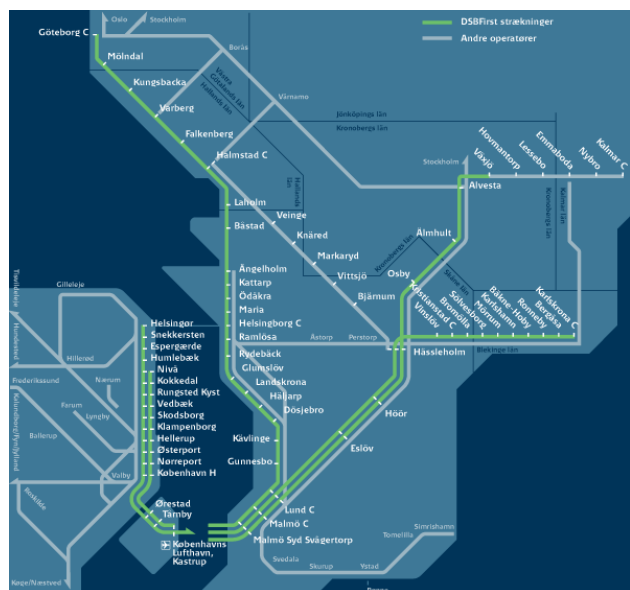


# Trafikstyrelsen Denmark

## Report Second Opinion Punctuality



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## Management summary

Some month ago a task force was set up with the target to ensure stable punctuality experienced by the passengers in the Oresund traffic and on "Kystbanen" on at least 90% of the cases. The participants of the taskforce are the executive managers of Banedanmark, DSB, DSBFirst and Trafikstyrelsen. The task force is chaired by Mr Carsten Falk Hansen from Trafikstyrelsen.

On the 27<sup>th</sup> January ECG AG got the mandate from Trafikstyrelsen to prepare a Second Opinion with the task to analyse the overall situation of delays in the Oresund traffic – including the interaction between each party – with the aim to point out where an improvement effort with a high leverage effect could take place.

Punctuality has been decreasing for months and remains quite far away from the target. At present punctuality is around 80%; 10 percentage points below the target. For sure, the bad weather conditions with lots of snow and low temperatures have contributed to that result. However this trend can also be an indication, that the measures taken so far are not the right ones or don't show the expected improvement. In that respect there are a lot of major issues to be checked, which have a high impact to punctuality.

In the following, we highlight six major areas with big potential for punctuality improvement.

1. The actual time table is based on frame conditions which were the basis for the tender for Kystbanen and Oresund traffic. Since then no major adaptations were made. The time table itself is not robust enough to absorb the inadequacy of infrastructure facilities, time consuming processes in stations and high numbers of disturbances of infrastructure and rolling stock that appear in daily rail traffic operation.  
The implementation of the **new time table concept** will lead to a higher robustness and in consequence to higher punctuality. In addition, **drivers, train managers, platform managers and dispatchers** shall be **trained to save every second**, not minutes, in the operational processes.
2. The technical systems of the infrastructure and rolling stock cause -at present- too many disturbances. The **failures and disturbances** of signalling equipment, on board train control systems, doors, information systems and systems to couple trains are considered to be far too high. Delayed or cancelled trains, trains running in shorter formations than planned or increased passenger rotation times at stations are the bad consequences. DSBFirst as well as Banedanmark shall **investigate the real root causes** of these failures. For that purpose the in-depth analysis of the systems, subsystems and components has to be intensified combined with pattern recognition to find out problem zones with frequent failures. Then the **right measures** have to be defined with an **estimation of the expected impact** on punctuality. To control the implementation and to monitor the impact a **more effective project management** needs to be established.
3. To reduce the big impact of long intervention and repair times on the **Oresund construction** the **repair and maintenance work of the Danish systems** of the **construction shall be subcontracted** from Banverket /Infranord **to Banedanmark**.

4. According to our observations the four stakeholders (Trafikstyrelsen, Banedanmark, DSBFirst and DSB) are not enough aware of the leadership of the taskforce. We consider this as a sign that the taskforce may need to be strengthened furthermore.  
A dedicated full time project manager for the huge, complex and very important improvement tasks does not exist. In order to manage and to control the large package of required actions and to **define and implement unified and effective processes and reports** an overall accepted **full time project manager** with excellent social skills combined with leadership competence may be appointed by Trafikstyrelsen. This project manager shall put into place all punctuality related actions and shall be backed up by a dedicated project manager from each stakeholder.  
A **strong leadership from the taskforce** chaired by Trafikstyrelsen is vital for accelerating the improvement process.  
The implementation of a strong project organisation with adequate well designed and effective processes needs time. Therefore the **task force** should not end in May 2010. The mandate is to **extend at least to May 2011**.
  
5. In the involved companies and their units a lot of KPI's are defined, recorded and monitored. Some of them are fixed in the contracts of the involved companies. One of the present key KPI is the number of delayed trains. But it does not reflect the delays of passengers. We propose to **define two new KPI's**:
  - "delay minutes of trains"
  - "delay minutes of trains multiplied by the number of passengers"This two KPI's guarantee that the focus of the work is put on the issues which contribute most to the delays of the passengers.  
According to our observations it is not ensured that the targets of Banedanmark, DSBFirst and the other stakeholders contribute enough to the expected punctuality level of 90%. We propose to **start a process to define and to harmonize all KPI's and to work out a target tree** to ensure the right contribution of every manager and employee involved in that program. We are well aware that in consequence the contracts may have to be adapted afterwards.
  
