Fact sheet 2:
Tanker shipping market and market development
Inland shipping is an important means of transport for the distribution of mineral oil and chemical products within Europe. With the requirement for the conversion of the fleet of single-hulls into double-hull ships, the tanker shipping industry is facing a tremendous challenge. It would therefore appear helpful to view the development of this industry and its future prospects from various perspectives.

1 - General development and sub-segments

With regard to the transport of liquid goods, a distinction needs to be made between chemical products and chemical gases, on the one hand, and mineral oil products, on the other hand. The two segments display varying trends when viewed over a number of years.

The transport of chemical products has developed in step with production levels in the chemical industry in Germany, Belgium and the Netherlands. The transport of such goods has been increasing for several years with growing production output within the chemical industry in Western Europe. The volume of chemical products transported on the Rhine increased considerably between 2004 and 2010, at a rate of 29%.

**Figure 20: Transport of chemical products on the Rhine**

![Graph showing transport of chemical products on the Rhine](source: destatis)

In contrast, transport of mineral oil products is declining with the downward trend in consumption of these commodities (tendency towards more efficient vehicle engines, more efficient use of heating oils...
among consumers). Increased transport demand for chemical products has compensated the reduced demand for mineral oil products, with the result that the overall balance for the tanker shipping industry in fact increased by almost 5% from 2004 to 2010.

**Figure 21: Volume transported by tanker shipping on the Rhine**

As a result of the various developments, there has been a structural shift in transport volumes. While the share of mineral oil products in total transport volume dropped from 67% in 2004 to 60% in 2010, the share of chemical products simultaneously increased from 33% to 40%.
2 - Transport demand

2.1 Factors affecting demand

In order to be able to assess the development of transport demand in tanker shipping, it is useful to make a distinction between a short-term and a long-term perspective. An additional distinction can be made between economic factors and factors that are exogenous to the market (i.e. natural factors).
Table 3: Factors affecting transport demand in tanker shipping

<table>
<thead>
<tr>
<th>Short-term factors</th>
<th>Long-term factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>Exogenous to the market</td>
</tr>
<tr>
<td>Oil price, oil futures markets and stock</td>
<td>Weather conditions (winter temperatures)</td>
</tr>
<tr>
<td>Business cycle of the chemical industry</td>
<td>Demand for mineral oil products</td>
</tr>
<tr>
<td></td>
<td>Location of refineries and chemical plants</td>
</tr>
<tr>
<td></td>
<td>refineries’ choice of transport carrier</td>
</tr>
<tr>
<td>Economic</td>
<td>Exogenous to the market</td>
</tr>
<tr>
<td></td>
<td>Technological progress in the energy sector</td>
</tr>
<tr>
<td></td>
<td>Energy policy</td>
</tr>
</tbody>
</table>

Source: CCNR Secretariat

The oil price plays a major role in the short and medium term. Evaluations carried out for the period from 2000 to 2008 have revealed that a high oil price tends to curb transport demand. The amount of oil stocked also has a significant effect. To mitigate the price risk posed by futures markets, oil products are transported to tank storage facilities and stocked whenever trends at the London futures market indicate rising gas oil prices in the future. 10 Tank storage facilities are located in the ARA region and on the Rhine.

When, as in late 2008, there is a very strong incentive to stockpile oil, inland and sea-going vessels are employed as floating storage facilities. Weather conditions have an effect depending on the season, influencing the heating oil segment in the autumn and the market for fuels in the summer months. The factors affecting demand in the long term will be discussed in detail farther below. First, a description of current trends in supply and demand will be given.

---

10 This kind of price swing results in a changeover from a backwardation to a contango situation, i.e. futures market trading reflects the expectation of rising instead of falling oil prices.
2.2 Current demand trend

The transport of mineral oil products during the last four years has been characterised by fluctuating demand. Initially, demand increased considerably in late 2008 in response to sharply falling oil prices. Demand subsequently became somewhat sluggish, remaining at this level for all of 2009. A recovery can be observed since early 2010.

Figure 23: Transport of mineral oil products on the Rhine

![Graph showing transport of mineral oil products on the Rhine from 2007 to 2010.](source: destatis)

The crisis had negative repercussions on the chemical industry at a much earlier point in time, whereas the recovery also set in earlier.

