



Continuing to improve safety more efficiently

In addition to environmental aspects, safety is one of the most important advantages of transporting goods by rail. Costs and services will have to be optimised if rail transport is to continue expanding its market share. More than anything, however, we need innovation. Through its support, the FOT is making a major contribution towards improving safety in the most efficient way.

By Colin Bonnet, Head of section Scientific Bases, at the Federal Office of Transport (FOT)

Despite the pandemic, the Federal Office of Transport (FOT) inspected over 6,300 wagons from around 370 freight trains in 2020. The operational inspections revealed that the number of complaints for freight trains is not yet at a satisfactory level and that the situation had not significantly improved compared to the previous year. Taking into account all the error categories, the quality of the freight trains remains at an unsatisfactory level overall. A considerable number of the quality standards that the industry has set for itself (via the "General

Contract of Use for Wagons", GCU, applicable throughout Europe) are not being met.

Inspections confirm the need for action

During its inspections, the FOT discovered – among other things – non-lubricated buffer plates, holes in the tarpaulins of the loading units, faulty brake pads, as well as defects in the wheels. Inspections during the transport of dangerous goods in particular revealed shortcomings in labelling and in the transmission of data.

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Dear readers,

As confirmed by Colin Bonnet from the FOT in the lead article, the fact that the most efficient way today of improving safety in freight transport is by increasing the rail freight market share over that of road, is of course a good thing, because there is no doubt as to the high level of safety that rail can offer as a mode of transport. To that end, a lot has been invested in new technologies and systems, which in the future will continue to be necessary in order to prevent serious accidents as far as possible.

Wagon keepers and lessors of freight wagons have a responsibility. Over the past 25 years, we at Wascosa have proven that we are an innovative company that delivers greater safety with new, innovative freight wagons: be it with the development of fireproof dangerous goods plates, derailment detectors, crash buffers, rollover protection, anti-climber modules, a second work platform, ladderless tank wagons, or recently an additional headshield. In the articles on pages 4ff. and 8ff., you can find an overview of the past years' developments and the innovations that are making rail freight transport safer.

Due to its relatively high safety, rail transport is the preferred means of transporting dangerous goods in particular. This also applies to acrylonitrile for the transport of which AnQore worked with us on the development of an innovative dangerous goods tank wagon (AN) based on the Wascosa safe tank car®. The new wagon boasts the highest safety standards (page 11f.).

Together with every innovation, the age of a wagon fleet plays a crucial role when it comes to safety. At 13 years, Wascosa has the youngest average age of all the well-known European wagon leasing companies. And that is also a compelling argument that underlines our safety expertise when it comes to transporting dangerous goods by rail.

Happy, exciting and above all safe reading!

Philipp Müller
Chairman of the Board of Directors

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Some of the non-compliances, however, are unlikely to have immediate severe consequences. Nevertheless, if the FOT discovers freight wagons with unacceptable safety issues, it will demand that they are put right on site. If the problems recur, it will require the railway undertaking in question to undertake systematic improvements.

Important exchanges with foreign supervisory authorities

Since nearly two-thirds of rail freight transport services use routes through Switzerland, the FOT regularly exchanges information on freight train safety with foreign supervisory authorities. To ensure that safety regulations can be complied with throughout the entire transport chain, international trains must even be carefully inspected at the departure terminals and train stations.

But despite all this: Railways are safer than roads

Despite all these findings, the traffic and accident statistics do nonetheless put the railways in a favourable light: Every year for the past 10 years on Swiss roads, goods

vehicles have been involved in 50 fatal accidents and over 300 incidents causing serious injury. By contrast, the yearly average for rail freight transport is one fatality and three severe injuries. Of course, every victim is one too many and a cause of a lot of suffering, but the numbers speak for themselves: There are fewer victims on the railways than there are on the roads, even when taking into account the modal split in freight transport¹.

The conclusion is clear: The most efficient way to improve safety (as well as the environmental impact) in freight transport is for rail to increase its market share over road. To achieve this, all those who work with the railways must continue to optimise costs and services for the benefit of customers. Innovation is what is needed, and there are good examples of this in Switzerland, such as the development of (exceptionally quiet) carrying wagons for transporting the so-called new BASF tank containers. This concept can be used to significantly optimise logistics and therefore reduce costs. The development of safer tank wagons for the transport of chlorine is also the absolute minimum requirement for continuing to transport this sensitive substance.



The FOT monitors the safety of freight traffic on a random and risk-oriented basis

¹ In Switzerland, 63% of transport services are by road and 37% by rail (17 and 10 billion tonne-kilometres per year, respectively).



Example of innovation: Particularly quiet flat wagons designed, among other things, for transporting tank containers for chemical products

Supporting rail transport

The FOT is aware of its responsibility in this matter: Unlike agencies in other EU states, the FOT – in addition to fulfilling the role of the national safety authority (NSA) – also acts as a Ministry of Transport and aims to manage and financially support the development and expansion of transport infrastructure, subsidise transport when needed and – under certain circumstances – support innovation. As such, financial support for technical innovations is one of the many ways of promoting rail freight transport in Switzerland.

By encouraging research and innovation, the FOT wishes to develop knowledge that will help optimise costs as well as increase safety, energy efficiency, and environmental sustainability in its areas of responsibility. The FOT invests approximately 10 to 15 million Swiss francs in research and innovation every year, which is roughly equivalent to 2 per thousandths of total expenditure. The FOT promotes research and innovation through subsidies and as part of contract research.

Earlier involvement of the FOT in innovations

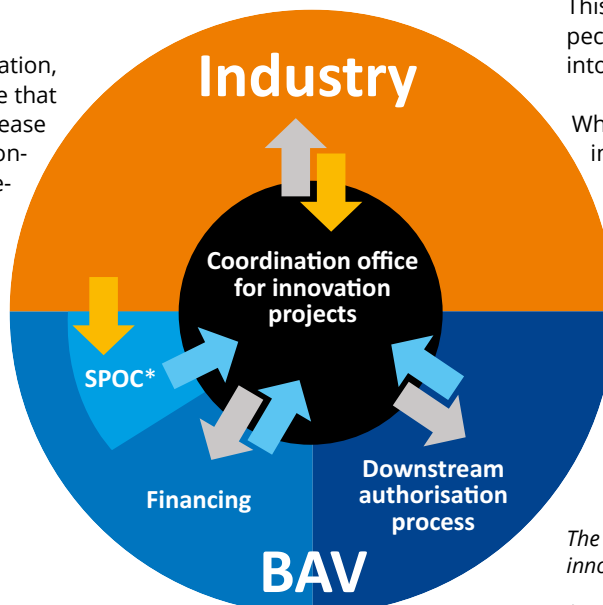
It will take more than financial muscle for long-awaited innovations such as automatic coupling, automatic brake testing, or electrified freight wagons to become a reality. As a safety authority, the FOT can offer assistance if the process-technology aspects are included as soon as possible, thereby anticipating potential hurdles. Because such developments are only possible with international cooperation, the FOT

actively contributes at an international level, e.g. in ERA committees for developing the technical specifications for interoperability TSI.

New coordination office for innovation projects

In order to support the projects internally as efficiently as possible so that they have every chance of succeeding, the FOT has recently created a coordination office for innovation projects in the Safety department of the Scientific Principles Section. This is to ensure that safety and legal aspects are promptly identified and taken into account.

What is just as important is FOT's timely involvement in developments that the industry independently pursues without federal funding. The shared goal of safe, climate-friendly and economical freight transport will only be achieved if all stakeholders consistently play their respective roles whilst working very closely together.