6. In the contracts between DSBFirst and Trafikstyrelsen and between DSBFirst and Skanetrafikken we found out that the incentives lead to a different operational behaviour in the two countries Denmark and Sweden. This is not necessarily supporting the punctuality initiative. With the assistance of the Danish Ministry a process is to be established in order to **harmonize the targets and incentives in the contracts of DSBFirst with Trafikstyrelsen and Skanetrafikken**.  
In a meeting with Banverket we were told that Swedish rail traffic punctuality is unsatisfying as well. Banverket is highly interested in a better co-operation with the Danish partners. Finally the punctuality of the DSBFirst trains is related to both sides and the number of train kilometres in Sweden is even higher than in Denmark. **We propose to reactivate the already existing working group Pöls and to establish an open minded co-operation with regular meetings**. This working group shall be chaired by the appointed punctuality project manager.  
Considering all those challenges we propose to **motivate Banverket, Banedanmark and DSBFirst to harmonize the processes and KPI's** which are related to the punctuality program of DSBFirst.

We are convinced that the **punctuality target can be achieved**. According to our judgement and with our vast experiences from the punctuality program at SBB, not only a few measures are necessary to improve punctuality, but a larger package of measures will be required. It will take about one year to establish a project of this level of complexity and to demonstrate a continuous improvement of railway traffic punctuality.

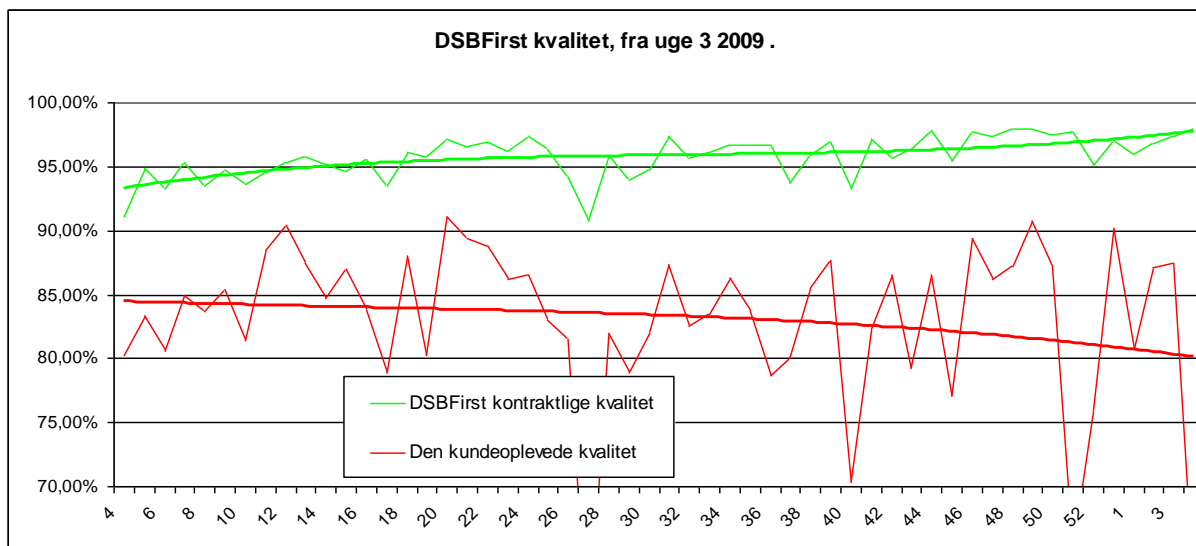
The work was done within a short period. All the interviewed persons from the different companies were very open minded and handed over all the information and documents for our analysis work. However it was sometimes difficult to find the relevant information among the big amount of data we received.

We would like to thank everyone who gave us the necessary assistance to perform this work.

## 1. Punctuality of the Oresund traffic

The red line in the graph below shows the punctuality of all DSBFirst trains running from Helsingør to Kastrup (Oresund traffic and Kystbanen). According to the Danish definition a train with a delay of more than 4:59 minutes is considered as unpunctual. The green line shows the contractually driven punctuality of DSBFirst trains when considering only the delays caused by DSBFirst itself.

Within the recorded period January 2009 until January 2010 the trains of DSBFirst were by definition only punctual during four weeks. The punctuality experienced by the passengers decreases continuously in the considered period. The special weather conditions during the last two months with a lot of snow and low temperatures have of course contributed to the unsatisfying result in December and January. However this trend can also be an indication, that the measures taken are not the right ones or don't show the expected effect.



