Trans Asian Railways…..
A Rolling stock perspective

By Dwarika Prasad

Senior Professor /Mechanical Engineering

Trans Asian Railways

Salient Features of the existing system

- Network of 1000 mm track gauge predominates
- MG Railway generally feature light track structures, light axle loads, slow speed & small vehicle profiles.
- Problem of limited capacity in an era of dynamic trade & economic growth.
- Can impose capacity bottlenecks (specially containers) when inter-faced with wider gauge Railways in neighboring countries

- Typically MG (1000 mm or 1067mm) tracks are designed for axle loads in the range of 14-16 tonnes.
- Axle load limits set by maximum locomotive / container weights.
- A significant increase in axle load will require major strengthening of track and structures and hence may require major investments
- The heaviest locomotives operating in the TAR network are in the region of 90 tonnes or a maximum axle of 15 tonnes which is within the axle load limits specified.

TAR has potential as an alternative competitive transport & should work to:-

- Identify the target market for both short and long term timeframes;
- Estimate the total requirement of containers in the identified target market, both now and in the future;
- Assess the transit time & tariffs offered by the competing modes & identify performance (i.e. time and cost)
- Benchmark for future operations of international container trains on TAR routes in the sub region.
- Asses growth in the international container trade of the sub region.

- Target market for container movement exists in Indonesia, Singapore, Malaysia, Thailand without constructing the missing links.

- After construction of these links, market may expand to include Myanmar, Lao P.D.R., Cambodia, Vietnam and Southern China.

TAR has potential to capture container traffic in Singapore, Malaysia & Thailand due to following reasons:-

- Rail offers significant advantage over feeding shipping service via Singapore in terms of distance & transit time.
- Feeder shipping voyages have considerably higher freight charges.
- Specialized Rail container terminals in Malaysia and Thailand are comparatively well-equipped with storage areas and container handling equipment
- Customs Inspection have a better ratio of staff to workload than the port facilities.

The Challenge is to

- Make this network operational for International traffic in accordance with uniform standard / operating procedures.

- Evolve a minimum standard for vehicle dimensions, vehicle axle loads, train speeds and railway structures.

Freight Container Designation	Height	Width	Length	Maximum Gross Weight Tonnes
1A	8’	8’	40’	30.48
1 B	8’	8’	30’	25.4
1C	8’	8’	20’	24
Non ISO I	9.6’	8’	48’	35
Non ISO 2	9.6’	8.6’	53’	35

The ISO standard maximum gross weight for a 20 feet container is 24 tonnes.

- It rarely exceeds 20 tonnes weight
- The axle load is calculated as

$$\frac{(2 \text{ TWU} \times 20 \text{ Tonnes}) + 14 \text{ tonnes wagon tare}}{4 \text{ axles}}$$

= 13.5 tonnes

Which is well within the limit of existing maximum axle load of 14 tonnes.

Speed Standards

Calculated by dividing the distance by the elapsed time.

- They make allowance for actual train running time plus stopping time, including time for safe working, attaching / detaching loads, crew/loco changing, break & equipment inspection & servicing and border inspection.

Total time is influenced by both stationary and running time.

- For improvement in stationary time following factors will be important.
  - Tightening of efficiency of the system.
  - Improve scheduling.
  - Locomotive and Crew operations.
  - Streamlining of customs and border inspections.
  - Can be reduced by moving container trains to a fixed timetable.

- Running time is determined by following factors
  - Maximum permissible speed in sections
  - Conditions of track and structures (Gradients /Curves)
  - Frequency of Level crossings
  - Conditions of Locomotives & running staff
  - Efficiency of train control
  - Despatch Procedures

Parallel scheduling of container & passenger trains would have the advantage of:

- Increasing line utilization (i.e. increasing throughput)
- Reducing locomotive & rolling stock requirements (due to faster locomotive & wagon turnarounds);
- Reducing operating costs (principally the costs of manpower & fuel);
- Increasing track availability for maintenance (by widening the intervals between passage of trains);

- If a parallel scheduling method were to be employed the maximum speeds of container trainings would have to be of the order of 90-100 km/hour.

  This would require

  – Extensive track upgrading including relaying of track with heavier rails on concrete sleepers.
  – Better train control and communication system.
  – Increased number of powerful locomotive, airbrake for container flats, upgrading of flats for high speed potential, grade separation for road crossings etc

- This would be beyond financial capabilities of most Railway organizations.
- A more practical approach would be to increase the speed to 70km /hour

- This would require intensive maintenance efforts but not involve very heavy capital investments associated with track/rolling stock up gradation.

UNIFORM MAXIMUM LENGTH

- Due to non-uniformity in train lengths, operational inefficiencies would create problems.
  - Train would require re-marshalling and load adjustments at borders.

- An optimum 30 bogie-flat wagon train would require a minimum track length of about 500 mtrs.