The newly created FOT coordination office for innovation projects optimises processes, © FOT

* Single Point of Contact

27 years of innovations for greater safety on the railways

27 years ago, a serious freight wagon accident in Zurich-Affoltern resulted in stricter safety requirements for transporting dangerous goods by rail in Switzerland. Wascosa also took swift action and equipped its tank wagons with the required derailment detectors. To this day, Wascosa continues to make a name for itself as a trendsetter by voluntarily developing innovations in order to improve safety.

By Irmhild Saabel, Chief Business Development Officer, Wascosa AG

On 8 March 1994, the seventh tank wagon from the front of the train was derailed as it was about to enter Zurich-Affoltern station. The derailed wagon spilled petrol and caught fire along with four other wagons that had tipped over. Three houses near the railway line were engulfed in flames, and several people were injured, one of them seriously.

The Swiss Federal Railways (SBB) took quick action: Derailment detectors became mandatory for transporting dangerous goods in Switzerland. They automatically trigger an emergency brake the moment a bogie leaves the rails. To this day, Wascosa has equipped more than 1,100 tank wagons with this technology, more than any other wagon keeper in Europe.

Nearly 10 years after the catastrophe at Zurich-Affoltern, the requirement to fit rail tank wagons with additional safety equipment is now part of the RID (Regulations concerning the International Carriage of Dangerous Goods by Rail). In 2003, the requirements to fit certain tank wagons with parts for absorbing energy and protecting the tank during buffer overriding/climbing were set out in the RID.

Responsible Care Philosophy put into practice

Six years later in 2009, an accident in the Netherlands led to questions being asked about the stringency of the RID requirements for certain types of cargo. The conclusions of all the experts concurred that the crash buffers that were fitted on the

mineral oil wagons involved in this accident had done exactly what they were supposed to do: absorb uncontrolled energy.

Thanks to the crash buffers that were voluntarily fitted by Wascosa, tank damage, product leakage and severe consequences similar to what were seen at the Zurich-Affoltern accident were avoided – proof in itself of their effectiveness. The crash buffers fitted to the mineral oil wagons formed an important part of Wascosa's and the shipper's Responsible Care Philosophy.

The trend towards greater "voluntary safety" in the transport of dangerous goods by rail has continued to gather pace since the accident in Barendrecht.

Pioneering new safety features

The trend towards greater "voluntary safety" in the transport of dangerous goods by rail has continued to gather pace since the accident in Barendrecht. In 2010, Wascosa introduced the safe tank car®, a completely new and ground-breaking safety concept.

The tank wagon developed for Grillo-Werke AG in Duisburg is equipped with derailment detectors, crash buffers, anti-climbing protection devices as well as rollover protection for the upper tank fittings. These are completely new safety fea-



Train crash in Barendrecht at Rotterdam on 25 September 2009: Wascosa euro tank car® – voluntarily equipped with crash buffers



Derailed detectors can significantly reduce the damage

tures the like of which simply do not exist anywhere else. Numerous accident simulations, carried out in cooperation with experts from automotive development, proved the effectiveness of the protection concept. Furthermore, the safe tank car® was equipped with a fully-fledged cross-over platform at both ends of the wagon in order to provide the best-possible safety in working conditions.

Europe's first ladderless tank wagon

In the petrochemical industry, the principle of "ALARP" (Risks As Low As Reasonably Practicable) has also led to more safety features being applied than are required by the RID: In 2013, Wascosa introduced the tank car 3000®, the first mineral oil tank wagon with derailment detection, energy absorption, anti-climbing protection, and two cross-over platforms and

Wascosa was the first wagon keeper at the time to stop fitting access ladders to the tank so as to avoid tragic accidents. Despite initial scepticism from the industry, other wagon keepers have followed Wascosa's lead.

has delivered nearly 500 of them. And the most important thing of all: Wascosa was already the first wagon keeper at the time to stop fitting access ladders to the tank so as to avoid tragic accidents. Despite initial criticism and scepticism from the industry, other wagon keepers have followed Wascosa's lead and this is also currently supported by the VPI (German Association of Wagon Keepers).

Awards and recommendations

In June 2015 Grillo-Werke AG, which is a lessee of the wagons, was awarded first prize in the Responsible Care competition of the North Rhine-Westphalia regional association by the German Chemical Industry Association for the safe tank car® protection concept.

One year later, the umbrella organisation of the chemical industry in Europe (CEFIC) added the Wascosa safe tank car® concept of two cross-over platforms to their recommendations for designing, constructing, and testing tank wagons to be used for transporting chemical and liquid gas products.

In the autumn of 2016, the Swiss Industry Association, Chemie Pharma Biotech (Chemistry, Pharmacy & Life Sciences), the Swiss Federal Railways (SBB), the Swiss Shippers' Industry Association (VAP), the Federal Office of Transport (FOT), and the Federal Office for the Environment (BAFU)

Thanks to the crash buffers that were voluntarily fitted by Wascosa, tank damage, product leakage and severe consequences were avoided – proof of their effectiveness.

signed a joint declaration on reducing the risks for the Swiss population caused by the transport of chlorine in tank wagons. The minimum requirements for tank wagons for importing chlorine into Switzerland – which were set out in the declaration – were to a great degree based on the Wascosa safe tank car® protection concept.

Consistent improvements to safety

Wascosa has remained true to the principle of minimising hazards as far as possible right from the start with the latest development of the Wascosa safe tank car® for Dutch company AnQore. In what was a smart move and as part of the cooperation with German company EST Eisenbahn-Systemtechnik GmbH, the gap between the two anti-climbing protection devices at the end of the safe tank car®, which was developed for acrylonitrile in 2020, was for the first time closed with an additional headshield (see also article on page 10).

Wascosa – the trendsetter in the field of safety

Over the past 27 years an enormous amount of work has gone into making railway logistics for the chemical and petrochemical industries safer than before. Over the years, Wascosa has shown itself to be a pioneer in safety, whether it be with fireproof dangerous goods plates, derailment detectors, crash buffers, rollover protection, anti-climbing protection, cross-over platforms on both ends of the wagon, abolition of access ladders, additional headshields, etc. This all goes to show the degree to which Wascosa is setting the trend in new safety features.

1995



All tank wagons of Wascosa have fireproof dangerous goods plates.

1998



Wascosa equips the first tank wagons with derailment detectors – to this day, more than 1,100 tank wagons have been equipped.

2007



Wascosa equips the first pressurised gas tank wagon with crash buffers.

2010



Wascosa launches the safe tank car®, the first tank wagon in Europe with rollover protection and various other safety elements. The Wascosa safe tank car® receives several awards. It is specified by CEFIC as a guideline for the new construction of tank wagons for chemicals and pressurised gas.

2010

Safety gas tank wagon for the transport of chlorine and sulphur dioxide, Wascosa safe tank car®, Zags 54 m³

2007

First pressurised gas tank wagon with crash buffers for the transport of gas products, Zags 120 m³



2011



Wascosa launches its "Safety Package" for tank wagons. Six safety elements can be freely selected for existing and new rolling stock according to the modular principle.

2013



Wascosa presents the tank car 3000®, the first ladderless tank wagon in Europe. Around 500 examples of this model have since been built and ladderless tank wagons have become the industry standard.

2020



Wascosa launches the second generation of the safe tank car® with an additional headshield at the end of the wagon.

Photo: © Tatragonka Poprad



2020

Dangerous goods tank wagon for the transport of acrylonitrile, Wascosa safe tank car®, Zacns 93 m³

2013

Tank wagons for the transport of heavy fuel oil class 9 according to RID, Wascosa tank car 3000®, Zans 80 m³

Wascosa Safety Module – Anti-climbing protection, crash buffer, rollover protection, etc. deliver greater safety

Safety is very important to Wascosa. This applies not only to the implementation of the RID's requirements but also to our in-house developments of innovative safety measures. At the same time, weight (payload) and efficiency are also optimised. This ensures that Wascosa's tank wagons best meet the needs of their customers.

