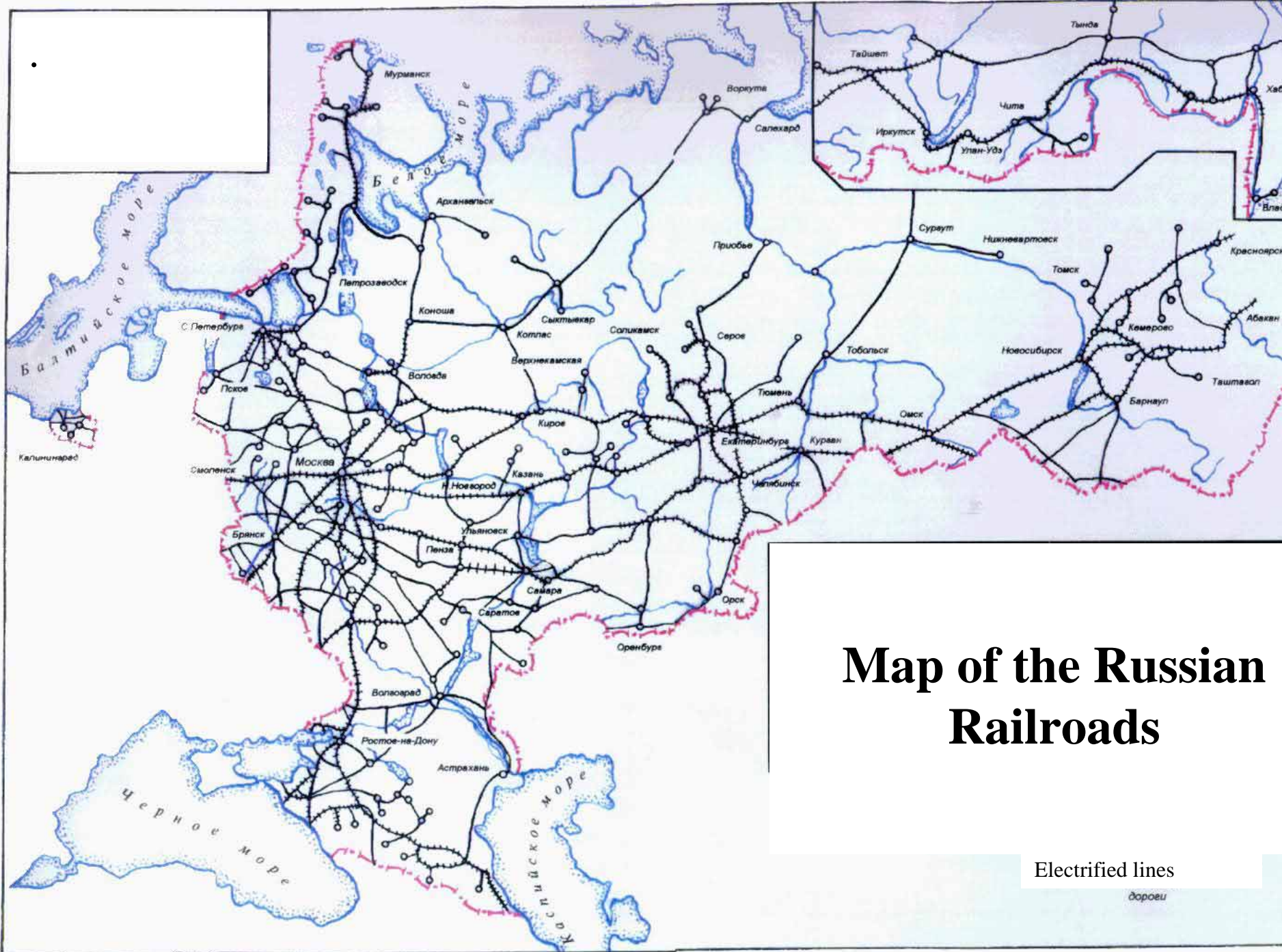


STATE OF TRAFFIC SAFETY CONDITIONS AND PROSPECTS OF SAFETY IMPROVMENT ON THE RUSSIAN RAILWAYS

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Map of the Russian Railroads