Compatible Locomotives and Rolling Stock

As rolling stock crosses national borders it is essential that they are of compatible design in several aspects

- There should be compatibility in the
  - Brake system design and efficiency
  - Type and height of couplers
  - Compatibility of system and equipment for loading and discharge of wagons
  - Compatibility of locomotives in terms of hauling capacity type and height of coupler etc

	<1500	1501-2000	>2000	Total	Diesel Elect	Diesel Hyd.
SRT	167		134	301	227	74
Comb Rly	18			18		
VNR	52	16		68		
Myn Rly	222	66		268	157	111
IR	663*			663		

No of locomotives (by HP)

	Wagon class						
		payload	tare	gross	axles	Length	Floor height
Myn Rly.	BCF	31	14.9	45.9	4	14.3	0.63
VNR	M6318	30	15	45	4	11.4	1.1
	M6298	27	14	41	4	11.4	1.1
	M6228	25	12.6	37.6	4	11.4	1.1
SRT	BCF	30	12	42	4	12.8	1.01
	BCF	47	13	60	4	12.8	1.01
	BCF	44	16	60	4	15	1.01

No of Container wagons (by class)

- One solution to this problem is to adopt well-type wagons, or wagons with small diameter wheels, with a floor height not exceeding 690 mm above rail level.

Areas requiring attention

- Agreements for maintenance and operation of rolling stock of member nations

- Rolling stock used in cross border traffic be examined and oiled as necessary by the train examining/ running staff of the Railway on whose lines the rolling stock is a stabled.

Areas requiring attention

- Provisions for detaining a vehicle for repairs or disable vehicle.
- Financial responsibility for damage to rolling stock
- Where loss of life, bodily harm or damage to goods is caused through negligence by any of the involved Railway organization.

Areas requiring attention

- Need for agreements for exchange, joint operation and maintenance of Railway assets.
- Need for procedures for safety inspections of rolling stock
- Need for procedures for security aspects
- Need for training of staff on minimum operation and maintenance of all type of stocks and equipment of member countries.

- Detailed procedure for
  - Setting up of railway tariffs
  - Distribution of revenue,
  - Exchange of railway vehicles and equipments.
  - Sharing of operational responsibilities & costs of, assets at border stations.

Deficiencies in these arrangements could impose serious impediments to the growth of international railway traffic in the TAR corridor.

- Need for streamlining of administrative & procedural problems to minimize interruption to the smooth flow of traffic.

- Unless security, customs, quarantine, railway inspection and clearances at border stations are sorted out, there would be delays.
- Need for common procedures and manuals for maintenance & operation in easy language to be understood by all member nation personnels.
- Agreement for exchange of data pertaining to maintenance / operating aspects

About Indian Railways….

Production capabilities

Rolling stock on IR

Locomotives

Diesel	4815
Electric	2810

Coaches

EMU & DMU	4636
Coaches	34360 (seating capacity 24 lakh)
Other Coaching	4827

Wagons

Total	216717

Department-wise Break up of Staff

SN	Department	No.	%of Total
1	Engineering	415093	26.2
2	Mechanical	400636	25.3
3	Transportation	185903	11.7
4	Commercial	113842	7.2
5	Electrical	156888	9.9
6	Signal & Telecom	74200	4.7
7	Administration	48186	3.04
8	Accounts	29493	1.85
9	Stores	36011	2.27
10	R.P.F.	56865	3.58
11	Medical	53673	3.38
12	Rly. Board / Other offices include. RPSF	15639	1.00
	Total	1586654	

Diesel Locos

Loco Code	Classification	Wheel Arrangement	Trans-mission	HP
WDM1	COCO	000 000	Electric.	1950
WDM2	COCO	000 000	Electric.	2600
WDS4	O-C-O	0-000-0	Hydraulic.	690/700
YDM4	COCO	000 000	Electric.	1400
WDP1	BO-BO	00 00	Electric.	2300
WDG2	COCO	000 000	Electric.	3100
WDS6	COCO	000 000	Electric.	1400
WDG4	COCO	000 000	Electric.	4000

- MANUFACTURED AT DLW
- RE-MANUFACTURED AT DMW(DCW)
- OVERHAULED IN MANY WORKSHOPS
- ROUTINE MAINTENANCE IN HOME SHEDS
- MINOR / TRIP ATTENTION IN ANY SHED

- ENGINE TYPE
  - ALCO
  - GM
- ELECTRICS
  - BHEL
  - SEIMENS

INTEGRAL COACH FACTORY

(ISO 9001& 14001 Certified)

SET UP	1955
PROJECT COST (INITIAL)	70 Million Rs.
CAPACITY	1000 COACHES/YEAR
MANPOWER	15,000

INTEGRAL COACH FACTORY

- Manufactured 125 different type of coaches
  - self propelled, Trailer coaches, AC Coaches, Conventional Coaches and Special Coaches like Palace on Wheels.
- Produced app. 33000 coaches so far.
- Exported to 11 countries.
- Manufactured stainless steel coaches
- Manufactured 150 Containers for Container Corporation of India.

RAIL COACH FACTORY, KAPURTHALA

PROD. STARTED FROM 1988

- PROJECT COST 3370 Million Rs.
- EMPLOYEES 7163
- PRODUCTION CAP – 1000 Coaches
- NEW DEVELOPMENT: LHB (HIGH SPEED COACH FOR 160 KMPH)

RAIL WHEEL FACTORY BANGALORE

PLANT CERTIFIED FOR QMS TO ISO: 9001

- SET UP — FEB 1978
  (In collaboration with GRIFFIN WHEEL CO., USA)

- COMMISSIONING — 1984
- PROJECT COST — 1500 Million Rs.
- EMPLOYEES — 1900
- PRODUCTION CAP
  - 45,000 AXLES
  - 90,000 WHEELS
  - 36,000 WHEELSETS

Thank You