By Irmhild Saabel, Chief Business Development Officer, Wascosa AG

Buffer overrides or ride-ups can occur on neighbouring wagons if a railway vehicle is no longer able to absorb energy during a collision and there is no mechanically resilient interlocking.

Preventing derailments and destruction caused by buffer overrides

The RID (Regulations concerning the International Carriage of Dangerous Goods by Rail) requires tank wagons to be equipped with devices for preventing buffer overrides if the tank wagons are used for transporting certain dangerous goods by rail. If the tank wagon is not equipped with buffer override or anti-climbing protection, then measures for limiting damage during buffer overrides must be implemented as per special provision TE 25 of the RID.

It is dangerous when railways vehicles overclimb because the collision continues uncontrolled often resulting in extreme destruction and derailment. This is why – working closely with EST Eisenbahn-Systemtechnik GmbH – Wascosa has focused on preventing buffer overrides/ride-ups (in accordance with RID TE 25a) instead of the second-best solution, i.e. protection of the tank body (in accordance with RID TE 25b), c) or d) from the buffers (or central buffer coupling) of the neighbouring wagon.

Wascosa safe tank car®: Using the AC04 anti-climber module

The Wascosa safe tank car®, introduced in 2010 with an AC04 anti-climber module from EST, underwent crash simulation tests in various collision scenarios to test its ability to prevent overclimbing right

from when it begins. All ten requirements of the RID, including the requirement that it also protect neighbouring wagons that do not have buffer override protection equipment, were successfully met by AC04 during the approval process.

The external appearance of the AC04 anti-climber module is characterised by its forward-facing contact zone with a serrated cell grid. In the event of a collision with a similarly equipped wagon, both devices interlock, regardless of the height and lateral position (load status, travel through curves) at which they meet.

In the event of a collision with a wagon without a buffer override protection device, the deformation of the crash buffer on the Wascosa safe tank car® causes the opposing buffer to be plunged below the protruding structure of the AC04 module and to get "caught" by the form closure. Should the safe tank car® climb over the neighbouring wagon in such an accident scenario, the "self-adaptability" of the AC04 modules significantly reduces the relative impact speed and the force on the opposing tank body, preventing cracks.

Wascosa safe tank car® – First generation – Pioneering innovation launched 2010



Photo: ©EST/jens Schurike



1. exceptionally high-performance crash buffers (in accordance with RID TE 22, EST Suprapuffer G2-100 MB)
2. an anti-climbing protection (in accordance with RID TE 25a), AC04 EST anti-climber module)

The first Wascosa safe tank car® was developed for transporting sulphur dioxide and presented for the first time in 2010. This dangerous goods tank wagon is equipped with the innovative, modularly structured "Safety Package", which consists of

A powerful team: Anti-climber module and crash buffer from EST

A buffer override protection device or anti-climber module in EST's AC04 design version requires the fitting of crash buffers on the vehicle on which the anti-climber module is installed. The Wascosa safe tank car® uses EST's Suprapuffer G2-100 MB crash buffers, which absorb the crash energy required in accordance with RID TE 22 at a relatively low force along a very long deformation path. This helps to reduce the overclimbing tendency between neighbouring wagons from the very beginning of a collision.

The anti-climber module comes into play a bit later. It must be structurally positioned far back enough to prevent unwanted entanglement between neighbouring wagons during operation. Only when the crash buffer has deformed does an anti-climber module become "active" in accordance with RID TE 25a) and can perform its function of catching or interlocking with the buffer of the neighbouring wagon.

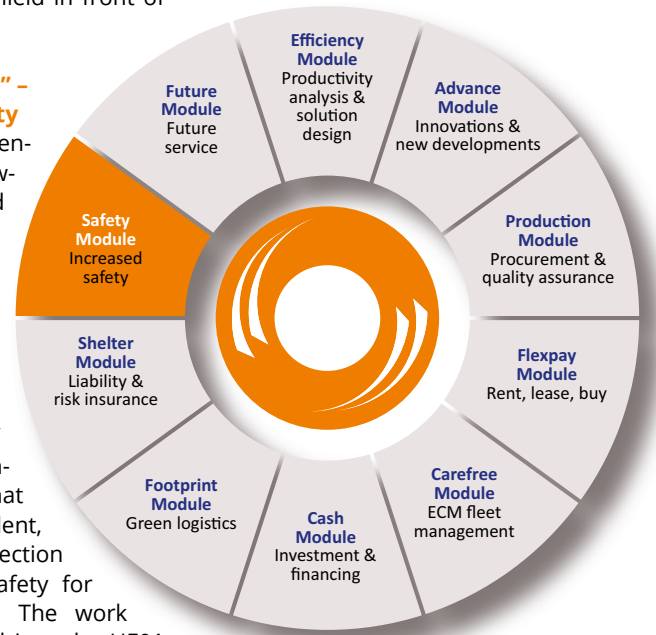
A weight disadvantage can be avoided if the safety modules are consistently factored into the design of new tank wagons from the start. The well-known principle of light construction involves making use of the increased load capacity of larger cross sections while simultaneously having lower wall thicknesses. Since the AC04 anti-climber module itself is characterised by a markedly high weight efficiency, a very low vehicle weight can be achieved compared to other known approaches for buff-

er override protection in accordance with RID TE 25 (such as reinforcing the bottom of the tank or placing a shield in front of the tank).

Wascosa "Safety Package" – modules for greater safety

Apart from the aforementioned, exceptionally powerful crash buffers and additional EST AC04 anti-climber module, an innovative rollover protection device (EST UE01) was patented for transporting sulphur dioxide. It is used for protecting the filling valves on top of the tank. Apart from the increased passive safety that is ensured during an accident, the UE01 rollover protection device increases active safety for the operating personnel. The work platform that is integrated into the UE01 rollover protection device is spacious, preventing lateral slipping, and the safety belt can be mounted at a greater height. It is also easier to reach, and the possible crash height is lower.

Derailment detectors from Knorr-Bremse AG are another component in the innovative safety concept of the first Wascosa safe tank car®. For a decade, it has enabled Wascosa to give its customers tank wagons that are optimal in terms of meeting safety, weight (payload), and efficiency needs.



Anti-climber modules and protective signs – ready for digital automatic couplings

Currently, the RID does not yet impose any requirements for protecting dangerous goods tank wagons from railway vehicles with a centre buffer coupling. Past accidents and current efforts to introduce digital automatic coupling in rail freight transport have now focused attention on the "gap" between both lateral buffers.

This has prompted Wascosa and EST to develop an additional PS02 protection shield, which supplements the tried and tested AC04 anti-climber module, together with which the protection shield is attached to the vehicle. Due to its position right at the front of the vehicle, it averts hazards for the tank as early as possible, in the same way as the lateral anti-climber module over the buffers does. This has increased safety levels in terms of protection against buffer overrides and climbovers to their highest level yet. In 2020, the PS02 protective shield was put into practical use for the first time in the new Wascosa safe tank car® for transporting acrylonitrile (see also article on page 11f.).