Electrified lines

дороги

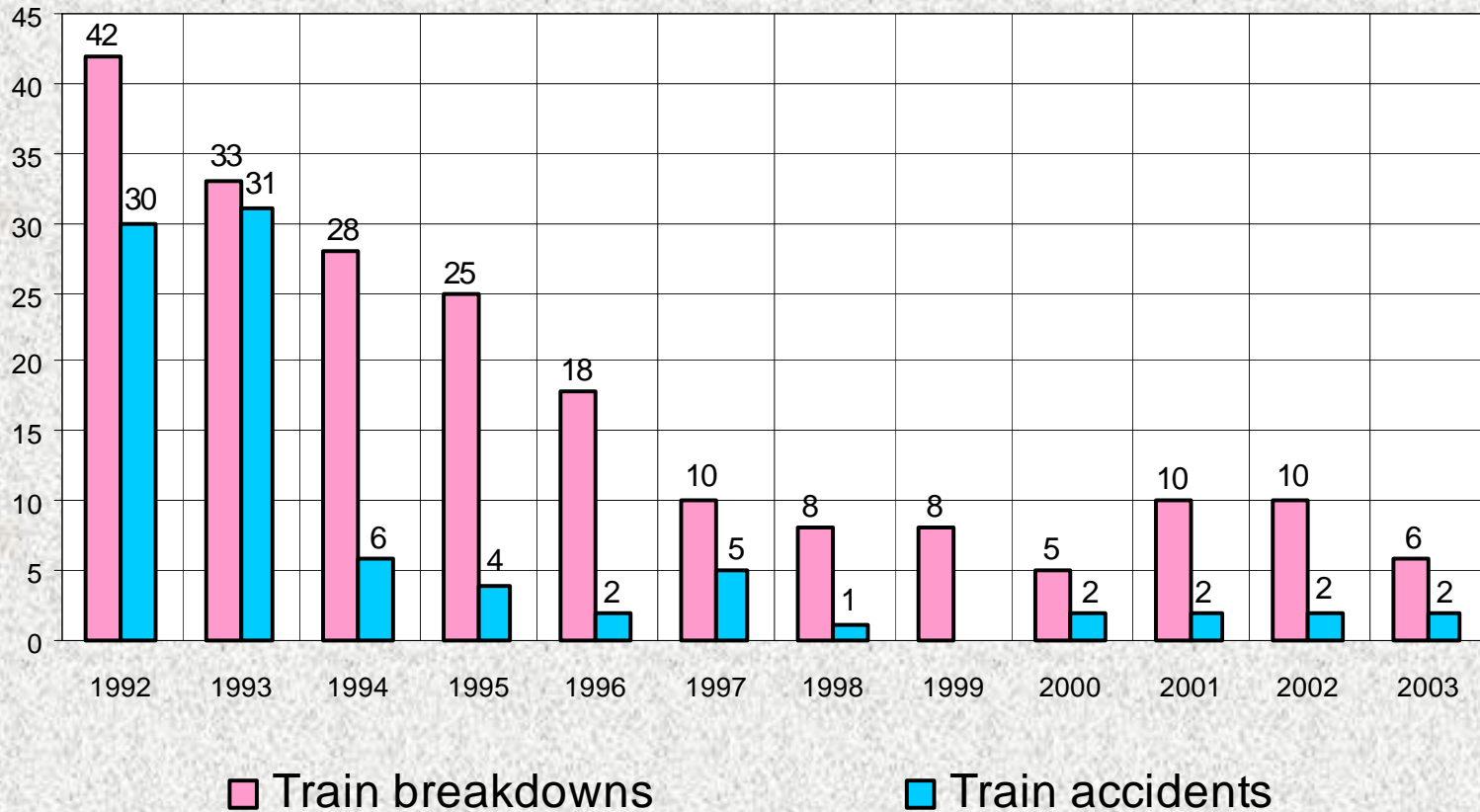
Operating Indices of the Joint Stock Company «Russian Railways» (2003)

- Operating route length, thousands km. 85.4
- Route length of electrified lines,
thousands km 42.6
- Originated tonnage, mln.tonne 1160.8
- Freight turnover, billion tonne-km 1668.9
- Passenger turnover, billion pass-km 157.6
- Average gross weight of freight train,t 3608.0

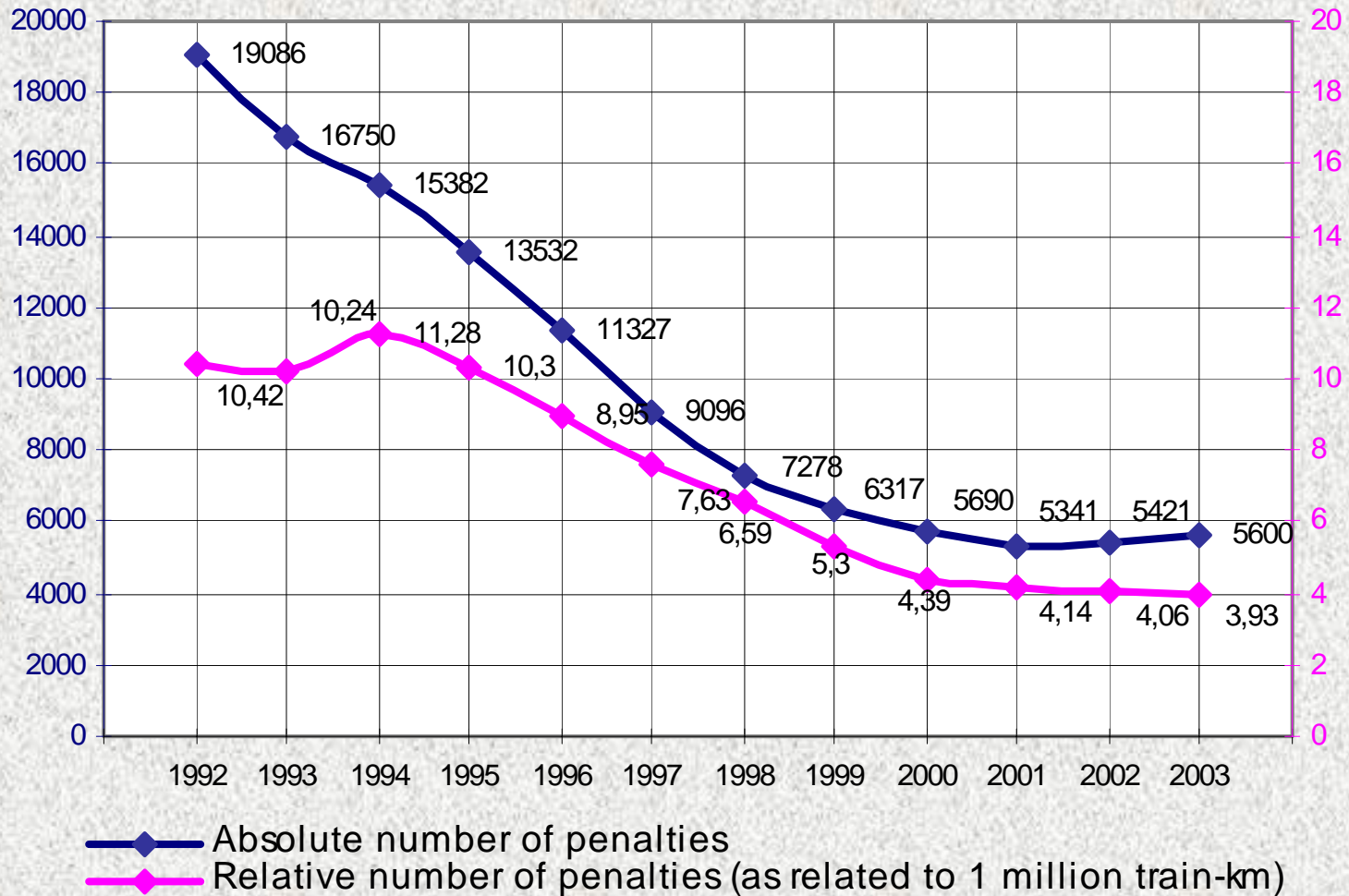
Operating Indices of the Joint Stock Company «Russian Railways» (cont-ed)

