + mph

USDOT High-Speed Rail Definitions			
Express HSR	**Regional HSR**	**Emerging HSR**	**Conventional Rail**
▪ Between cities 200-600 miles apart ▪ Few stops ▪ Top speeds 150+ mph ▪ Dedicated track and right-of-way ▪ Relieves air and road congestion	▪ Between cities 100-500 miles apart ▪ Top speeds 110-150 mph ▪ Some dedicated and some shared track	▪ Developing 100-500 miles of corridor ▪ Top speeds 90-110 mph ▪ Shared track ▪ Develops existing passenger rail market	▪ More than 100 miles ▪ Multiple daily trips ▪ May have potential to be developed into future HSR ▪ Top speeds 90 mph





KM/H
MPH
380
235
350
220
250
155
220
140
200
125
140
90
Avril
Talgo 350
Talgo 250 v. gauge
Talgo push-pull trains
Day Trains
Night Trains
InterCityNight
5
50
100
150
200
300
Distance between stops (miles)

Talgo 350

General Data	
Type of Trainset	High Speed Electric Trainset
Order Dates	2001 and 2004
Quantity	46 (16 S-102 + 30 S-112)
Train Consist	1-12-1 (2 Power heads, 11 Passenger cars and 1 Cafe car)
Overall Trainset Length	656 ft (200 m)

Number of Passengers	
Coach	S-102: 197 S-112: 220
First Class	S-102: 121 S-112: 128
Total	S-102: 318 S-112: 348

Weight (empty)	
Power head	67 metric tons (x2)
Car Consist	195 metric tons (12 cars)
Total Weight	329 metric tons

Talgo 350

Performance and Capacity	
Maximum Design Speed	220 mph (350 km/h)
Starting Tractive Force	44,906 lbf (200 kN)
Service Braking Deceleration	2.3 mph/s (1 m/s^2)
Emergency Braking Deceleration	2.7 mph/s (1.2 m/s^2)
Buff Load	As required by market regulations

Dimensions	Power head	Passenger Cars
Length	67’ 6.3” (20,588 mm)	43’ 1.2” (13,140 mm)
Width	9’ 8.5” (2,960 mm)	9’ 7.8” (2,942 mm)
Height	13’ 1.4” (4,000 mm)	11’ 0.4” (3,365 mm)
Side Doorway Width	N/A	2’ 8” (813 mm)
Floor Height Above Rail	4’ 6.7” (1.390 mm)	2’ 5.9” (760 mm)
Truck Center Distance	36’ 1” (11,000 mm)	43’ 1.2” (13,140 mm)
Coupler Height Above Rail	3’ 5.3” (1,050 mm)	2’ 1” (635 mm)
Wheel Diameter	3’ 4.9” (1,040 mm)	2’ 11.4” (900 mm)
Truck Wheelbase	8’ 8.3” (2,650 mm)	Mono-axle
Track C		

Talgo 350

Technical Characteristics			
Propulsion System	2 Power heads per trainset. 2,944 HP (4,000 kW) per Power head	**Monitoring system**	Dedicated computers that control, diagnose and monitor systems and subsystems for optimum safety an reliability
Motor	4 asynchronous AC traction motors per Power head	**Carbody**	Power head: Carbon steel Passenger cars: Aluminum (double-wall extrusions)
Traction Control	IGBT-Type inverters, 2 per Power head	**Tilting system**	Natural Talgo tilting system
Transmission	Fully Truck suspended gearbox and motor assembly	**Truck Type**	Power head: Outboard bearing, welded frame Passenger cars: Mono-axle independent wheel between cars, welded frame
Power Input	Overhead catenary wire , 25 kV 50 Hz	**Coupler**	Front: Automatic Scharfenberg type Intermediate: Semi-permanent with energy absorption
Auxiliary Power	1 static converter per Power head	**Suspension**	Power head: Primary and secondary helical springs Passenger cars: Primary helical springs. Secondary air springs
Voltage	400 V 3-phase 50 Hz, 110 V DC	**Air Comfort**	One self-contained under-frame mounted HVAC and air heating
Braking System	Power head: Blended regenerative/rheostatic resistance braking supplemented by friction braking. 3 brake disks per axle (2 in wheels-1 in axle). Redundant wheel-slide protection. Anti-slide system Passenger cars: 4 brake disks per axle. Redundant wheel-slide protection. Anti-slide system	**Passenger Services**	- MRP compliant areas - Standard and MRP toilets - Audio entertainment in passenger cars - Video entertainment in passenger cars - Public address system - Information sign displays - Rotating seats (some with folding tables) - Meal service (First Class)
Doors	Outside sliding-plug type		