Wascosa and EST independently developed the PS02. It is focussed on the RID objective of providing protection for the tank wagon's tank, although it is not a measure or design that would be suitable for meeting the TE 25 special requirement according to one of the methods currently known from this requirement. The Wascosa safe tank car® continues to meet this requirement by virtue of the AC04 anti-climber



3. a rollover protection device (EST UE01) for the valves on top of the tank



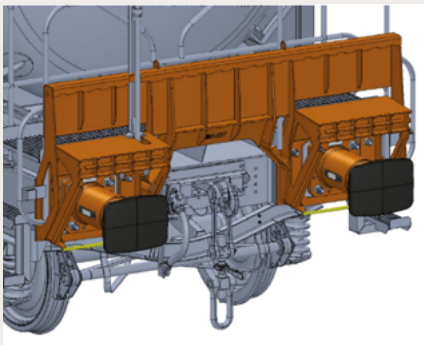
4. derailment detectors from Knorr-Bremse AG



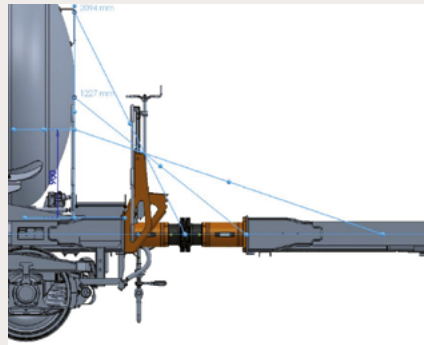
Example of wagons for which the Wascosa "Safety Package" has been individually selected and assembled

Wascosa safe tank car® – Second generation – Further development in 2020

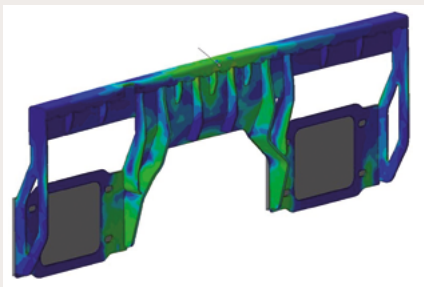
The tank on the 2020 second-generation Wascosa safe tank car® has a self-supporting functionality. The buffer override protection consists of the G2-400 M type super buffers, the AC04 anti-climber module, and the innovative PS02 protective shield from the manufacturer EST Eisenbahn-Systemtechnik.



CAD model of wagon end with EST Suprapuffer G2-400 M, AC04 anti-climber module, and PS02 protective shield.



Projection of the EST PS02 protection shield on the tank. Although it is "only" 830 mm high when measured from the buffer centre axle, or roughly 700 mm when measured from the top corner of the vehicle frame, the PS02 protective shield provides extensive protection for the tank due to its position on the front part of the vehicle frame. A headshield positioned directly in front of the tank – and for which the RID requires a height of at least 900 mm as per TE 25 – would have to be affixed far higher in order to effectively protect the same area as the PS02.



Strength calculations according to the finite element method against buffer override and climb-over with a min. of 30 tonnes (300 kN) of force. This is twice the design load of 150 kN as per RID TE 25 for each of the two lateral anti-climber modules.

module alone. As a result, steps were taken during the PS02's design to ensure that its function would complement and not negatively affect the AC04.

Greater safety, less weight

Although it is "only" 830 mm high when measured from the buffer centre axle, or roughly 700 mm when measured from the top corner of the vehicle frame, the PS02 protective shield provides extensive protection for the tank due to its position on the front part of the vehicle frame. A headshield positioned directly in front of the tank – and for which the RID requires a height of at least 900 mm as per TE 25 – would have to be affixed far higher in order to effectively protect the same area as the PS02.

A precisely defined interface examination was performed by the vehicle manufacturer by simulating the various extreme case load conditions, for a normal operating situation and various crash scenarios. This method was used to structurally and functionally integrate and certify the modular safety components in the tank wagons at their maximum development level.

An additional, noteworthy characteristic of the second-generation Wascosa safe tank car® is the self-supporting tank design. In addition to offering greater safety, the advantages of this new design lie in far greater productivity in the transportation of chemicals by rail. Despite the additional, modern safety elements, the wagon has a tank enlarged for acrylonitrile with an optimised volume of 93 m³ yet still achieves a weight saving and thus an increase in payload of over 500 kg.

Chemical transport by rail: New standards for safety and productivity

Working closely with AnQore, the Dutch manufacturer of speciality chemical products, Wascosa has developed an innovative dangerous goods tank wagon (AN) for transporting acrylonitrile. These new wagons meet the highest safety standards and result in an obvious increase of efficiency and sustainability in transporting chemicals. They were produced by Slovak wagon builder Tatravagonka Poprad.

AnQore has been working in speciality chemicals for over 50 years, AnQore's main priority is the safe, reliable and efficient production and distribution of their products. The dangerous goods tank wagon (AN) that AnQore and Wascosa jointly developed includes the latest generation of safety features within the AnQore fleet. Pieter Boon, the CEO of AnQore, is very pleased: "I am proud that we were able to successfully complete this sophisticated project with our major partner Wascosa, in the space of two years and that we have exceeded the legal requirements in the

"The new dangerous goods tank wagon shows that we are consistently forward-looking and that it is through swift and determined action that we are able to achieve the highest levels of safety."

Peter Balzer, CEO Wascosa

process. Now we have a tank wagon, that is designed and built according to the highest safety standards and fully approved for transporting acrylonitrile. This tank wagon is the new standard bearer." Peter Balzer, CEO of Wascosa, is just as proud: "Our company has a culture of innovation that

"Now we have a tank wagon, that is designed and built according to the highest safety standards and fully approved for transporting acrylonitrile. This tank wagon is the new standard bearer."

Pieter Boon, CEO AnQore

is always breaking new ground in the European freight wagon market. The new dangerous goods tank wagon is yet another testament to this commitment and shows that we are consistently forward-looking and that it is through swift and determined action that we are able to achieve the highest levels of safety." 25 of the new tank wagons were delivered to AnQore back in the spring of 2020 and a further 75 wagons followed at the end of 2020.



Highest safety standards – the innovative dangerous goods tank wagon for transporting acrylonitrile



Benefits in terms of safety, productivity, and design

The new AN is impressive and not just in terms of safety. It also represents progress and innovation in productivity and wagon design. The AN is a further development of the Wascosa safe tank car®, which was successfully introduced in 2010. In addition to the self-supporting tank construction, the new tank wagons are equipped with the following innovative features:

- **A special headshield called the "Protection Shield PS02"**, which is specifically developed for this wagon by system supplier EST Eisenbahn-Systemtechnik. Thanks to its position at the very front of the wagon, the Protection Shield PS02 provides protection in the event of a collision with neighbour wagons, other vehicles or obstacles;

- **Crash buffers** with an **exceptionally long deformation path** to reduce the energy caused by an impact;
- **Derailment detectors** to immediately apply the train brakes in the event of a derailment and thereby **limit the damage**;
- **Low-noise brakes**;
- **Anti-climbing protection** according to RID TE 25a);
- **Hard plastic signs** instead of stickers to ensure **clear signage at all times**.

Increased railway productivity through weight savings has been achieved by using materials more efficiently, using the calculations based on the finite element method and certified in practical tests. Despite

its additional, modern safety elements, the AN has a tank that is made bigger for transporting acrylonitrile with an optimised volume of 93m³.

Equipped with telematics as standard

All tank wagons are equipped with telematics thanks to a solution provided by SAVVY Telematic Systems AG which has improved fleet efficiency and transport safety. AnQore uses this technology to continuously monitor the wagons regarding location, speed or shock.

About AnQore

AnQore is a Dutch specialist chemical manufacturer based in Urmond near Maastricht. AnQore produces acrylonitrile and cyanide and delivers this to customers in various, high-value end markets. AnQore is recognised as a reliable supplier with a secure and unique logistics network that covers the whole of Europe. AnQore has a track record of more than 50 years of delivering acrylonitrile, acetonitrile, and sodium cyanide safely and reliably.