- Operating locomotive fleet
 - electric units 5890
 - diesel electric units 6202
- Operating number of freight cars 497600
- Operating number of passenger cars 20797
- Share of freight turnover by electric traction 85.4%

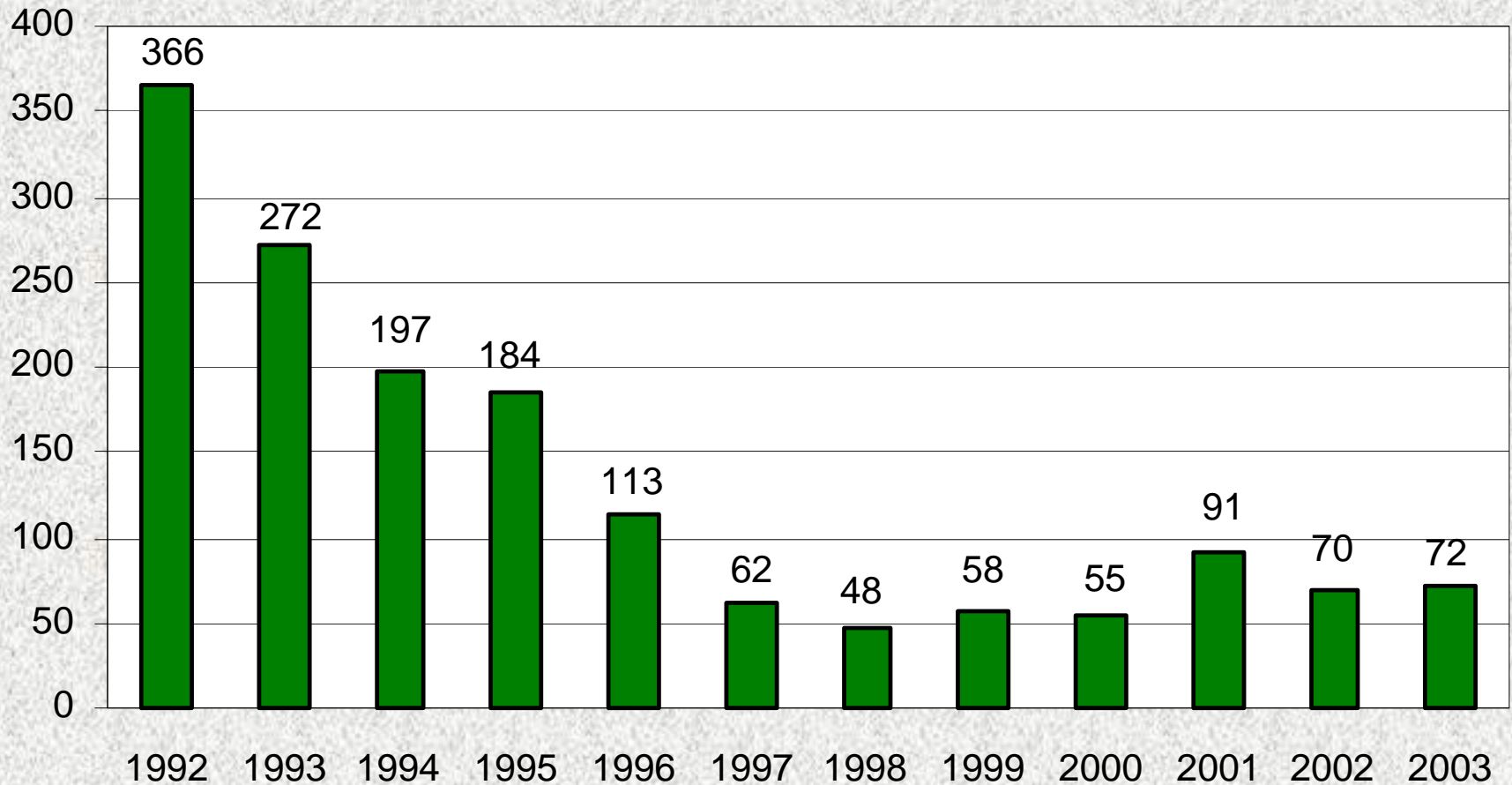
Number of Train Breakdowns and Accidents (1992 – 2003)