Figure 24: Transport of chemical products on the Rhine *

![Graph showing transport of chemical products on the Rhine and chemical industry production from 2003 to 2010.](source: destatis; calculations by the CCNR Secretariat. * Production index for Germany)
On the Rhine, the pre-crisis level of 4.6 million tonnes (value for third quarter 2008) was already reached in the first quarter of 2010. About 5.2 million tonnes were transported in the third quarter of 2010. The volume transported rose by 20% from 2005 to 2010 and by 29% during the 2004-2010 period. This would indicate a trend toward increased transport of chemical products.

3 - Fleet development

The fleet capacity of a country or a river system can change because of the following factors:

- New ships
- Converted ships (if the ships' capacity is changed as a result)
- Scrapping
- Purchase and sale

3.1 New and converted ships

From 2006 to 2010 inclusive, around 280 new tankers were added to the fleets of the Western European countries (Netherlands, Belgium, Germany, Luxembourg, Switzerland). For several years new building has been focused to double-hulled motor tankers. By far the greatest number of new ships have a Dutch flag, followed by Germany and Belgium (see chart).

Figure 25: Construction of new tankers in Western Europe (tonnage)

Source: IVR
In the tanker shipping industry, the fleet is currently being converted from single-hull to double-hull ships. The conversion is being carried out in accordance with the transitional provisions of the ADN, which permit the industry to continue transporting certain substances in single-hull ships during the transition period (which lasts until 2018).

The transition deadlines vary according to the substance being transported. For instance, for many chemical products a transition period until 31.12.2012 applies. Petrol fuel may be transported in single-hull ships until the end of 2015. In respect of diesel fuel, gas oil, light heating oil and kerosene, this is still possible until the end of 2018.

---

11 ADN = Annex to the European agreement from 26 May concerning the international carriage of dangerous goods by inland waterways
12 Source: ADN (2011)
Table 4: Schematic representation of the transition deadlines for tanker shipping

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Various chemical substances</td>
<td>Petrol, various other petroleum distillates, hydrocarbons</td>
<td>Diesel, gas oil, light heating oil, kerosene, jet fuel, turpentine oil substitute</td>
<td></td>
</tr>
</tbody>
</table>

Source: ADN (2011)

The ADN regulations mean that different conditions will prevail in sub-segments of the tanker shipping industry in the coming years. It may be observed that the quantitatively largest area of the mineral oil segment (i.e. diesel, light heating oil, gas oil, kerosene) is affected relatively late by the transitional provisions. By contrast, the changeover comes relatively early for chemical products.

The following chart shows the growth of double-hull ships in each year from 2000 to 2010. This growth is based on information from the EBIS organisation, which monitors the operational safety of tankers on inland waterways.13

---

13 The total number of tankers inspected by the EBIS is roughly comparable to the size of the Western European fleet of tankers, as stated here by the CCNR.
The above chart shows that the conversion of single-hulls to double-hulls is not very frequent. Consequently, hardly any limitation of the fleet stock due to the conversion of existing ships can be discerned.

3.2 Scrapping of ships

The scrapping of ships is of negligible importance in Western Europe at present. Calculations for the Netherlands and Germany reveal the following:

- Netherlands: 546,300 tonnes, in other words more than half a million tonnes, were added as newly built ships from 2006 to 2010, while only 5,700 tonnes were scrapped in the same period. The scrapped tonnage corresponds to a share of only 1 % of the newly built tonnage.\(^\text{14}\)
- Germany: 81,600 tonnes were added to the market as newly built ships in the period from 2006 to 2010. 5,000 tonnes were scrapped. This corresponds to a share of 6 % of the newly built tonnage.

3.3 Purchase and sale of ships

This form of inventory change is quantitatively important. This is shown by the following charts which take Germany as an example. Here, the purchase and sale of ships from 2006 to 2008 was quantitatively more important than new building. However, the proportion of the inventory change accounted for by newly built ships has grown year after year.

\(^{14}\) These are approximate figures
Figure 28: Additions to tanker tonnage in Germany differentiated by type of addition

Source: WSV Südwest; ELWIS. Note: Apart from tankers the additions also included a (tiny and diminishing) number of tank barges for push tows.