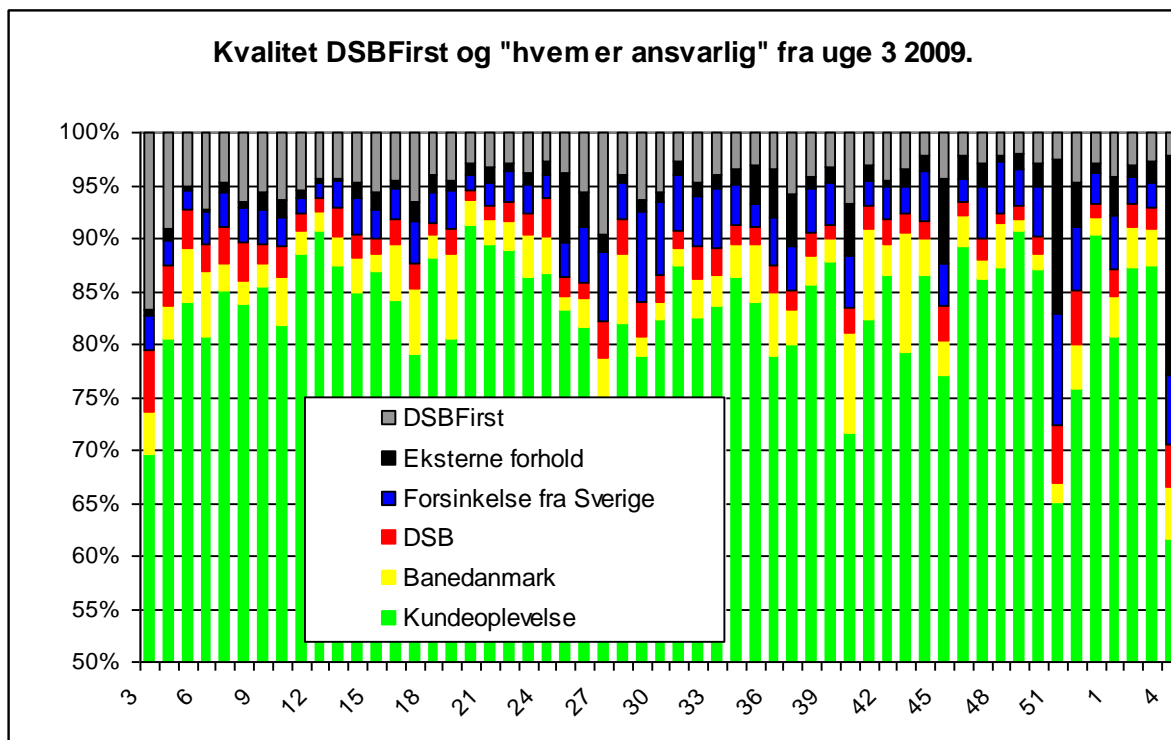
In the main station of Copenhagen end a lot of different lines from other parts of the country. Despite the growing traffic the tracks in this area are not yet adapted. When the regional and intercity trains are late then they influence also the traffic of DSBFirst. The punctuality on other lines varies a lot, but cannot be considered better as the table below indicates. The goal set for DSBFirst trains of 90% punctuality has been achieved only in January last year on the line Ringsted – Korsør. The punctuality value was down to 29.8% on Sydbanen line.

Regularitet 2009 på udvalgte strækninger								
Baseret på ikke-låste data.								
Måned	Øresund	Kystbanen	Sydbanen	Nordvestbanen	København-Roskilde	Roskilde-Ringsted	Ringsted-Korsør	
Januar	80.1%	82.1%	88.1%	85.8%	86.8%	88.2%	90.6%	
Februar	81.7%	80.8%	79.1%	83.5%	84.2%	82.7%	88.4%	
Marts	81.8%	82.6%	75.0%	86.7%	85.6%	83.3%	88.5%	
April	80.3%	77.8%	34.5%	88.5%	69.4%	61.6%	78.7%	
Maj	82.7%	63.7%	35.5%	85.8%	67.2%	56.7%	76.5%	
Juni	80.4%	69.3%	29.8%	85.6%	65.4%	54.1%	72.7%	
Juli	74.0%	78.2%	45.6%	85.1%	74.0%	68.3%	72.2%	
August	83.2%	83.1%	39.2%	86.5%	73.1%	64.8%	78.5%	
September	83.0%	83.1%	65.7%	78.7%	75.5%	73.2%	81.2%	
Oktober	80.9%	76.3%	62.6%	68.7%	76.9%	73.4%	78.7%	
November	83.5%	85.0%	67.9%	79.9%	79.1%	77.0%	83.4%	
December	77.6%	81.6%	74.8%	84.3%	77.8%	76.8%	77.9%	

As already mentioned a lot of trains are running from the regions to the main station Copenhagen and some of them run further to the north to Osterport or to Malmö. The following table shows that trains from different operators are influencing each other. Due to the fact that most of the trains in the Copenhagen area are operated by DSB and DSBFirst it is understandable that trains from these companies are influencing each other to an important level. For example the trains from DSB have affected 4125 DSBFirst trains in the year 2009. In the average of the year 2009 about 14 trains of other operators have influenced DSBFirst trains per day. In our opinion this impact from other trains on DSBFirst trains has to be reduced.

	Har påvirket								average per day
	2009	Arriva	DSB	DSBFirst	Railion	SJ	Andre	Sum	
Er blevet påvirket	Arriva		533	3	8	0	4	548	2
	DSB	294		1323	1316	111	311	3355	9
	DSBFirst	1	4125		363	373	54	4916	14
	Railion	2	457	76		10	85	630	2
	SJ	0	239	222	40		1	502	1

The causes of the disturbances are diverse. For some of them Banedanmark, DSB and DSBFirst are responsible. In some weeks a lot of disturbances stem from external causes e.g. weather conditions or other operators. Some of the disturbances have their cause in Sweden and are recorded and shown as "Delay from Sweden".



## Comments

Punctuality is not only below the target on the lines within the present scope of work of the taskforce but also on other lines in the same area. Due to the dense traffic in the narrow area of Copenhagen Central, trains are influencing each other and due to the unpunctuality of trains other trains are affected. Most of the incidents are caused by Banedanmark, DSB and DSBFirst, and a significant part has their cause in Sweden (approx. 10% punctuality reduction). "Delays from Sweden" cannot be investigated in-depth because there is no regular and organised information flow established between the Danish and the Swedish stakeholders.