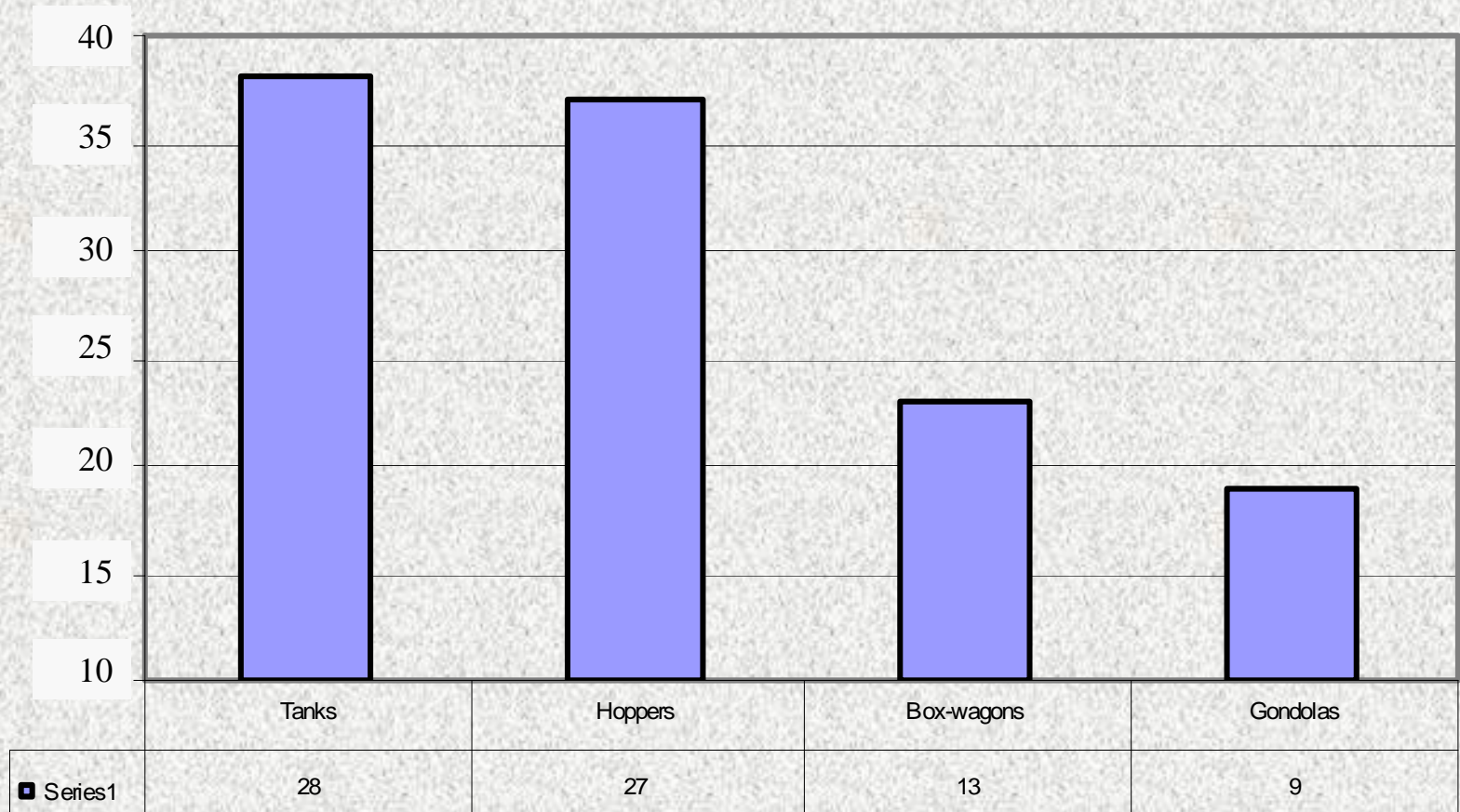
Number of Penalty Cases in Mainline and Shunting Operations (1992 –2003)



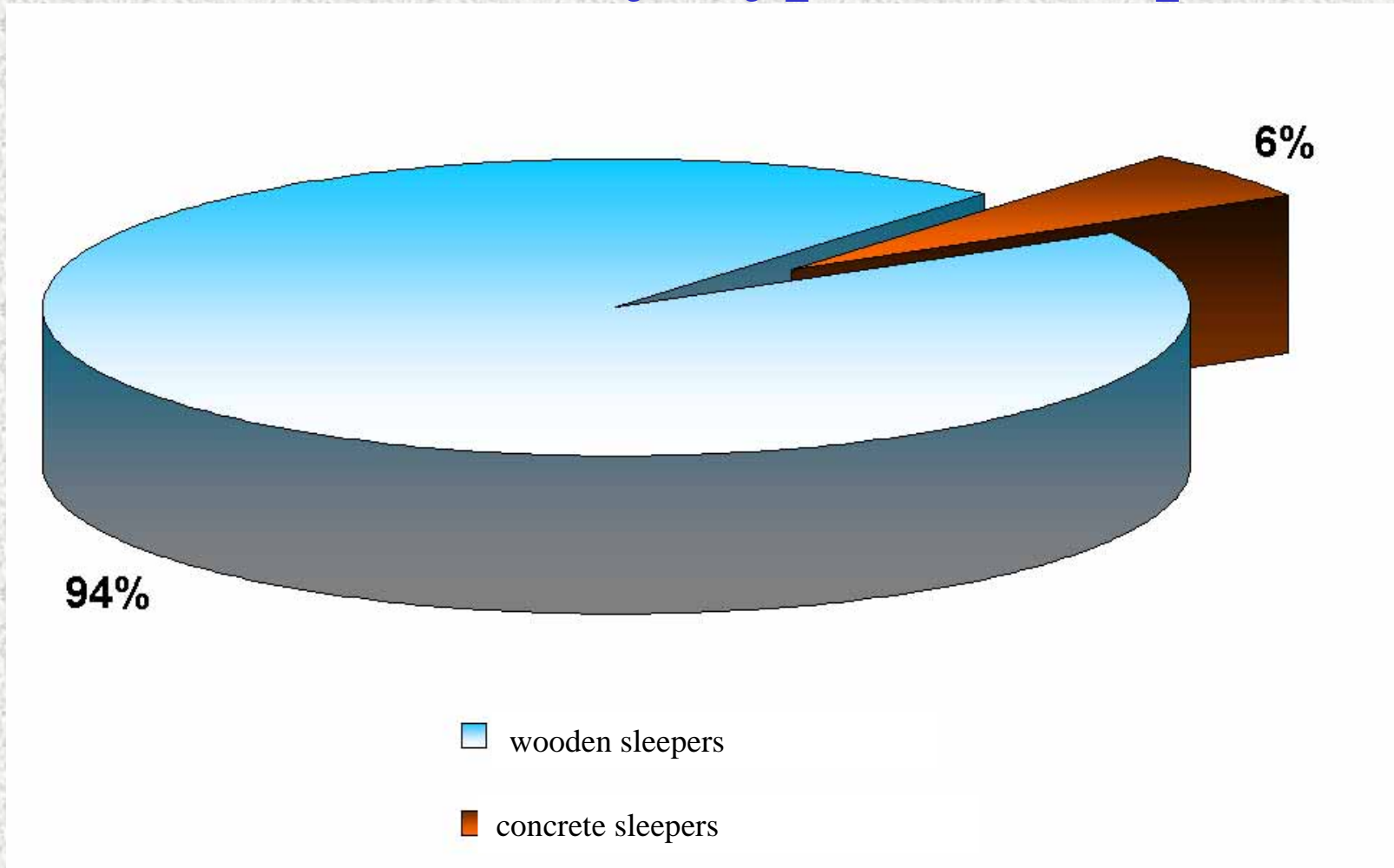
Number of Derailments of Freight Trains (1992 – 2003)