It may also be observed that in 2010 these ships originated exclusively from the Netherlands and Luxembourg.

Figure 29: Subtractions from tanker tonnage in Germany differentiated by type of subtraction

Source: WSV Südwest; ELWIS. Note: Apart from tankers the subtractions also included a (tiny and diminishing) number of tank barges for push tows.
Around 64 % of the countries to which the ships were sold were countries on the Rhine river system (Netherlands, Belgium, Switzerland, Luxembourg). The remaining 35 % went primarily to Eastern Europe (Romania, Serbia, Ukraine). In 2010, ten motor tankers (16.200 t) were sold from Germany to abroad. The main countries to which the ships were sold are the Netherlands and Belgium. On balance, there was an increase of stock for Germany, because the tonnage added outweighed the subtractions.

It may be observed that most of the countries to which the tankers were exported from Germany were Western European countries. This indicates – at least in the case of Germany – that the fleet operating in Western Europe is barely reduced by the export of ships.

4 - Available shipping tonnage

As mentioned above in relation to newly built ships, pushed tanker barges are no longer being built, only motor tankers. However, the pushed tanker barges still have a certain share of the existing fleet.

The total capacity of the Western European tanker fleet (Netherlands, Germany, Belgium, France, Switzerland, Luxembourg) is approximately 2.8 million tonnes, 2.6 million tonnes of which is accounted for by motor tankers, leaving a tiny remainder of 0.2 million tonnes to be accounted for by pushed barges. Expressed in numbers of ships, there are 1,177 motor tankers and 142 pushed tanker barges, including some barges for push tows.

Figure 30: Tanker fleet in Western Europe *

Source: CCNR. * Western Europe = Netherlands, Germany, Belgium, France, Switzerland, Luxembourg
In terms of proportional share of the fleet among individual countries, the Netherlands rank first, having a 49 % share (based on tonnage). Germany ranks second at 28 %, followed by Belgium with 13 % and the remaining countries (Switzerland, France and Luxembourg) which each hold a share of 5 % or less.

Table 5: Distribution of the Western European tanker fleet by country

<table>
<thead>
<tr>
<th>Country</th>
<th>Tonnage (1.000 T)</th>
<th>Share of capacity in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>1.396,5</td>
<td>49</td>
</tr>
<tr>
<td>Germany</td>
<td>765,5</td>
<td>28</td>
</tr>
<tr>
<td>Belgium</td>
<td>377,2</td>
<td>13</td>
</tr>
<tr>
<td>Switzerland</td>
<td>114,8</td>
<td>4</td>
</tr>
<tr>
<td>France</td>
<td>131,9</td>
<td>4</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>36,2</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>2.825,6</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: CCNR calculation based on national statistics. As of 31.12.2010

The proportional share of double-hulls in relation to the entire fleet may also be estimated. When all double-hull ships newly built since 2000 (as well as the converted vessels) are taken into account, the current double-hull share of the Western European fleet can be assumed to be about 60 %.

5 - Comparison of changes in supply and demand

If the volume to be transported does not increase at a rate commensurate with fleet expansion, utilisation of vessel capacities will decrease, affecting utilisation both at the level of individual shipping companies and the industry as a whole. An additional consequence is downward pressure on freight rates.

The chart below shows the changes in supply and demand over time. The curves specifically indicate the changes in the capacities of the Western European tanker fleet relative to 2003 as well as fluctuations in the corresponding demand for capacities.

Demand in this case entails transport services for chemical goods and mineral oil products on the Rhine. Supply includes the tanker fleet capacities of Belgium, Germany, France, Luxembourg, the Netherlands and Switzerland.
The chart shows that supply and demand developed at a similar rate until 2006. The percent increases in total volume roughly corresponded to the percent increases in capacity. A more or less balanced development may thus be observed until 2006.

Beginning in 2007, supply and demand can be seen to increasingly drift apart. While demand remained more or less constant, the capacity increased at a linear rate. The fleet transport capacity grew by about 35 % between 2003 and 2010. Demand, meanwhile, increased by a mere 4 %.