Planning security by digitally connecting the industry

The use of telematics in rail freight transport has been making major headway nationwide since 2015 and has helped make things a lot more transparent. At the same time, planning data from the waybill has been a major factor in optimising logistics processes. By interconnecting telematics and waybill data and combining it with additional data sources, we can achieve an unparalleled level of planning security in the industry and thereby significantly increase the competitiveness of rail freight transport compared to road transport.

particular the integration of infrastructure data that enables the appropriate arrival times to be calculated for planned routes based on experience and depending on any sudden disruptions that may occur. The knowledge obtained is specifically handed over to process managers, who are able to proactively inform the parties involved. Only in this way can the optimisations achieved be incorporated in the current work structures.

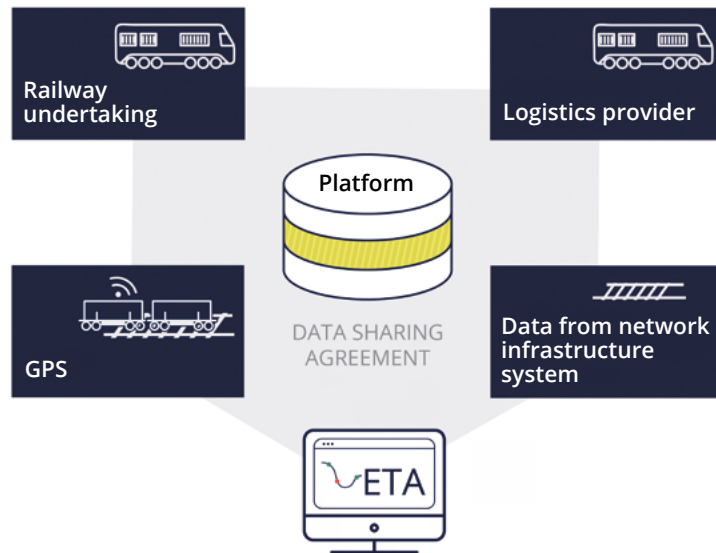
By Markus Lechner, CEO, kasasi GmbH

As more and more rail freight vehicles are equipped with telematics in Europe so the logistics processes will become more efficient and transparent. Interconnecting telematics data with additional data sources enables shippers and freight forwarders to create entirely new added value that goes far beyond mere portal applications.

Data linking, a solution for greater transparency

It's obviously important to know where a wagon is and what mileage it has done. However, you can only make an intelligent use of this information by making the link between the wagon or train and the trip data from its waybill. For this purpose, the trip data from the electronic waybill is linked to the telematics data of the wagons in use.

By using this sort of interconnected trip history, a railway undertaking, logistics provider, or shipper can intelligently calculate the ETA (Estimated Time of Arrival). This type of reliable ETA forecast provides all the parameters for rail logistics 4.0.



Digitisation helps to optimise processes

The various components need to interact in order for it to be possible to reliably predict the arrival time. In addition to lead time calculations for individual route sections that are self-learning and based on algorithms and AI (artificial intelligence), timetable data from the network infrastructure systems play a crucial role. It is in

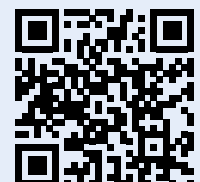
the transparency achieved will holistically transform logistics in rail freight transport and make it more efficient – regardless of the individual areas involved. For instance, the shipper or warehouse manager in the supply process knows when the next wagon or train can be expected right down to the very last minute. A loading manager at a refinery can see that enough tank wag-



Additional information on the topic

Watch the presentation "Gamechanger Digitalization" by Markus Lechner, CEO kasasi GmbH, at the Wascosa Livestream Event 2020.

Use the QR code or link:
https://youtu.be/bFQWo0hMI_w



ons will arrive at their location for filling on the next day. The logistics manager can keep track of whether deliveries or returns are shipped without unexpected downtimes and detect potential for optimising the performance throughout the entire process.

We can expect to see significant process improvements and increased competitiveness throughout the entire rail freight transport industry. Thanks to the newly achieved planning security and transport transparency for rail based traffic, there is an opportunity to significantly increase rail competitiveness compared to road in a short period of time using digitisation and targeted data networking.



In our Wascosa brochure "asset intelligence", you will learn

- which concrete benefits the individual functions have for users,
- which service packages the Wascosa Telematics Solution offers, and
- how the individual functions of our Telematics Portal work.

The brochure is available **to our customers** free of charge as a print or online version in **German, French and English**:

www.wascosa.ch/telematics



Telematics? – Order our brochure "asset intelligence"!



Requirements for seals in tank wagons

A particularly sensitive matter when transporting dangerous goods in tank wagons is whether the materials which form part of the wagon are resistant to the product being transported. Any materials that come into contact with the product, and that includes seals, must be resistant to the products transported.

By Rainer Ziesmer, expert on dangerous goods

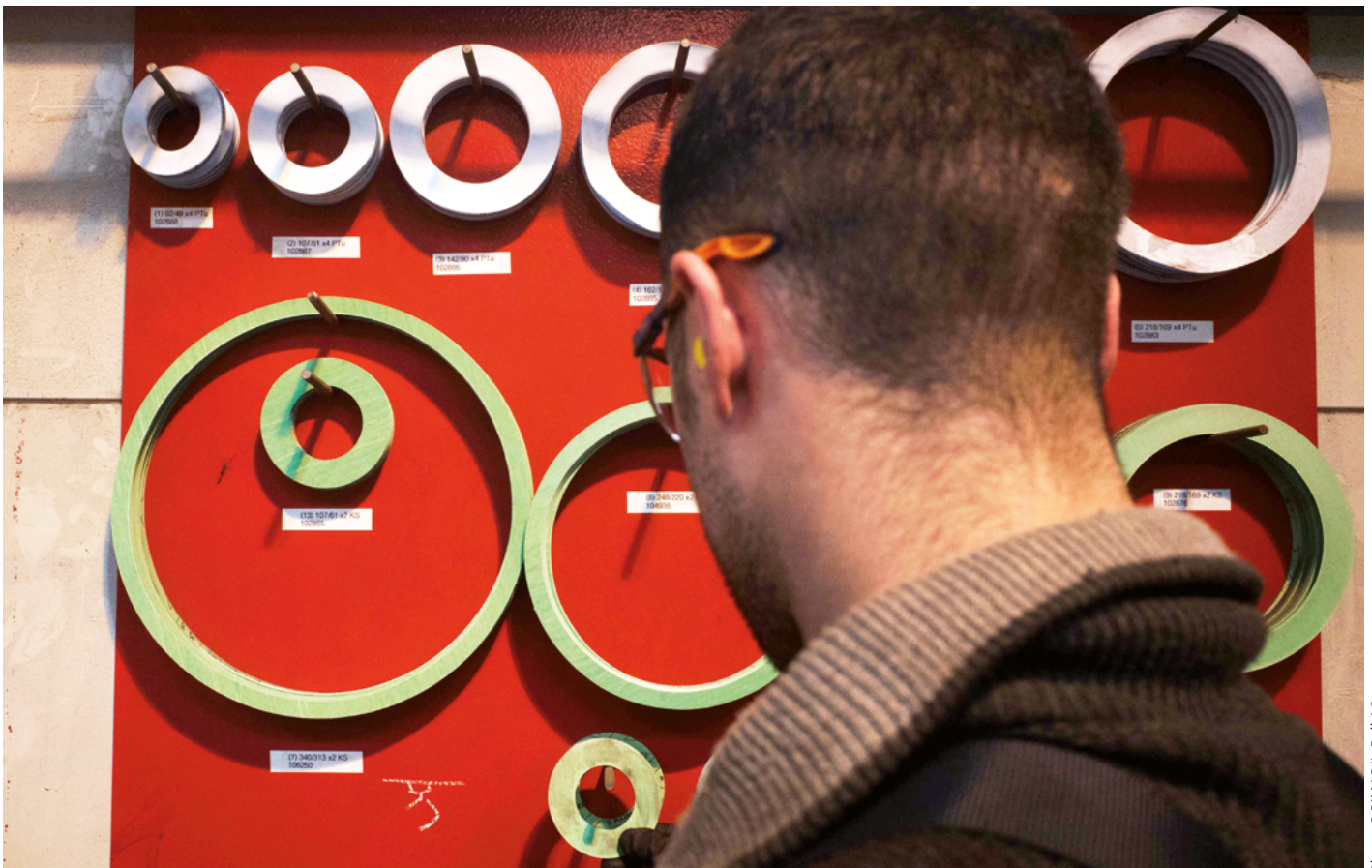
Particular attention must be paid to seals, since they are the most common cause of leaks. There is an almost unlimited variety of seal types available on the market, which makes it hard to assess their suitability. What's more they have different

names (see table). It is up to the shipper responsible for the suitability of the tank wagon (in accordance with RID 1.4.2.1.1c) should obtain the information required for assessing the seals from the filling plant. Although regrettably they are not under

any legal obligation, many manufacturers also assist by providing lists of resistant materials or the official list from the Federal Institute for Materials Research and Testing (BAM), Berlin.