Talgo 250

General Data	
Type of Vehicle	High Speed Trainset, with variable track gauge and 2 catenary voltages in the Spanish units
Order Dates	2003 and 2009
Quantity	45 Renfe + 2 Uzbekistan
Train Consist	1-11-1 (2 Power heads, 10 Passenger cars and 1 Cafe car
Overall Trainset Length	590 ft (180 m)

Number of Passengers	
Coach	236
First Class	63
Total	299

Weight (empty)	
Power head	72 metric tons (x2)
Car Consist	240 metric tons (11 cars)
Total Weight	312 metric tons

Talgo 250

Performance and Capacity	
Maximum Speed Design	156 mph in 25 kV (250 km/h)
Starting Tractive Force	49,397 lbf (220 kN)
Service Braking Deceleration	2.3 mph/s (1 m/s^2)
Emergency Braking Deceleration	2.7 mph/s (1.2 m/s^2)
Buff Load	As required by market regulations

Dimensions	Power head	Passenger Cars
Length	67’ 0.3” (20,434 mm)	43’ 1.2” (13,140 mm)
Width	9’ 8.5” (2,960 mm)	9’ 7.8” (2,942 mm)
Height	13’ 1.4” (4,000 mm)	11’ 0.4” (3,365 mm)
Side Doorway Width	N/A	2’ 8” (813 mm)
Floor Height Above Rail	4’ 6.7” (1.390 mm)	2’ 5.9” (760 mm)
Truck Center Distance	34’ 11.2” (10,650 mm)	43’ 1.2” (13,140 mm)
Coupler Height Above Rail	3’ 5.3” (1,050 mm)	2’ 1” (635 mm)
Wheel Diameter	3’ 3.8” (1,010 mm)	2’ 11.4” (900 mm)
Truck Wheelbase	9’ 2.2” (2,800 mm)	Mono-axle
Track Gauge	4’ 8.5” (1,435 mm) 5’ 5.7” (1,668 mm)	4’ 8.5” (1,435 mm) 5’ 5.7” (1,668 mm)

Talgo 250

Technical Characteristics			
Propulsion System	2 Power heads per trainset. 1,766 HP (2,400 kW) per Power head in 25 kV mode 1,472 HP (2,000 kW) per Power head in 3 kV mode	**Monitoring system**	Dedicated computers that control, diagnose and monitor systems and subsystems for optimum safety an reliability
Motor	4 asynchronous AC traction motors per Power head	**Carbody**	Power head: Carbon steel Passenger cars: Aluminum (double-wall extrusions)
Traction Control	IGBT-Type inverters, 2 per Power head	**Tilting system**	Natural Talgo tilting system
Transmission	Fully Truck suspended gearbox and motor assembly	**Truck Type**	Power head: Outboard bearing, welded frame Passenger cars: Mono-axle independent wheel between cars, welded frame
Power Input	Overhead catenary wire: - 25 kV 50 Hz - 3 kV DC	**Coupler**	Front: Automatic Scharfenberg type Intermediate: Semi-permanent with energy absorption
Auxiliary Power	1 static converter per Power head	**Suspension**	Power head: Primary and secondary helical springs Passenger cars: Secondary air springs
Voltage	400 V 3-phase 50 Hz, 110 V DC	**Air Comfort**	One self-contained under-frame mounted HVAC and air heating
Braking System	Power head: Blended regenerative/rheostatic dynamic braking supplemented by friction braking. 2 brake disks per axle. Redundant wheel-slide protection. Anti-slide system Passenger cars: 2 brake disks per axle. Redundant wheel-slide protection. Anti-slide system	**Passenger Services**	- MRP compliant areas - Standard and MRP toilets - Audio entertainment in passenger cars - Video entertainment in passenger cars - Public address system - Information sign displays - Rotating seats (some with folding tables) - Meal service (First Class)
Doors	Outside sliding-plug type		