It must be assumed that this gap will continue to widen in the coming years. This follows from the fact that the conversion of the Western European fleet from single-hulls to double-hulls is far from completion, since the estimated share of double-hulls in Western Europe is 60 %.

Another fact needing to be considered is that the increased productivity of new ships will have the effect of increasing the capacity supply. A higher level of personnel (i.e. with several shifts operating 24/7) is one of several factors that enhance the productivity of newer tankers in comparison to more dated vessels. This aspect additionally contributes to the effective supply of vessel capacity.
6 - Freight rates and turnover

When examining freight rates in the tanker shipping industry, a distinction needs to be made between gas oil and petrol fuels. In a manner similar to demand, the factors affecting freight rates can generally be broken into economic causes and factors exogenous to the market (i.e. natural effects). In both categories it is useful to further distinguish between supply-side and demand-side factors.

It is also necessary to distinguish among freight rates according to region. Tanker shipping on the Rhine needs to be distinguished from tanker shipping in the ARA region. Freight rate changes in each of the sub-markets can parallel each other at times but also follow differing curves at other times. A shipping company always has the option of shifting the focus of activities either to the Rhine market or on the ARA market, depending on which offers higher freight rates.

The water level is the most important factor exogenous to the market and at the same time the most important determinant of freight rates in general. As the water level falls, the maximum draught of each vessel is reduced, so that less vessel capacity is available for a given total fleet capacity and level of demand. This results in rising freight prices.

**Table 6: Factors affecting freight rates in tanker shipping**

<table>
<thead>
<tr>
<th>Economic factors</th>
<th>Factors exogenous to the market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand side</td>
<td>Supply side</td>
</tr>
<tr>
<td>Supply side</td>
<td>Demand side</td>
</tr>
<tr>
<td>Supply side</td>
<td>Supply side</td>
</tr>
<tr>
<td>Transport demand</td>
<td>Fleet capacity</td>
</tr>
<tr>
<td>Oil futures markets</td>
<td>Changes in tanker shipping costs</td>
</tr>
<tr>
<td>Stockpiles</td>
<td>Winter temperatures</td>
</tr>
<tr>
<td></td>
<td>(for the heating oil market)</td>
</tr>
<tr>
<td></td>
<td>Summer (for the fuel market)</td>
</tr>
<tr>
<td></td>
<td>Water level</td>
</tr>
</tbody>
</table>

*Source: CCNR Secretariat*
One look at the figure below is sufficient to recognise that the water level is generally the most important determinant for the level of freight rates.\textsuperscript{15} The chart shows the water level at Kaub on the Rhine and the average freight rates for gas oil (average for six destinations from Rotterdam) for the period of 2002 to the end of 2010.\textsuperscript{16} The price for transport increases regularly during periods when the water level drops below ‘normal’. Thus, a clearly recognisable inverse relationship exists between the water level and the freight rate.

**Figure 32 : Water level and gas oil freight rates in Rhine shipping** *

![Chart showing water level and gas oil freight rates](image)

Source: Data from PJK International; Federal Institute for Hydrology; calculations by CCNR.

Note: Values have been logarithmised to allow plotting of the two datasets on one and the same chart.

\textsuperscript{15} The visual impression is additionally confirmed by calculations. For example, in the period 2002 to 2008 an average increase of one percent in the water level at Kaub on the Rhine resulted in a 0.8 % reduction in Rhine freight rates. Refer to “Freight rates in the tanker sector”, CCNR Market Observation Report 2010-1.

\textsuperscript{16} Monthly averages of the gas oil freight rates for transport from Rotterdam to six destinations (Duisburg, Dortmund, Cologne, Frankfurt, Karlsruhe, Basel)
Other factors affecting rates, such as transport demand, while difficult to recognise from the chart, can be readily identified mathematically. From the chart it can be recognised at least that the second half of 2008 was a period during which the freight rate trend was clearly determined by the demand side. During this period, the drastic price drop in the oil market swiftly drove transport demand upward, and with it the freight rates. The water level at this time could be considered more or less normal.

In a manner similar to demand, freight rates returned to a relatively low level in the course of 2009, increasing only briefly during the second half of the year due to a low water level phase. Very low freight rates were typical for all of 2010, which can be attributed to the high rate at which new ships were being built, but also to the relatively high water level.