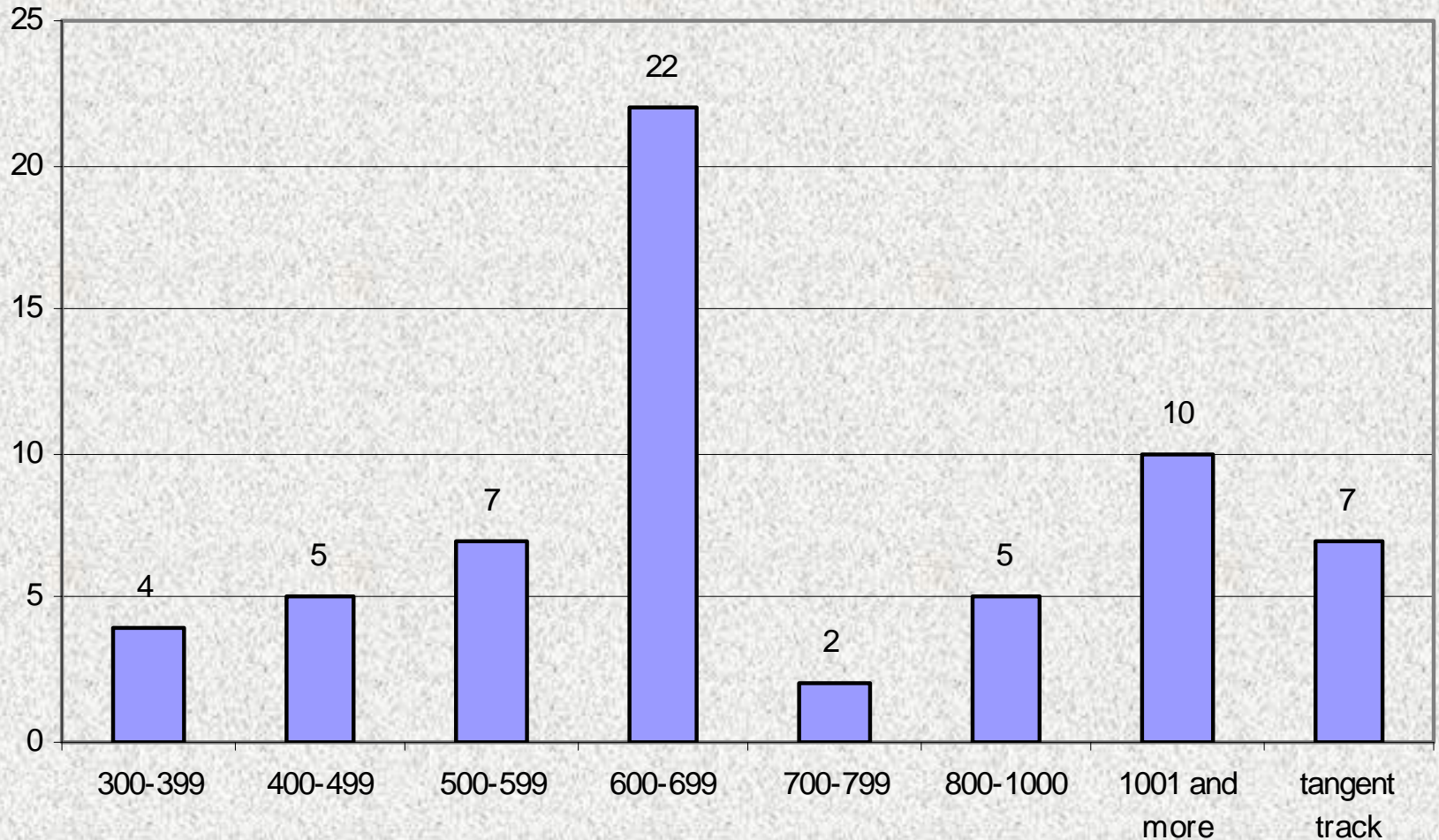
Distribution of Derailed Empty Wagons by their Type (1999-2003)