Talgo 250 Dual

- Same train as T250, with the addition of two generator cars, which allows accessing to the non-electrified portion of the network.
- Train transitions from one power source to the other without stopping
- Provides non-electrified areas access to the high speed network without investment in infrastructure

General Data	
Type of Vehicle	High Speed Dual Electric + Diesel Trainset, with variable track gauge
Order Dates	2009
Quantity	15
Train Consist	1-1-9-1-1 (2 Power heads, 2 Generator cars, 8 Passenger cars and 1 Cafe car)
Overall Trainset Length	608 ft (186 m)

Talgo 250 Dual

Diesel Engine Data	
Model	12 v – 4000 rpm – 43 liters
Power	2448 HP (1800 kW) at 1800 rpm
Compliance with Emissions	EU 26/2004 Stage IIIa
Emissions	190 g CO_2/kWh
Unitary Cylinder Capacity	4.77 liters
Total Cylinder Capacity	57.23 liters
Weight	14,537 lb (6600 kg)

Performance and Weight	
Operating Speed	Electric 25 kV: 156 mph (250 km/h) Electric 3 kV: 138 mph (220 km/h) Diesel: 113 mph (180 km/h)
Power	Electric 25 kV: 3,533 HP (4,800 kW) Electric 3 kV: 2,944 HP (4,000 kW) Diesel: 1,766 HP (2,400 kW)
Weight	361 metric tons

Talgo Series 7 Hauled Trainset

General Data	
Type of Vehicle	High Speed Trainset
Order Dates	From 2001 on
Quantity	203 cars
Train Consist	Multiple combinations depending on the customer requirements
Overall Trainset Length	Variable, depending on number of cars and based on customer needs

Number of Passengers	
Variable	Day Train Night train 1st class and Coach

Weight (empty)	
Power head	N. A.
Car Consist	240 metric tons (for 11 cars)
Total Weight	240 metric tons (for 11 cars)

Talgo Series 7 Hauled Trainset

Performance and Capacity	
Maximum Speed Design	156 mph (250 km/h)
Starting Tractive Force	N.A.
Service Braking Deceleration	2.3 mph/s (1 m/s^2)
Emergency Braking Deceleration	2.7 mph/s (1.2 m/s^2)
Buff Load	As required by market regulations

Dimensions	
	Passenger Cars
Length	43’ 1.2” (13,140 mm)
Width	9’ 7.8” (2,942 mm)
Height	11’ 0.4” (3,365 mm)
Side Doorway Width	2’ 8” (813 mm)
Floor Height Above Rail	2’ 5.9” (760 mm)
Truck Center Distance	43’ 1.2” (13,140 mm)
Coupler Height Above Rail	2’ 1” (635 mm)
Wheel Diameter	2’ 11.4” (900 mm)
Truck Wheelbase	Mono-axle
Track Gauge	4’ 8.5” (1,435 mm) 5’ 5.7” (1,668 mm)