Materials for seals: Overview of chemical and trade names

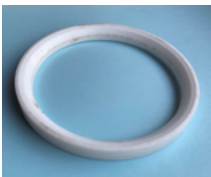
Abbreviation	Chemical name	Trade name(s)
NBR	Nitrile butadiene rubber	Perbunan®, Hycar®, Krynac®, Elaprim®, JSR-N®, Chemigum®
EPDM, APTK	Ethylene propylene diene monomer rubber Ethylene propylene terpolymer rubber	Vistalon®, Buna AP®, Dutral®, APTK®
FPM, FKM	Fluorine rubber, fluorocarbon rubber	Viton®, Tecnoflon®, Fluorel®, Dai-el®
FFKM, FFPM	Perfluoro rubber from DuPont	Kalrez®
CR	Polychloroprene rubber, chlorinated rubber	Neoprene®, Bayrene®, Butaclor®, Petro-Tex Neoprene®, Denka®
PTFE	Polytetrafluoroethylene	Teflon, Dyneon®, Hostaflon®, Fluon®



PTFE flat seals ...

PTFE flat seals are the preferred choice for use in static flange connections as this material is resistant to almost all substances. Its mechanical properties have drawbacks, such as its flawed elastic recovery and poor flow when the tightening torque is increased. This is why it is essential to observe the specified tightening torque for the screws. To stabilise the flow, pure PTFE is mixed with other ingredients, such as 25% glass powder. PTFE-coated seals also significantly improve the mechanical properties.

An innovative sealing material that is unfortunately hardly ever used in tank wagons is expanded PTFE (ePTFE). This material is bidirectionally deformable, soft, and is excellent at evening out bumps in flanges. The material deforms in one direction in a defined manner and is controllable.



PTFE



ePTFE expanded

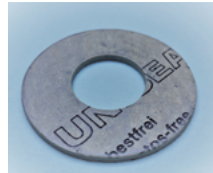


Coated PTFE

Photo: ©ISH Kunststoff- und Dichtungstechnik, Dipl.-Ing. Andreas Eickmeier e.K.

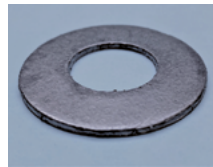
... or even seals made of aramid fibres or graphite

Although in cases where chemical resistance is a minor concern (e.g., when transporting petrol), flat seals made of aramid fibres (Centellen WS 3820) are often used. At the time, this material was used as a replacement for the widely used, asbestos-containing IT seal and is not only cheaper but also more dimensionally stable.



Aramid fibre seal

For special requirements, such as transporting ethylene oxide, graphite seals are used.



Graphite seal with spike plate

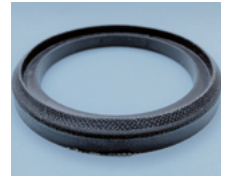
Profile seals for bottom valves, often also made of PTFE

In addition to flat seals, profile seals are used particularly for bottom discharges, as the main seals of the tank wagon. The bottom valve seals are subject to exceptionally strong wear and tear, because they act as a direct seal for the tank and are opened and closed each time the wagon is emptied. The seal is dynamically stressed by a spring when opening and closing.

PTFE seals are also preferred for use in this case because of their resistance capacity. However, this can cause problems during operation due to impurities in the load, such as quartz sand, rust or foreign particles. This sensitive material is harsh also on lead seals that fall inside during the dome filling. Elastomer seals such as Viton or neoprene have greater tolerance.



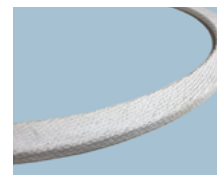
Viton seal



Neoprene seal

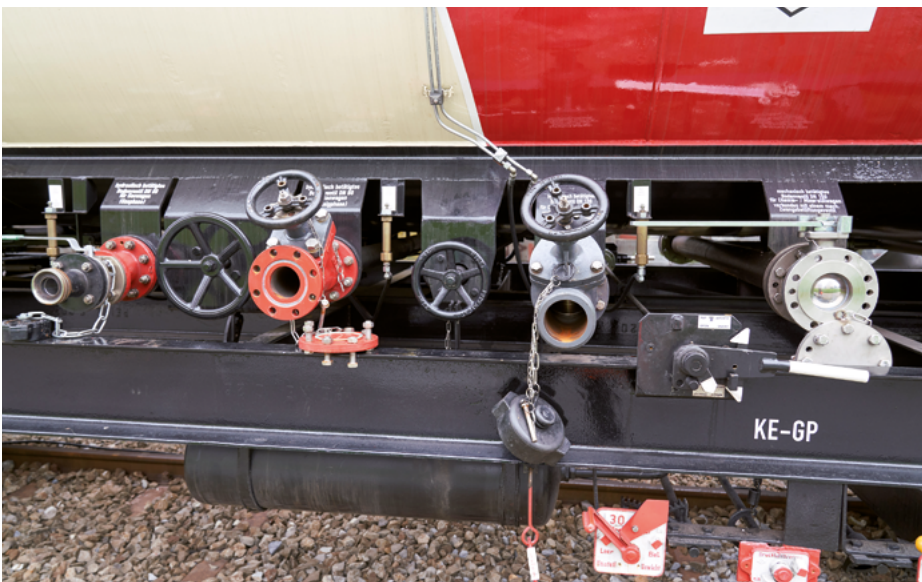
Dome seal

The dome on the top of the tank is also sealed with a profile seal. However, the requirements are different since the dome is located in the gas phase area.