The relation between water level and transport price for the period cited above (2002-2010) can also be recognised from the chart below. It reveals that the relationship between water level and transport price, viewed overall, is not a linear one. Specifically, the freight rate increases at a disproportionately high rate once the water level drops below a certain threshold. The regression curve, which was drawn in on the basis of the data, illustrates the cited non-linear relationship.

**Figure 33: Water level and gas oil freight rates in Rhine shipping**

Source: Chart prepared by CCNR Secretariat based on data from PJK International; Federal Institute for Hydrology. Including non-linear regression function

Effect of ship size on the water level-freight rate relation

The relationship between water level and freight price is additionally affected by the cargo capacity of the ships themselves. Vessels having a larger cargo capacity reach the maximum permissible draught sooner than smaller ships. Scientific research has established that lowering the water level reduces the maximum permissible cargo volume for small vessels to a proportionally lesser extent than for large vessels, with the result that the freight price for large vessels increases more quickly than for small vessels when the water level falls.

Figure 34: Effect of increasing cargo capacity on the water level-freight rate relation

![Diagram](image)

This effect is revealed by the chart above. The black line represents the water level-freight rate relation for a fleet of small vessels. The average cargo capacity of the fleet subsequently increases as large vessels are added. The result is that the curve representing the water level-freight rate relation shifts to the right. The red line represents the new relation.

A decrease in water level from $P_0$ to $P_1$ results in a defined increase in freight rate for a fleet of small vessels. The increase in freight rate is greater, however, for a fleet of large vessels than for a small-vessel fleet. Estimates indicate that the negative effects of a freight rate increase caused by a low water level are relatively minor due to a low price elasticity of demand.

*Refer here to the doctoral thesis by O. Jonkeren (2009): Adaptation to Climate Change in Inland Waterway Transport; p.30: “…Given a decrease in water level, for small ships, the increase in price per ton is less than for large ships […].
A comparison of the average freight rates for individual years reveals that 2008 was a record year – at least within the period of 2002 to 2010.

**Figure 35: Average annual gas oil freight rates in Rhine shipping**

![Graph showing average annual gas oil freight rates in Rhine shipping from 2002 to 2010.](image)

Source: Data from PJK International; calculations by CCNR.

The changes in freight rates from month to month during the years 2008, 2009 and 2010 allow two observations to be made: There was an overall ‘phase shift’ in 2008, relative to the other two years. A seasonal effect can be seen in the autumn of each year; this is probably related to the time when heating oil was delivered to tank storage facilities.
Turnover is a function of freight rates in relation to the total volume transported. An indicator for the “industry turnover” in the tanker shipping sector can be derived by multiplying the average freight rate level for one year by the total volume transported by tankers in that year.

Industry turnover can be increased, either through a large transport volume, higher transport prices, or through a combination of these two factors. It is thus of interest to note the changes in freight rates, in total volume transported and in industry turnover, which is derived from the two foregoing figures, for the tanker shipping industry on the Rhine. It is additionally of interest to note the specific contributions of freight prices and total volume to turnover.

The chart below shows the changes, from year to year, in freight rates, in the volume transported and in the resulting level of industry turnover, whereas each of the variables is represented relative to the year 2004. Substantially greater variability can be recognised for rates than for total volume. Freight rates consequently also have a greater effect on changes in industry turnover.
One example for this relationship is 2008, when the total volume transported during the year as a whole was slightly below the 2004 level (despite very strong increases toward the end of the year). Freight rates, in contrast, rose sharply as the year came to a close. As a result, there was very strong growth in turnover during 2008, while this trend was dampened only somewhat by the slight transport volume losses.

Rates in 2009 were about 50% higher than in 2004, whereas the total volume was slightly below the 2004 level. Industry turnover nonetheless increased relative to 2004, because the positive effects generated by higher freight rates more than compensated the negative impact of volume. The chart below shows the changes in turnover, rates and total volume for each of the quarters of 2009 and 2010.
A closer examination of the chart above reveals the after-effects of high freight rates in 2008. Specifically, freight rates during the second to fourth quarters 2009 were well below the level recorded for the previous year, which consequently resulted in less turnover. While demand in 2010 picked up compared to 2009, freight rates did not follow the trend, principally due to the relatively high water level.