Talgo Series 7 Hauled Trainset

Technical Characteristics			
Propulsion System	N.A.	**Monitoring system**	Dedicated computers that control, diagnose and monitor systems and subsystems for optimum safety an reliability
Motor	N.A.	**Carbody**	Aluminum (double-wall extrusions)
Traction Control	N.A.	**Tilting system**	Natural Talgo tilting system
Transmission	N.A.	**Truck Type**	Mono-axle independent wheel between cars, welded frame
Power Input	N.A.	**Coupler**	Front: Automatic Scharfenberg type (or other type depending on the country) Intermediate: Semi-permanent with energy absorption
Auxiliary Power	Static converter or Diesel generator	**Suspension**	Secondary air springs
Voltage	400 V 3-phase 50 Hz, 110 V DC	**Air Comfort**	One self-contained under-frame mounted HVAC and air heating
Braking System	2 brake disks per axle. Redundant wheel-slide protection. Anti-slide system	**Passenger Services**	- MRP compliant areas - Standard and MRP toilets - Audio entertainment in passenger cars - Video entertainment in passenger cars - Public address system - Information sign displays - Rotating seats (some with folding tables) - Meal service (First Class) - WIFI Internet access - 2-bed cabins, including video service

Talgo Series 8 Wisconsin

General Data	
Type of Vehicle	High Speed Diesel Trainset
Order Dates	2009
Quantity	2
Train Consist	13-1 (12 Passenger cars, 1 Cafe car and 1 Cab car)
Overall Trainset Length	672 ft (205 m)

Number of Passengers	
Coach	397
First Class	-
Total	397

Weight (empty)	
Power head	121.7 metric tons (x2)
Car Consist+Cab car	299.3 metric tons (13 + 1 cars)
Total Weight	421 metric tons

Talgo Series 8 Wisconsin

Performance and Capacity	
Maximum Speed Design	135 mph (216 km/h)
Starting Tractive Force	88,570 lbf (394 kN)
Service Braking Deceleration	2.3 mph/s (1 m/s^2)
Emergency Braking Deceleration	2.7 mph/s (1.2 m/s^2)
Buff Load	800,000 lbf (3,563 kN)

Dimensions		
	Amtrak Locomotive (P42 DC)	**Passenger Cars**
Length	69’ (21,036 mm)	43’ 1.2” (13,140 mm)
Width	10’ (3,050 mm)	9’ 7.8” (2,942 mm)
Height	14’ 6.5” (4,434 mm)	11’ 0.4” (3,365 mm)
Side Doorway Width	N/A	2’ 8” (813 mm)
Floor Height Above Rail	5’ 4” (1.625 mm)	2’ 5.9” (760 mm)
Truck Center Distance	43’ 2.5” (13,174 mm)	43’ 1.2” (13,140 mm)
Coupler Height Above Rail	34.5” (876.3 mm)	2’ 1” (635 mm)
Wheel Diameter	3’ 4” (1,016 mm)	2’ 11.4” (900 mm)
Truck Wheelbase	9’ (2,745 mm)	Mono-axle
Track Gauge	4’ 8.5” (1,435 mm)	4’ 8.5” (1,435 mm)