Dome seal

See VPI seal guide for tank wagons on page 20

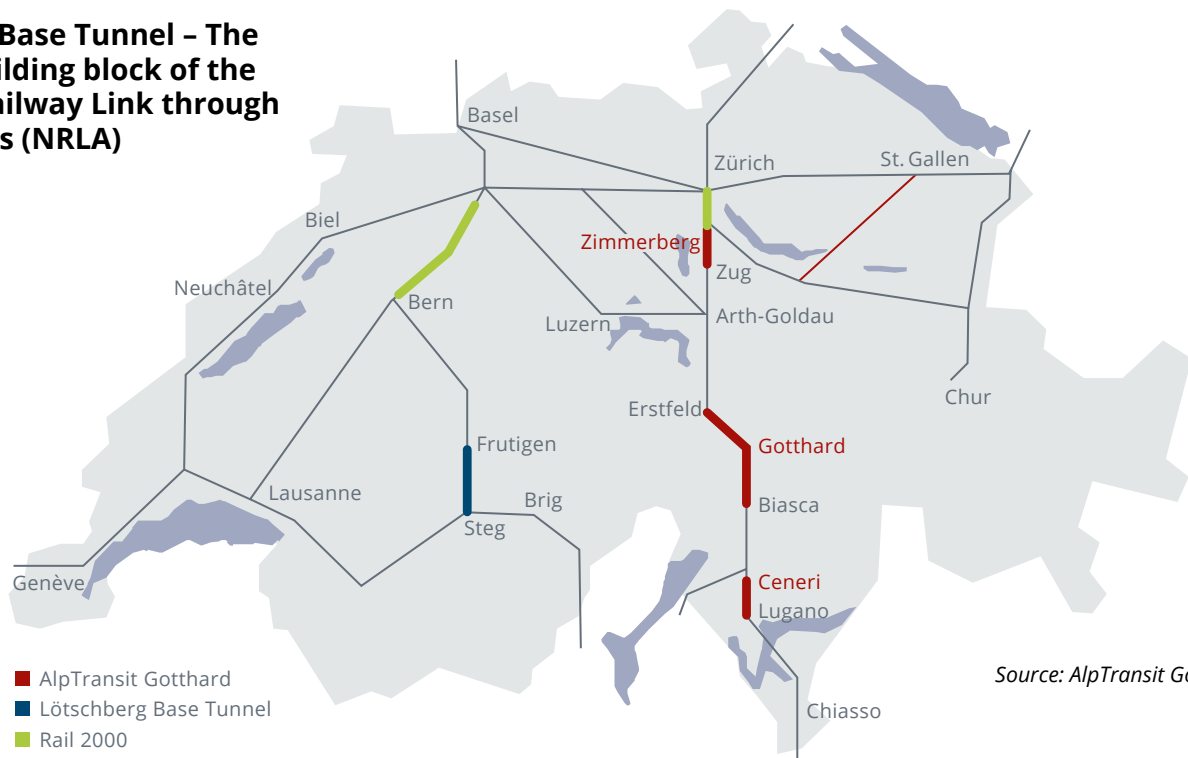


Today, there are good, innovative sealing materials on the market, which offer major advantages over the seals which have been used up until now. Perfluorelastomers (Kalrez, Aflas, or Chemraz) for example have properties which offer excellent resistance to many chemicals (similar to PTFE), but are elastic and flexible. Due to their significantly higher price, they are used on tank wagons only as O-rings in shaft seals or in dry clutches.

Summary

Seals need to meet the following requirements: Be resistant against any substances, have a long service life, be elastic to even out any bumps and, of course, be cost-effective.

Ceneri Base Tunnel – The last building block of the New Railway Link through the Alps (NRLA)



Ceneri Tunnel inauguration: No limits for transporting dangerous goods

Generally, it is forbidden by law in Switzerland to transport dangerous goods through trans-Alpine road tunnels, such as St. Gotthard, San Bernardino, or the Great St. Bernard as well as in certain other tunnels. This makes it all the more important to have safe rail transport capacity.

By Ernst Winkler, Dipl. Ing. FH, Manager at GEFAG Gefahrgutausbildung und Beratung AG

On 13 December 2020, the last building block of the New Railway Link through the Alps (NRLA), the Ceneri Base Tunnel, was put into operation. NRLA aims to attract more trans-Alpine freight transport to the railways. As a flat route through the Alps, NRLA offers greater capacity, efficiency and reliability – also for transporting dangerous goods.

Like the Gotthard Base Tunnel, the Ceneri Base Tunnel consists of two single-track tunnels, each 15.4 km in length and roughly 40 m apart. They are connected to each other via passageways every 325 m. Unlike the Gotthard Base Tunnel, the length of the Ceneri Base Tunnel means that no



Opening day of the Ceneri Base Tunnel, 4 September 2020

track crossovers or multifunction stations are required. Another difference that the Ceneri Base Tunnel has compared to the Gotthard Base Tunnel is that there are no ventilation stations. Fifty jet fans, which are mounted near the portals and in the middle of the tunnel, provide the necessary ventilation for the tunnel when it is in operation and in the event of any incidents. It has a capacity of 170 freight trains per day. The Ceneri Base Tunnel meets all the requirements of Switzerland's Major Accidents Ordinance, thereby allowing for the unrestricted transport of dangerous goods.

Legal requirements from the Major Accidents Ordinance also apply for transport routes

In order to manage the risk of incidents involving dangerous goods, the Major Accidents Ordinance started life in Switzerland back in 1991. Unlike the EU's "Seveso" Directive, this ordinance not only guarantees a high level of protection for stationary facilities but also for transport routes and consequently, for the Ceneri Base Tunnel as well.

A comprehensive safety concept in the tunnel ...

The Ceneri Base Tunnel is operated in accordance with strict safety standards. There is no risk of collisions, because the

tunnel was built in the form of two separate tubes, one for each direction and the European Train Control System (ETCS) is used in the neighbouring sections of track. The modern electronic ETCS Level 2 cab signalling systems wirelessly send all the information to the display in the driver's cab. ETCS increases safety and enables extra capacity thanks to shorter time intervals between trains. Because there is no need for visual signals the infrastructure along the route is simplified. In Europe, the signalling system is standardised, thereby ensuring interoperability and simplified network access.

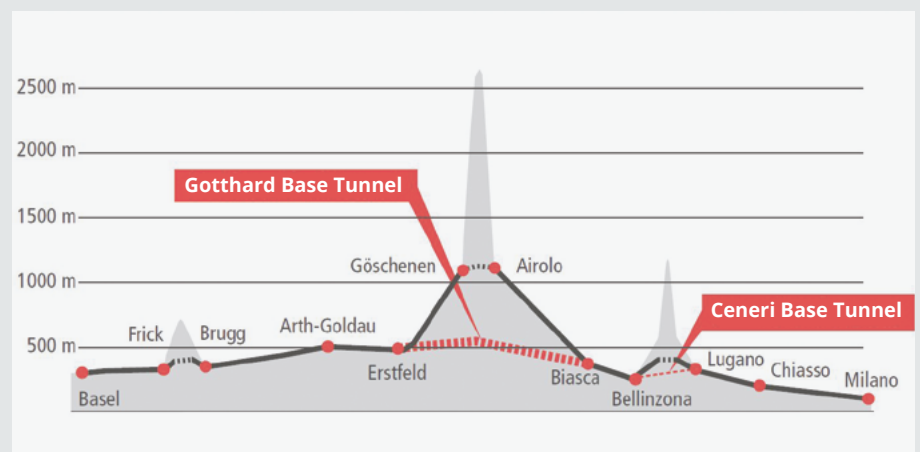
If an alarm for a train is triggered, the train is automatically guided to the next emergency stop, and the following trains are stopped. Handrails, emergency lighting and signs point the way out of the danger

zone should a train need to be evacuated. Every 325 metres, there are passageways to the tunnel which runs in the opposite direction.

... as well as on Switzerland's entire railway network

From a dangerous goods point of view, it is worthy of note that Switzerland's railway network already has over 160 train monitoring facilities, which use strain gauges to monitor the maximum axle load on passing trains as well as any axial movements and rough wheel defects. Furthermore, laser scanners are used to determine whenever the clearance gauge has been exceeded, i.e., due to cargo or a cover that has moved. Infrared sensors are used to detect any locking of wheels and axle hot boxes which can cause axle breakages and derailments.

The NRLA's Gotthard path, a new, flat route of which the highest point is 550 metres above sea level



Source: Federal Office of Transport (FOT)



Calendar of events

Due to the Covid 19 pandemic, changes in dates, venues and the form of the events (e.g. online) are still possible. It is recommended to consult the individual websites of the organisers for the definitive dates and type of event.