## Recommendations

It is correct to focus the scope of work of the taskforce on the DSBFirst traffic, but the other lines influencing the traffic of DSBFirst shall also be fully taken into account. The punctuality target of 90% should be harmonised and become valid for all lines in Denmark contributing to train interferences.

- To improve the punctuality, a large package of (different and sometimes small) measures will be necessary and therefore the work of the taskforce may not be finished by end of May 2010.
- We consider the definition of the continuous improvement processes and its supporting organisation as two of the main tasks of the punctuality taskforce, since we consider punctuality control and improvement as an ongoing and never ending operational task. The overall operational organisation between the stakeholders that contribute to punctuality of DSBFirst trains should be adapted to the approach of a continuous improvement process.



## 2. Key factors contributing to an unsatisfying punctuality

A package of different causes of delay leads to an insufficient punctuality on Kystbanen and in the Oresund traffic.

- time table design (buffer times, passenger rotating times, train turnaround times)
- departure process
- passenger information (announcement of the stopping sector, location of the coaches for the different classes)
- Passenger rotation times (number of doors of the train sets, door control disturbances or failures, less train sets than planned, platform dimensions, platform access, passenger information system, train types on shared platforms)
- construction work at Malmö station
- infrastructure disturbances (signalling systems, catenary, telecommunications, command and control systems)
- disturbances and failure of rolling stock
- insufficient track quality (long lasting temporary speed restrictions)
- delays imported from Sweden

Some of the key factors are described in this chapter, furthermore in the following chapters.

### 2.1. Time table

#### 2.1.1 Trip times

The trip times between the stations can be met. Within the planned trip times there are time buffers, which are of common values used by other railways as well. But these time buffers are consumed by too short stopping times in the stations. As a consequence there is no spare time left for compensating delays, which would be necessary in order to stabilise the traffic according to the time table in case of disturbances.

#### 2.1.2 Stopping times and passenger information

In the Oresund traffic and on Kystbanen there are default stopping times of 30 seconds. Additionally a technical reaction time of 10 seconds is foreseen.

Exceptions with longer stopping times:

- Copenhagen Central (2 minutes for Oresund trains / 3 minutes for trains of Niva-System)
- Nørreport (1 minute for trains of Niva-System only)
- Osterport (1 minute for Oresund trains only)
- Copenhagen Airport (1 minute for all trains)
- Svagertorp (1 minute for all trains)

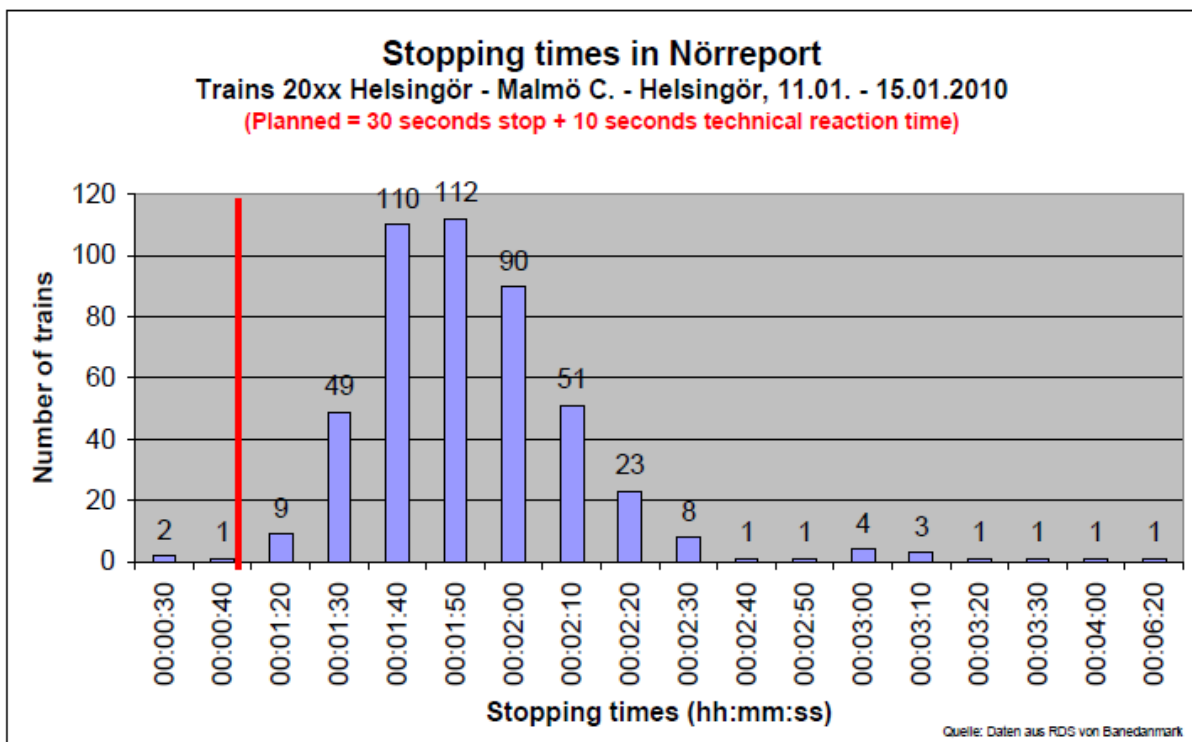
The stopping times have been fixed from Trafikstyrelsen for the tender of Kystbanen and Oresund traffic.