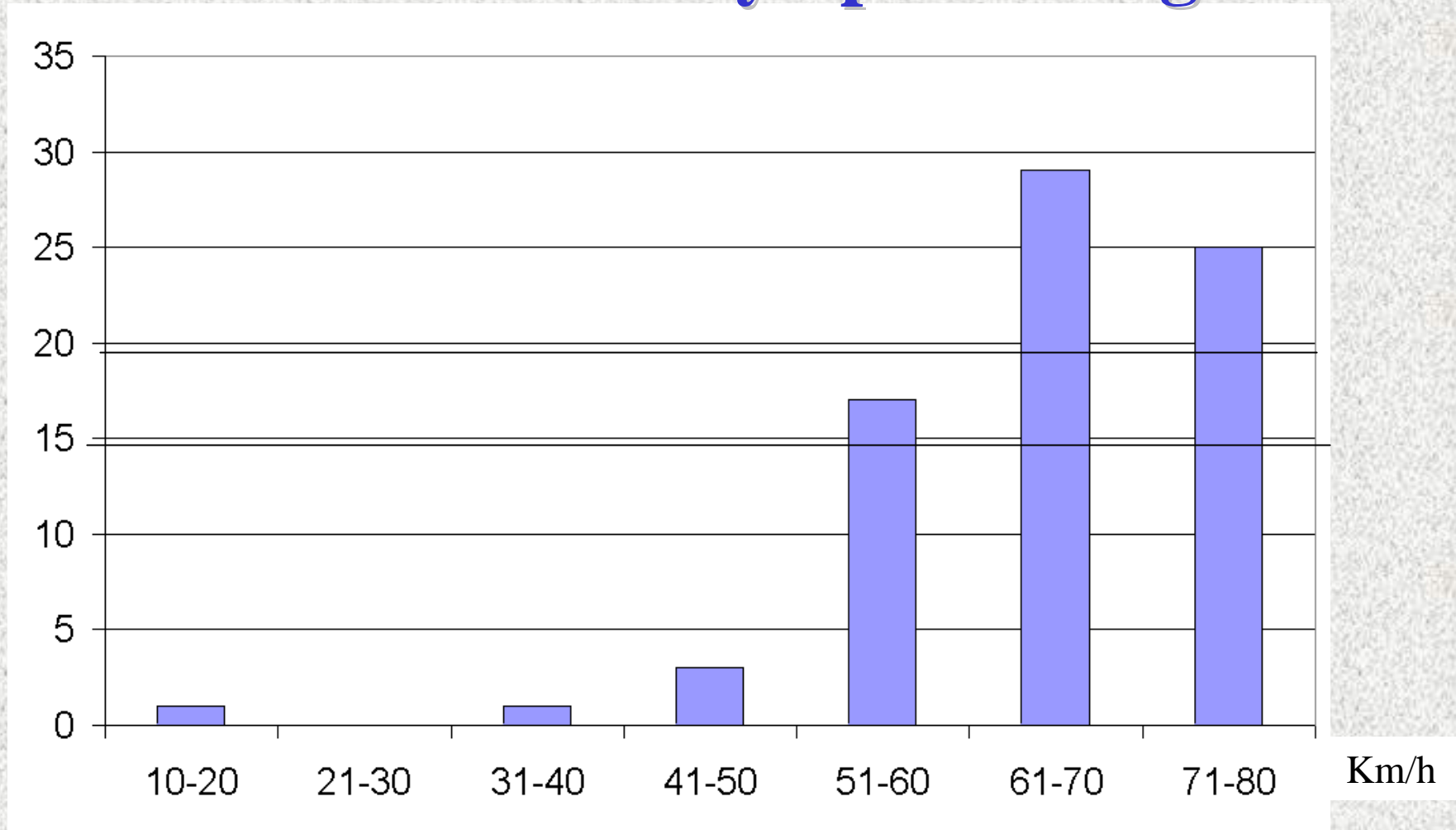
Distribution of Empty Wagons Derailments by Types of Sleepers