Date	Event	Location	Website
31.05. - 02.06.2021	Rail Freight Summit	Łódź, PL	https://events.railfreight.com
31.05. - 05.06.2021	International Green Transport Week	Not yet defined	https://uic.org/events/international-green-transport-week
10.06.2021	AFWP / UIP General Assembly	Nice, FR	https://uiprail.org/meetings/
14. - 15.06.2021	VDV Annual Meeting	cancelled	www.vdv.de/vdv-jahrestagung.aspx
16. - 17.06.2021	UNIFE General Assembly	Lisbon, P	www.unife.org/events/unife-events.html
22. - 24.06.2021	Scandinavian Rail Optimisation	Online	https://scandinavianrail.co.uk
23.06.2021	VPI General Assembly	Online	www.vpihamburg.de
24.06.2021	22nd Technical information event	Online	www.vpihamburg.de
25. - 26.08.2021	CRSC Information and member event	Bochum, DE	www.crsc.eu.com/de
07. - 08.09.2021	7th Railway Forum	Berlin, DE	https://railwayforum.de
09.09.2021	RFG Awards Dinner 2021	Chesham, UK	www.rfg.org.uk
16. - 22.09.2021	European Mobility Week	Europe	https://mobilityweek.eu/home
21. - 23.09.2021	Intelligent Rail Summit 2021, WTMS	Bilbao, ES	https://events.railtech.com/intelligent-rail-summit-wtms
21. - 24.09.2021	TRAKO International Railway Fair	Gdansk, PL	www.trakofair.com
27. - 29.09.2021	16th International Conference on Critical Information Infrastructures Security (CRITIS)	Lausanne, CH	https://critis2021.org
03. - 06.10.2021	55th EPCA Annual Meeting	Not yet defined	https://epca.eu
06.10.2021	Rail Freight Conference 2021	London, UK	www.rfg.org.uk
06.10.2021	Alpine Rail Optimisation	Vienna, AT	https://alpinerailoptimisation.com
11. - 15.10.2021	ITS World Congress	Hamburg, DE	https://itsworldcongress.com
18.10.2021	European Year of Rail event	Vienna, AT	https://shift2rail.org/events/
19. - 21.10.2021	Multimodal Exhibition	Birmingham, UK	www.multimodal.org.uk
20. - 22.10.2021	Deutscher Logistik-Kongress	Berlin, DE	www.bvl.de/dlk
26. - 28.10.2021	Intermodal Europe 2021	Amsterdam, NL	www.intermodal-events.com
26. - 28.10.2021	12th International Exhibition of Railway Technology (SIFER)	Lille, FR	www.sifer2021.com
03. - 05.11.2021	8th International Transport & Logistics Exhibition	Warsaw, PL	https://translogistica.pl/en
10.11.2021	RFG's AGM & Autumn Group Meeting	Online	www.rfg.org.uk/events/aggm-group-meeting
16. - 18.11.2021	Innorail 2021	Budapest, HU	https://innorail2021.hu/en/
17. - 19.11.2021	F&L Leader's Forum	Geneva, CH	www.europeanfreightleaders.eu
22. - 24.11.2021	Smart Rail Europe	Rome, IT	https://smartrailcongress.com/live/en/page/home
23. - 25.11.2021	Intelligent Rail Summit 2021, ATO & The Digital Railway	Not yet defined	https://events.railtech.com/intelligent-rail-summit-2021-ato
30.11. - 01.12.2021	Rail Live 2021	Madrid, ES	www.terrapinn.com/conference/rail-live/index.stm
30.11. - 01.12.2021	UIC Symposium	Not yet defined	https://uic.org/events/uic-new-normal-symposium

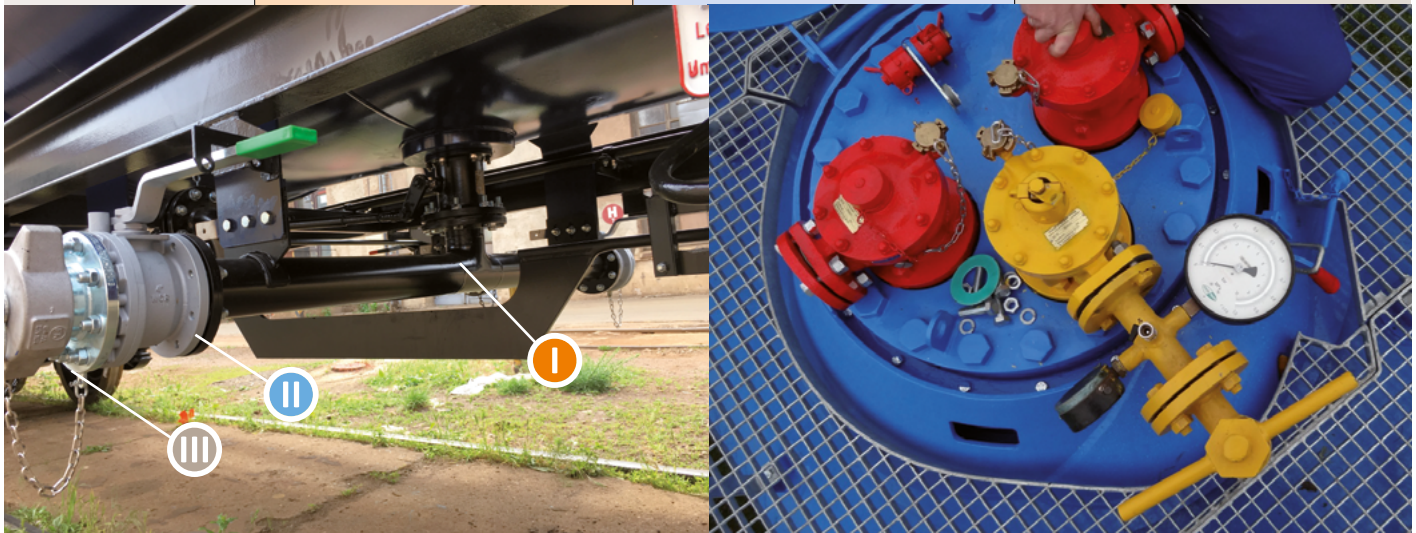
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VPI seal guide for tank wagons

Seals	Category I	Category II	Category III
Description	Seals that are exposed to product when the tank wagon is full	Seals that are temporarily exposed when filling and emptying the tank wagon	Seals on the sealing caps
Assignment	Dome cover seals Bottom valves Block flange seal Valve seat seal Top nozzles, blind covers/fittings Outlet fittings Valve seat seals/flange seals	All other seals (e.g., spindle seals for bottom valves, housing and blind cover seals of fittings)	Seals on the sealing caps
RID requirement	6.8.2.2.1, (5) RID	6.8.2.2.1, (5) RID	



	Required characteristics	Potential characteristics	Required characteristics	Potential characteristics	Required characteristics	Potential characteristics
Seal group 1	PTFE	Perfluorolastomeres	PTFE FKM/FPM	Perfluorolastomeres	PTFE	Aramid fibre
Seal group 2	FKM/FPM	PTFE	PTFE NBR	PTFE FKM/FPM Graphite	Aramid fibre	PTFE
Seal group 3	NBR Perbunan CR	PTFE FKM/FPM Graphite	NBR CR	PTFE FKM/FPM Graphite	Aramid fibre	PTFE
Seal group 9	Special agreements, e.g., CEFIC standard for ethylene oxide = graphite (CEFIC: European Chemical Industry Council)					

Without guarantee

Seals directory

Polytetrafluoroethylene (PTFE):	Teflon, Gylon
Perfluorolastomeres:	Chemraz, Kalrez
CR:	Neoprene
FKM/FPM:	Viton
NBR:	Perbunan
Graphite:	Sigraflex, IDT
Aramid fibre:	Centellen, AFM, UNISEAL