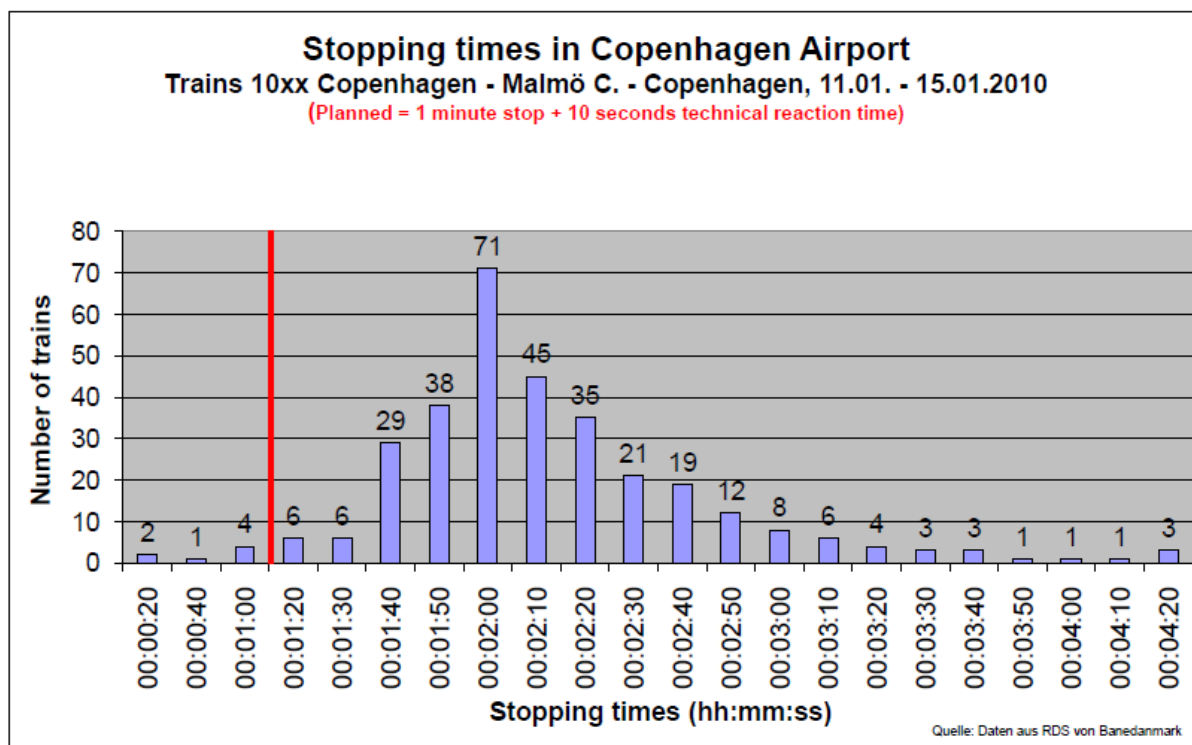
The stopping times are very demanding. Based on our observations of passenger rotation times and departure processes, we consider them as insufficient. They are exceeded most of the times by more than 100%, also in small stations. The reason for this is mainly the departure process itself (see 2.2.), not enough doors on the coaches and door failures or disturbances.

Further we recognised that the passengers often wait in the wrong sections of the platform, due to missing real time customer information displays for:

- the train sector (only existing in Copenhagen Airport, the reference „short train“ is insufficient)
- location of the 1<sup>st</sup> and 2<sup>nd</sup> class coaches (only for long distance trains there is a coach indication)
- only partial information about trains with reduced train sets ( the indication „short train“ is insufficient)

The graphic tables below indicate the distribution of different stopping times in Nörreport and Copenhagen Airport:





## Recommendations

- an extension of the stopping times in Copenhagen to 2 minutes and in Nørreport und Osterport to 1 minute for all trains is required
- The position of the 1<sup>st</sup> and 2<sup>nd</sup> class coaches has to be shown on the departure displays

### 2.1.3 Turnaround times

Station	Turnaround time
Helsingör	24 or 31 minutes; during peak times 7 or 11 minutes
Niva	10 minutes
Copenhagen Airport	25 minutes
Malmö	10 minutes

The turnaround time of 7 minutes during the peak time in Helsingör is too short (see 6.2.2). The other turnaround times are sufficient; delays of arriving trains can at least partially be compensated.

### Recommendation

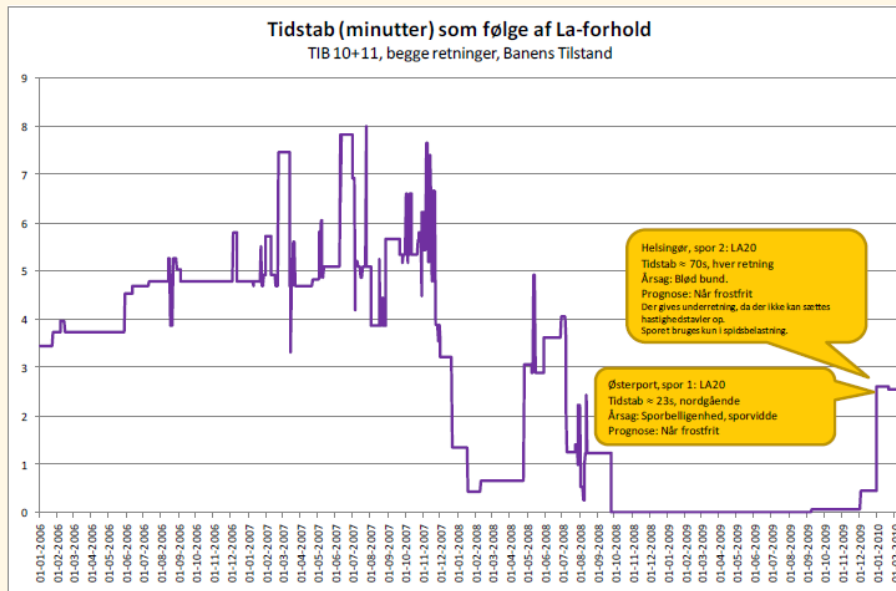
- Increase the present turnaround time of only 7 minutes in Helsingör