Talgo Series 8 Wisconsin

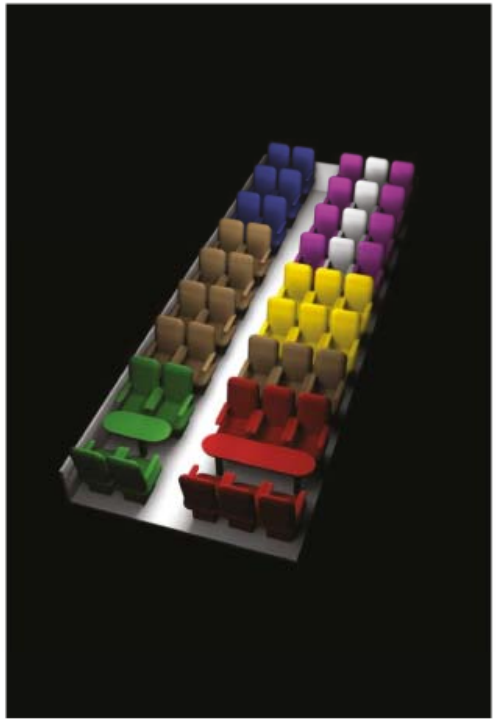
Technical Characteristics			
Propulsion System	1 Locomotive per trainset. 4,250 HP (3,128 kW) per Power head (Amtrak P42 DC)	**Monitoring system**	Dedicated computers that control, diagnose and monitor systems and subsystems for optimum safety an reliability
Motor	4 asynchronous AC traction motors per Power head	**Carbody**	Locomotive: Carbon steel Passenger cars: Aluminum (double-wall extrusions)
Traction Control	Microcomputer	**Tilting system**	Natural Talgo tilting system
Transmission	Diesel-Electric	**Truck Type**	Locomotive: Outboard bearing, welded frame Passenger cars: Mono-axle independent wheel between cars, welded frame
Engine and Alternator	Engine: FDL16 – V16 Alternator: GMG195	**Coupler**	Front: AAR type H Intermediate: Semi-permanent with energy absorption
Auxiliary Power	Diesel generator Set (approx. 500 KVA) 480 Volts 60 Hz	**Suspension**	Locomotive: Primary and secondary helical springs Passenger cars: Secondary air springs
Voltage	480 V 3-phase 60 Hz, 110 V DC, 24 V DC	**Air Comfort**	One self-contained under-frame mounted HVAC and air heating
Braking System	Power head: Dynamic braking supplemented by friction braking. Knorr CCBI version of electronic air brake. Unitized tread brakes with integral automatic slack adjuster and a spring applied parking brake. Passenger cars: 2 brake disks per axle. Redundant wheel-slide protection. Anti-slide system	**Passenger Services**	- ADA MRP compliant areas - ADA MRP toilets - Audio entertainment in passenger cars - Video entertainment in passenger cars - WIFI Internet Access - Public address system - Information sign displays - Rotating seats (some with folding tables)
Doors	Outside sliding-plug type		

Talgo response to high capacity trainsets demanded by the European market

- 220 mph (350 km/h) trainset
- Talgo full integrator of the power heads
- Prototype (12+2) built 4th quarter 2012
- Testing begins 1st quarter 2013

AVRIL Interiors

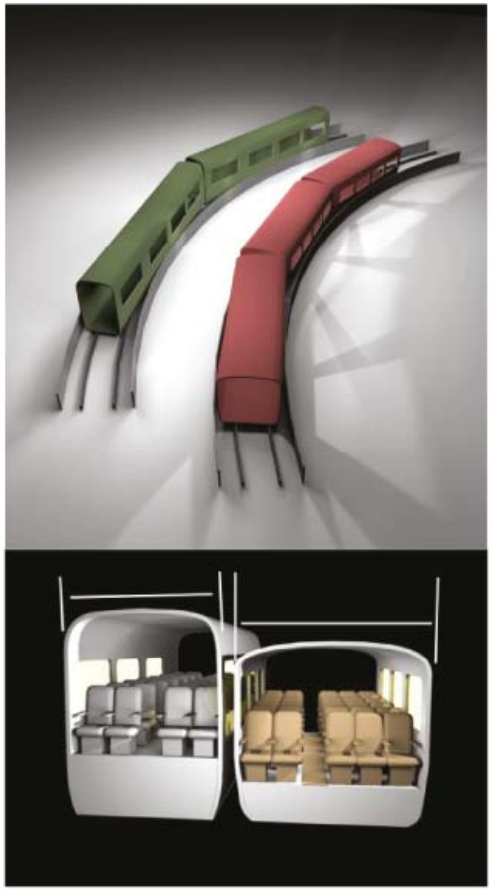
- Wide carbody in UIC clearance (10’ 6”)
- 3+2 seating in Coach class



SEAT CONFIGURATION ADAPTED TO ALL USES:

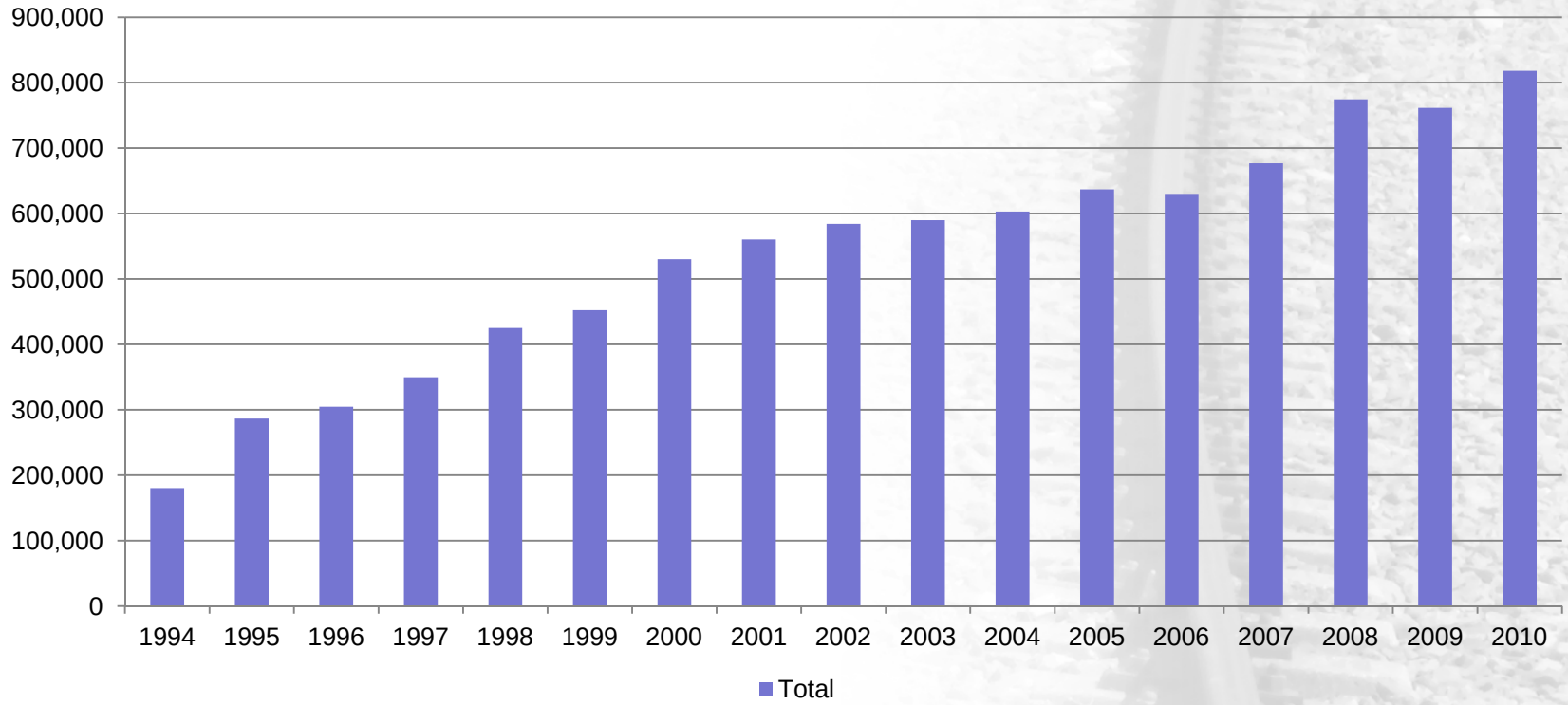
- INDIVIDUAL PASSENGERS
- COUPLES
- GROUPS OF THREE
- FAMILIES OR GROUPS OF FOUR
- LARGER FAMILIES OR GROUP OF SIX
- INTERMEDIATE SEAT OCCUPIED

ONLY IF LOAD FACTOR IS OVER 80%



Ridership Talgo Trains in the USA

Amtrak *Cascades* Annual Ridership 2004-2010



Q&A