► 7 - Market shares of inland shipping in the mineral oil segment

In areas where waterways and rail links are simultaneously available, inland shipping must compete with rail for the transport of chemical and mineral oil products, as well as with pipelines. In the mineral oil sector, transport on inland waterways is used almost exclusively for shipping oil products from refineries to tank storage facilities, since crude oil is supplied to refinery locations by way of pipelines or by sea-going tanker (depending on the geographical location of the refinery).
The next two charts present the results of a survey among all refineries currently in operation in Belgium, the Netherlands and Germany to determine the market shares of the modes of transport used. The locations are indicated in the order of size (i.e. beginning with the largest refineries on the left and on to the smallest ones at the right end of the chart).

The plants at the ports of Rotterdam and Antwerp (there are four refineries in each of the port areas) have been grouped together, with the modal split share in each case estimated on the basis of the port of Rotterdam.

In view of available capacities, inland shipping could achieve an even greater share of the market at the ARA ports. However, the logistic rhythms of sea-going tankers, tank storage facilities and inland shipping are frequently not very well coordinated. This often results in waiting times and thus in lost time.

In this context, inland vessels often function as logistic buffers and floating storage facilities for mineral oil products. In 2008, there were very often waits at loading and unloading points. This also meant that shipping companies had to pay a large amount in demurrage charges.
**Figure 40:** Modal split shares for deliveries of mineral oil products from refineries in the Rhine region

![Modal split shares graph for Rhine region refineries](image)

Source: Corporate information from Shell, BP Germany, Total, Petroplus, Mineral Oil Refinery Oberhein, Haven Rotterdam. Refineries in the port areas of Rotterdam and Antwerp: Estimate based on port information

The corresponding chart for the other refineries located in Germany shows very clearly that inland shipping is in a disadvantaged position in much of Germany, particularly when compared to rail transport.

**Figure 41:** Modal split shares for deliveries of mineral oil products from refineries in Germany outside the Rhine region

![Modal split shares graph for non-Rhine region refineries](image)

Source: Corporate information from ConocoPhilips, Total, PCK GmbH, Petroplus, BP Germany. Vohburg/Neustadt: Estimate
It thus becomes clear that, in Germany as a whole, about an equal volume of mineral oil products are transported by inland shipping and by rail. Finally, inland shipping and rail will probably not be natural competitors for refinery business – at least not everywhere. That is because transport on inland waterways, due to a lack of infrastructure, is simply not feasible in a number of regions.

**Figure 42: Total volume of mineral oil products, petroleum and gases transported by rail and by inland tanker in Germany**

When discussing the transport of mineral oil products in Western Europe, the role of Rhine shipping for Switzerland also needs to be mentioned. It is true that the Switzerland’s two refineries are not situated on waterways: the Cressier refinery is near Neuchâtel, while the Colombey refinery is situated near Lake Geneva.

Nonetheless, the Rhine plays a central role in imports of mineral oil products. A total of about 80% of such imports arrive in Switzerland by rail and by waterway (i.e. the Rhine). As a means of transport, the Rhine is responsible for about 38% of such imports.\(^{18}\)

---

\(^{18}\) Source: CCNR calculations based on information from the Swiss Oil Association (EV)
The mineral oil imports transported on the Rhine originate in the Netherlands, Belgium and Germany. A total of 3.2 million tonnes of mineral oil products reached Switzerland via the Rhine in 2009. Of these shipments, 1.6 million tonnes were from Germany, 1.3 million tonnes from the Netherlands and 0.3 million tonnes from Belgium.

**Figure 43: Market shares of individual modes of transport in imports of mineral oil products to Switzerland**

![Market shares of individual modes of transport in imports of mineral oil products to Switzerland](image)

*Source: CCNR calculations based on information from the Swiss Oil Association (EV)*

► **8 - Future prospects – with special consideration of the mineral oil segment**

When discussing the outlook for tanker shipping demand in the years to come, a distinction needs to be made between chemical products, mineral oil products and alternative fuels.