### 2.1.4 Temporary speed restrictions

In the year 2009 trains on the Kystbanen have not been hindered by zones with speed reduction. However in the years before, significant speed reductions occurred during several months as the graph below indicates:

## Udvikling i La-forhold, Kystbanen

2006-d.d.



banedanmark



It must be expected that in the coming months and years track sections with speed restrictions will pop up again. The currently available spare time in the timetable does not allow compensating the resulting travel time increases. A decrease in punctuality might be the consequence.

### Recommendations

- Foresee an amount of spare time in the timetable August 2010 in view of working sites
- Stagger in time the working sites in such a way that the planned buffer time is not over passed.

### 2.2. Passenger rotation and departure process

After the stop of a train it takes 3-5 seconds (sometimes longer) until the doors are opened. As the push button for door opening is enabled only after the train has come to a stop (an earlier request is not stored), the total time needed for door opening is fully dependant on the passenger reaction.

Most commonly the coaches have only one door (see picture below). Passengers have normally to queue a long time in the peak hour for getting on and out. With more and wider doors the passenger rotation could be much faster. Huge delays are arising when a door has a failure (which is happening daily).



The departure process is very time consuming:

- Requests for door closing by the train-manager
- Door closing (except the one for the train manager)
- Train observation by the train-manager
- Departure sign and closing of the train manager's door.

The typical time span for these process steps is around 18 to 24 seconds. Sometimes significantly higher values were measured, as the train-manager accepts passengers to enter at the remaining open door. We could observe this fact quite often at Copenhagen Airport.

### **Conclusion**

Most of the scheduled time span in the train station (30+10 seconds) is consumed for door opening and closing process. For the passenger rotation itself the buffer time of the timetable must be used.

### **Recommendations**

- Replace the today's departure process with self-dispatching of the train driver (already quite common in some countries in Europe as well at SBB). To our knowledge this process is already established on S-Banen of Copenhagen.
- Immediate measure: staff training for acceleration of the existing departure process.
- Exchange of existing clocks with clocks having second hands in order to increase accuracy
- When new rolling stock is specified and purchased then major attention shall be paid to passenger fluid dynamics (door numbers and door seize, door platform seize).

## **2.3 Insufficient infrastructure facilities**

Following facilities do not comply with the needs of a modern train operation:

- Helsingör (see chapter 6)
- Helgoland (for shunting movements of train sets between workshop and preparation area, one of the main tracks has to be used and crossed)
- Nørreport (platform too narrow, passengers hinder themselves)
- Copenhagen Central (a lot of shunting manoeuvres have to cross different main tracks)

### **Recommendation**

We recommend the review and adaptation of the facilities in Helsingör, Helgoland and Nørreport in order to meet the needs of today's dense traffic operation.

## **2.4 Delays caused by Banedanmark's infrastructure or DSBFirst's trains**

The partition of the incidents in the year 2009, which are influencing the DSBFirst trains, looks like the following:

- Banedanmark: 38,6%
- DSBFirst 23,6%
- External influences: 37,8%

In the following sections the partition of Banedanmark and DSBFirst are analysed in a more detailed manner. Because the external reasons were not in our focus further investigations would be needed in order to analyse this big partition.

### 2.4.1 Delays caused by Banedanmark's infrastructure

For the reporting of incidents the infrastructure installation of Banedanmark is subdivided into 6 groups: environment (Danish: "Forst"), train control systems, track, power, Oresund and externals.

In 2007 and 2008 only delays of more than 5:59 have been recorded. In 2009 the scope has been enlarged and delays of more than 4:59 have been recorded and reported.

In 2009 there are three major groups of events causing delays:

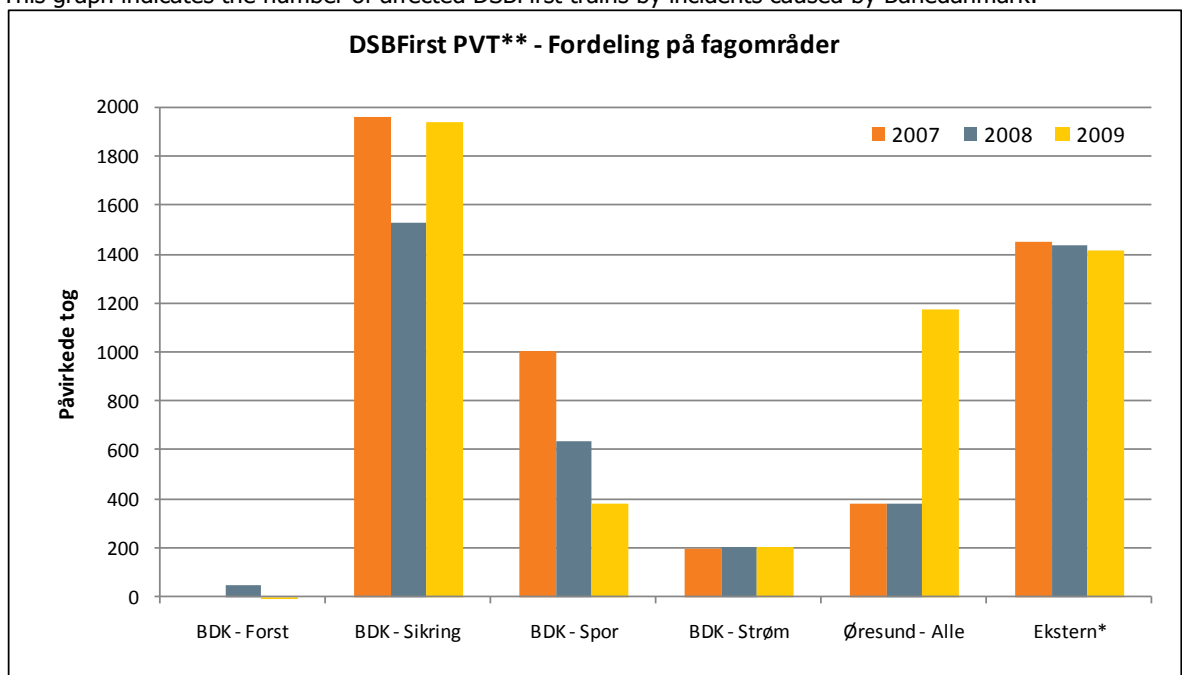
- train control systems
- Oresund
- External events

It has to be mentioned that all affected trains (primary and secondary delayed trains) have been recorded and shown in the graph. About 5200 DSBFirst trains were delayed more than 4:59 minutes last year caused by incidents of Banedanmark, that means in average about 14.5 trains per day all year. In our opinion this KPI value is far too high.

Within Banedanmark a lot of experts are working on analysing and reporting reasons of delays but whether the experts really have found out the root causes and whether the right measures have been taken remains unclear to us.

It is difficult to say, what the right value of the maximum delayed trains is, that the overall punctuality target of 90% can be reached. Also this needs to be investigated because no brake down structure of the targets for every stakeholder exists.

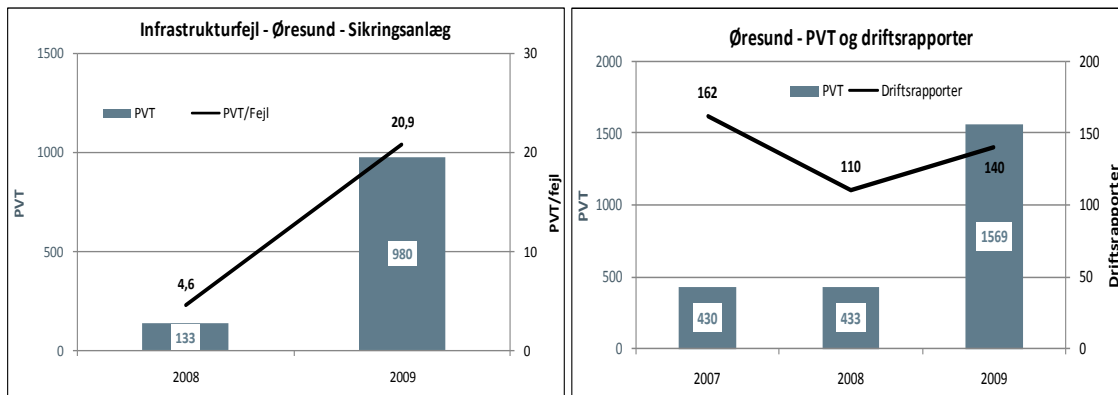
This graph indicates the number of affected DSBFirst trains by incidents caused by Banedanmark:



\*„Ekstern“ contents affected trains by wet foliage and material filings

The big increase of the delayed trains caused by Oresund infrastructure (graph below) is eye catching. Banedanmark has reported that most of the problems are caused by train control systems including interlockings. Due to the dense traffic on Oresund it is not surprising that a much bigger number of trains were affected by one incident, an increase from 4.6 trains in

2008 to 20.9 trains in 2009. The number of incidents (Driftsrapporter) is increasing from 110 to 140 as well. This situation requires major improvement actions.



The Oresund construction consists of a tunnel and a bridge and belongs to the company Oresundsbro Consortium which is owned by both states Denmark and Sweden. On the Swedish side of the Oresund construction Swedish train control systems are installed which are connected to the Swedish interlockings and on the Danish side Danish train control systems which are connected to the remote control centre in Copenhagen. The maintenance and repair work for the whole signalling systems belonging to the Oresund construction were awarded from Oresundsbro Consortium to Banverket. Some weeks ago the maintenance division called Infranord was split off from Banverket. When a problem occurs with a train control system on the Danish side, the dispatcher in the remote control centre of Copenhagen calls an expert from Infranord to fix it. The time between the call and arriving at the failure location takes on average about 75 minutes in the peak time and another 120 minutes to repair the system. We assume that a lack of know-how is the reason for that long repair time.