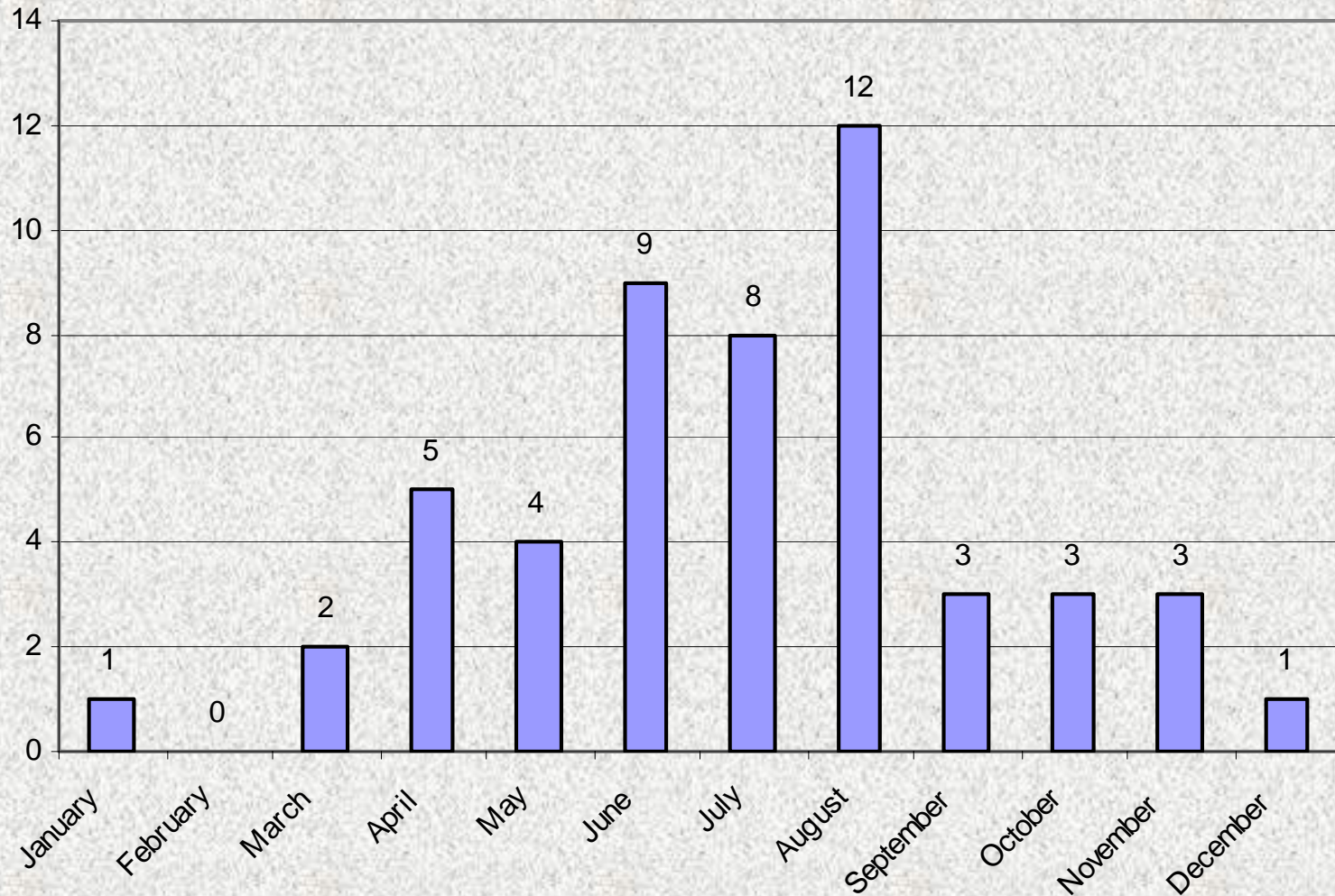
Distribution of Empty Wagons Derailments by Curve Radius



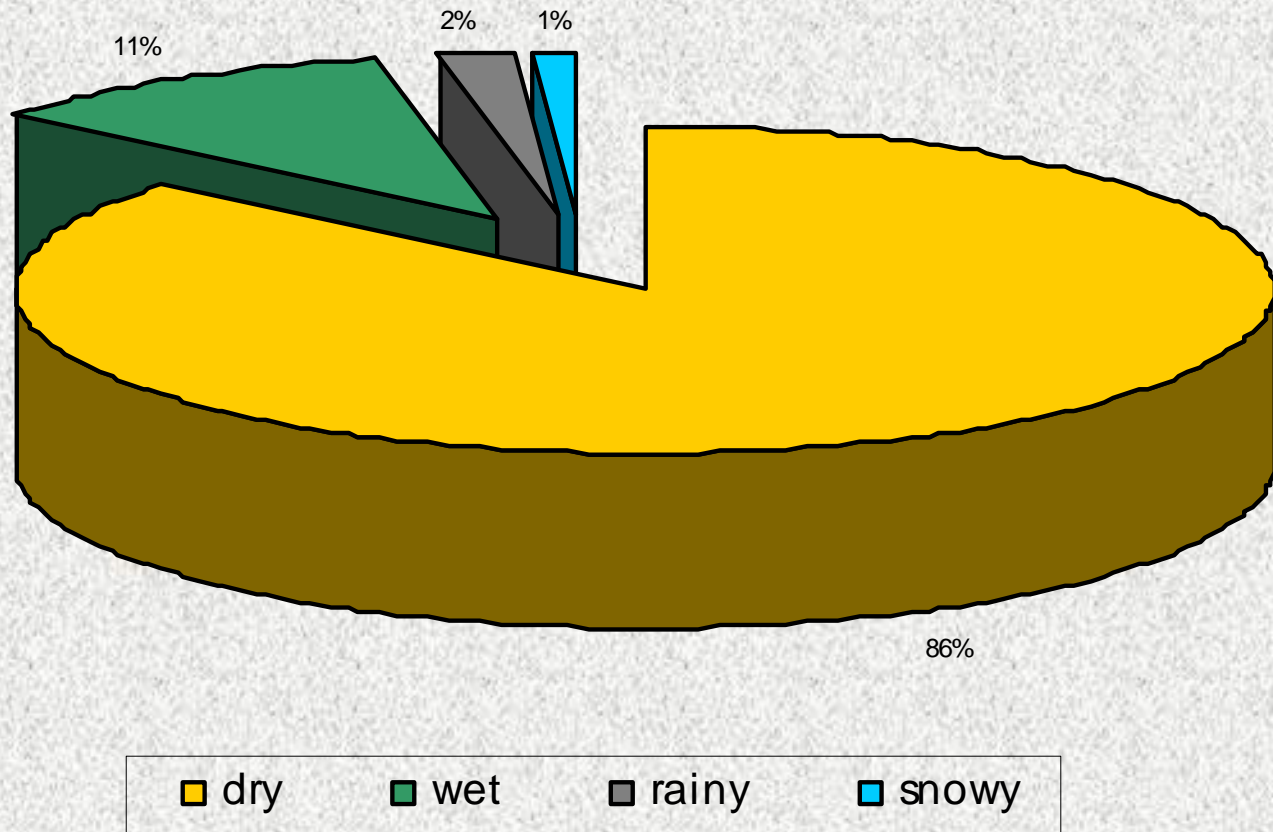
Distribution of Empty Wagons Derailments by Speed Ranges