Refinery production must be regarded as a determining factor in future transport demand within the mineral oil segment. The chart below presents a comparison of the trend in refinery production in Western European countries (Belgium, Germany, France and the Netherlands) with the transport of mineral oil products on the Rhine.
On the whole, the chart indicates that the two variables are related. However, transports, at 20%, decreased at a higher rate between 2001 and 2009 than refinery production, which declined by 14%. It could be concluded from this observation that inland shipping forfeited shares in the market for the transport of mineral oil products. Recently several refineries in Europe have been shut down or converted to tank storage facilities. The locations listed in the following were affected: 19

- Dunkirk refinery, France, 2010
- Reichstett refinery near Strasbourg, France, 2010
- Hamburg-Harburg refinery, Germany, 2010
- Heide refinery, Germany, 2010

Closure of the Strasbourg refinery is not likely to impact Rhine shipping to any great extent. That is because the waterway played only a minor role in the logistics of the refinery.

19 Source: Corporate information from Shell, Total and Petroplus
Simultaneous with the reduction of refinery capacities in Europe, new capacities are being created in the Middle East (e.g. with a new Total refinery in Saudi Arabia) and in Asian nations. Capacities are in this way being shifted to oil producing countries (in the Middle East) and to mineral oil markets that are still expanding (in Asia). By and large, the activities and announced plans of oil company groups provide indications of the following trends for Europe:

- Concentration of activities on major refinery locations and the merging of mid-sized operations in order to achieve economies of scale (for example, refineries at Cologne-Godorf and Wesseling)
- Elimination of smaller units 20
- Realignment of refinery production to reflect altered market demand (increase in diesel output, decrease in petrol output) 21
- Downsizing: realignment is frequently accompanied by a reduction of total capacity (an example is the refinery at Gonfreville, France)

For conventional refinery production, i.e. based on fossil crude oil, further reduction of capacities in Europe and thus of transport demand is expected in the next decades. Increased output and subsequent growth in transport needs can be expected for the chemical industry, particularly in countries such as Germany, Switzerland, the Netherlands and Belgium, which produce significant quantities. The alternative fuels market is an additional source of growing demand for tanker shipping. Biodiesel and ethanol are now being produced at a number of biorefineries in Western Europe (examples can be found at the inland ports of Emden, Würzburg and Straubing).

An additional aspect is that the biodiesel industry very much considers shipping availability when deciding on the location of facilities. Inland tankers are very frequently included in the logistics chain of plants producing alternative fuels. This applies both to the supply of agricultural raw materials (rapeseed, oilseeds, wood chips etc.) and the outgoing delivery of the final products (biodiesel, ethanol).

20 The point at which a refinery should be considered “small” is obviously not quite clear. Yet, the examples seen in the past two years have shown that all four of the refineries shut down in France and Germany had an annual crude oil processing capacity of 4 to a maximum of 7 million tonnes. Europe’s largest refinery (Rotterdam-Pernis) has a capacity of 20 million tonnes.

21 However, reconfigurations of this kind are, for technical reasons, only feasible to a limited extent (a refinery cannot exclusively produce diesel fuel).
9 - Summary

A central feature of the tanker shipping industry is that it acts under a highly complex and volatile set of circumstances that are affected by both economic and non-economic factors. This can be seen for the demand side and for freight rates as well as for the supply side.

Summarising the structural changes and business cycle developments in all three areas (i.e. supply, demand and freight rates) and subsequently analysing the outlook for the near and more distant future allows the following observations:

9.1 Demand and freight rates

- A structural shift in transport volumes, i.e. a decreasing proportion of mineral oil products and an increasing share of chemical products, has manifested itself in recent years and will continue into the future. The current share of chemical products is 40 %, while mineral oil products account for 60 % of the volume transported.

- The economic crisis has affected the two sub-segments of the tanker shipping industry in entirely different ways. Whereas demand and freight rates in the mineral oil segment were bolstered, the volume of chemical products transported declined dramatically. In the meantime, however, as of early 2011, the chemicals segment has recovered once again. The mineral oil segment was much less hard-hit by the crisis year 2009, and new demand was generated in 2010.

- Freight rate levels result from the interaction of non-economic and economic factors. Freight rates have followed a linear downward trend in the last three years (2008 to 2010), with 2008 representing a record year within the decade from 2000 to 2010.

- An indicator for industry turnover in the Rhine shipping market can be derived from the relation between freight rates and total volume transported. Freight rates vary much more greatly than the transport volume, so that the percent change in industry turnover is affected to a greater degree by variations in freight rate levels.

- A declining level of industry turnover was typical for 2009 (when compared both from quarter to quarter and with the previous year), a trend resulting from the record freight rates levels seen in 2008. 2010 saw a continued decrease in the amount of industry turnover. This was caused by further decreases in freight rates, even though the total
volume transported increased. Yet the increase in total volume more than compensated the decrease in freight rates.

9.2 Supply

• Compared to many of the preceding years, a very high level of new ship building took place in 2009 and 2010. At 231,000 tonnes in 2009 and 256,000 tonnes in 2010, the rate of new building in Western Europe for both years was more than double that of 2008 (111,000 tonnes). The Netherlands accounted for the largest share by far of newly built vessels.

• The average capacity of a newly built Western European tanker increased from 1,674 tonnes in 2007 to 2,870 tonnes in 2010.

• Conversion of the fleet from single-hull to double-hull vessels is largely taking place by building new double-hull motor tankers. Conversion of existing vessels hardly plays a role in this regard.

• Following the rapid growth of the fleet in 2009 and 2010, the proportion of vessels with double walls in the Western European tanker fleet has continued to increase and is currently estimated at 60 %.

• In addition to new building, purchases and sales of vessels to and from other countries account for changes in total fleet tonnage. The ships purchased by Germany in 2009 originated exclusively from the Netherlands and Belgium. Roughly two thirds of the vessels sold by Germany went to Western European countries and one third was sold to Eastern Europe.

9.3 Comparison of supply and demand

• Supply and demand developed at a similar rate until 2006. In the place of this concurrent trend, from 2007 a gap began to grow between supply and demand. While supply continues to increase at a linear rate, demand has remained almost constant.

• The fleet transport capacity grew by about 35 % between 2003 and 2010. Demand, meanwhile, increased by a mere 4 %.

• Overcapacity has resulted from structural factors in the tanker shipping industry due to the trends in supply and demand.
9.4 Modal split

• Inland shipping in the Rhine region has very large shares in certain market segments related to refinery logistics. In Germany, roughly the same volume of mineral oil products was transported by rail and waterway in 2009 (waterway: 34 million tonnes; rail: 39 million tonnes). Yet the market share held by rail is greater in many regions due to naturally given factors.

• Railways at 41 % and waterways at 38 % have an almost equal market share in the transport of mineral oil products imported to Switzerland.

• A distinction needs to be made in the modal split for refineries in Western Europe: inland shipping holds a large share of the transport market for refineries in the Rhine region, in contrast to the small share of refinery business in other regions.

9.5 Future prospects

a) Short-term

• Double-hull ships represented about an estimated 60 % of the Western European tanker fleet by the end of 2010.

• Conversion of the fleet to double-wall vessels is taking place amidst costly investments in new vessels. The single-hull ships will operate within the same market until the end of 2018, which, given a more or less constant level of demand, will necessarily result in the accumulation of additional structural overcapacities in coming years.

• The consequences of this imbalance could be a reduced utilisation of vessel capacities as well as downward pressure on freight rates.

b) Long-term

• Refinery production output in Western Europe more or less stagnated between 2001 and 2006 and has since decreased. A parallel development can be recognised to a certain extent, particularly within the past three years, when comparing production levels to the volume of mineral oil products transported on the Rhine.

• Given an unchanging modal split, the expected drop in refinery capacities in Europe will lead to a continued decrease in transports of mineral oil products in Western Europe.
• The chemicals segment as well as the transport of alternative fuels, such as biodiesel and ethanol, will be the growth markets for tanker shipping. For their logistics needs, biorefineries can be seen to noticeably favour inland shipping; this fact can be recognised for a large number of biorefineries situated in Germany (at the ports of Emden on the Ems, Würzburg on the Main and Straubing on the Danube).