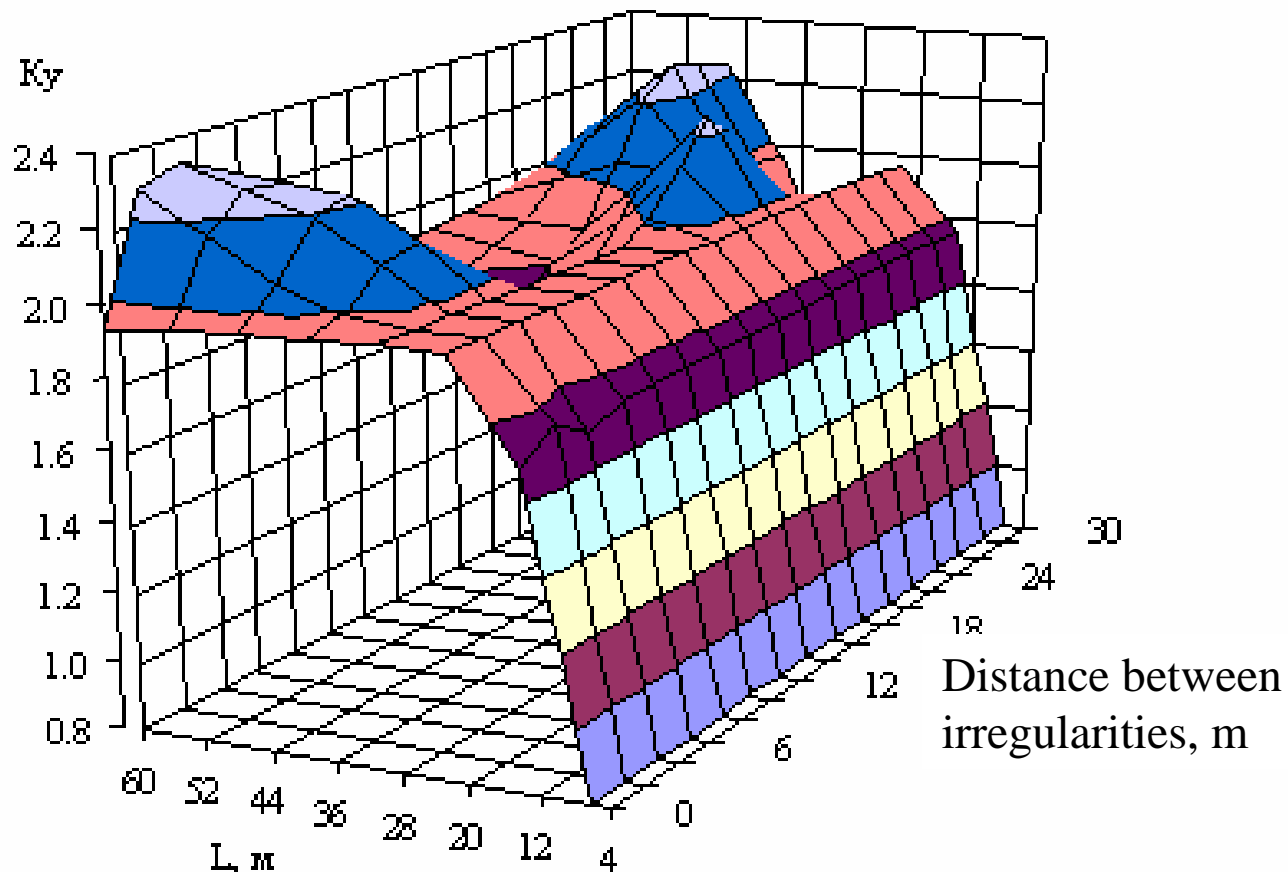
Distribution of Empty Wagon Derailments by Months



Distribution of Derailments by Weather Conditions



Estimate of Derailment Stability Factor (K_y) of a Wheel Passing the Sequence of Track Horizontal Irregularities



Loss of Contact Between Wheel and Rail



Conclusions

- For the last 10-13 years there was a considerable reduction of all types of safety indices in absolute values and related to one million train-km, including reduction of derailments by 5 times
- Such results were achieved due to laborious work of the managerial staff of the former MPS, individual railways, railway divisions, and the introduction of engineering means of safety
- Derailments generally were registered on empty cars, on sections with curve less than 850 m, wooden sleepers, in dry weather conditions and at speeds exceeding 60 km/h
- The share of empty wagons in the total number of derailed increased by 2.5 times. Most of derailment are on tank- and hopper-wagons.

Conclusion (continued)

- Modeling and experiments have shown that:
 - the most unfavorable cases are the interaction of empty cars with reduced damping in spring suspension and track with a large amplitude of irregularities
 - in these cases speed should be restricted to 60 km/h, otherwise a prolonged separation of wheel from rail may take place especially if the wheel-rail contact is unlubricated
 - a package of measures is required to reduce the danger of empty wagons derailments, including stricter track maintenance and wagon repair tolerances, quality of repair and modernization of car bogies.

Conclusions (continued)

- In the late 90-ties the number of serious safety violations was stabilized which means that the potential of the traffic safety management system employed by the former MPS-Russia was practically exhausted
- Set of traffic safety improvement measures was suggested, including:
 - establishing Traffic Safety Management System as a component of the Integrated Quality Control System based on the ISO 9000 standards
 - revision of legal, technical and technological documents
 - developing Multilevel Traffic Control and Train Protection System
 - introduction of monitoring facilities intended to supervise over correctness of operational staff actions.
- Implementation of indicated measures allow **annual reduction** in the number of traffic safety violations not less than **by 10 %**.