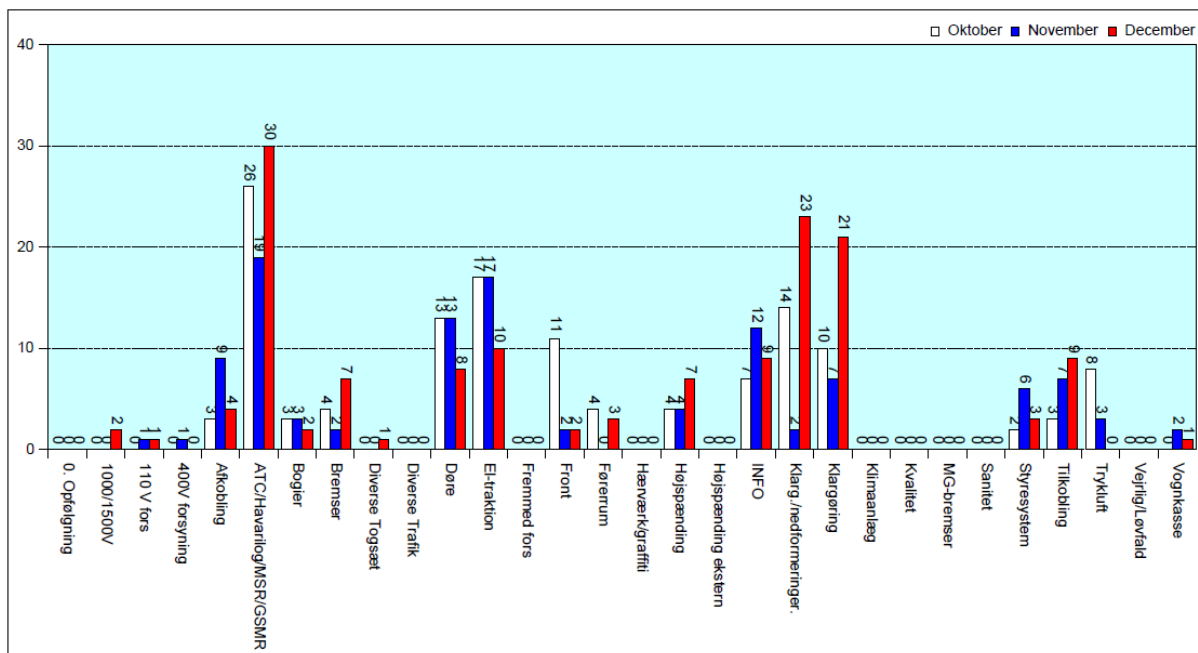
### Recommendations

- make an investigation on the measures taken by Banedanmark whether these contribute as expected to the improvement of the punctuality and whether the root causes were found out
- assess the target of Banedanmark in order to ensure that the contribution is high enough in order to achieve the overall punctuality target of 90%
- The responsibility of maintenance and repair work of the train control systems on the Danish side of the Oresund construction has to be taken over by Banedanmark immediately.

### 2.4.2 Delays caused by DSBFirst trains

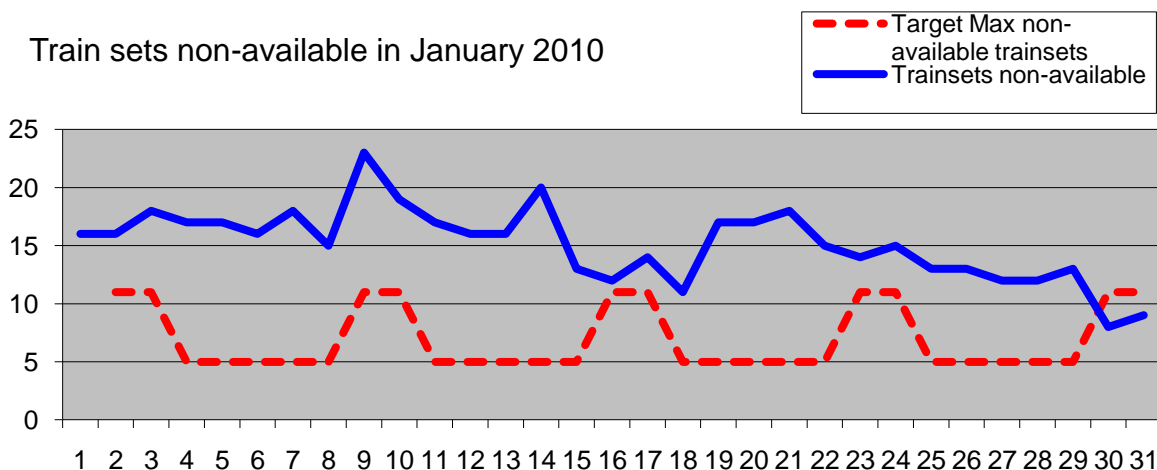
The part of the delays caused by DSBFirst trains has been split up into 30 train subsystems. As major problem zones the ATC-System, doors, traction, information system and coupling and decoupling system are to be considered.

The management of information about disturbances and repair work is well organized in the workshop at Helgoland. The work flow is computer based using SAP and a special software tool from DSB is used. A direct link to the system of Banedanmark also exists.



Due to the big number of disturbances more train sets than expected are in the workshop at Helgoland, sometimes more than 20. For a normal operation according to the time table only 5 train sets are allowed to be out of service on working days. In consequence a lot of trains run with less sets than planned, even in the peak hour. Therefore more time is needed in the stations for passenger rotation. DSBFirst will get from Trafikstyrelsen ten more new trains until June 2010 sets that will help to reduce the problem.

Train sets non-available in January 2010



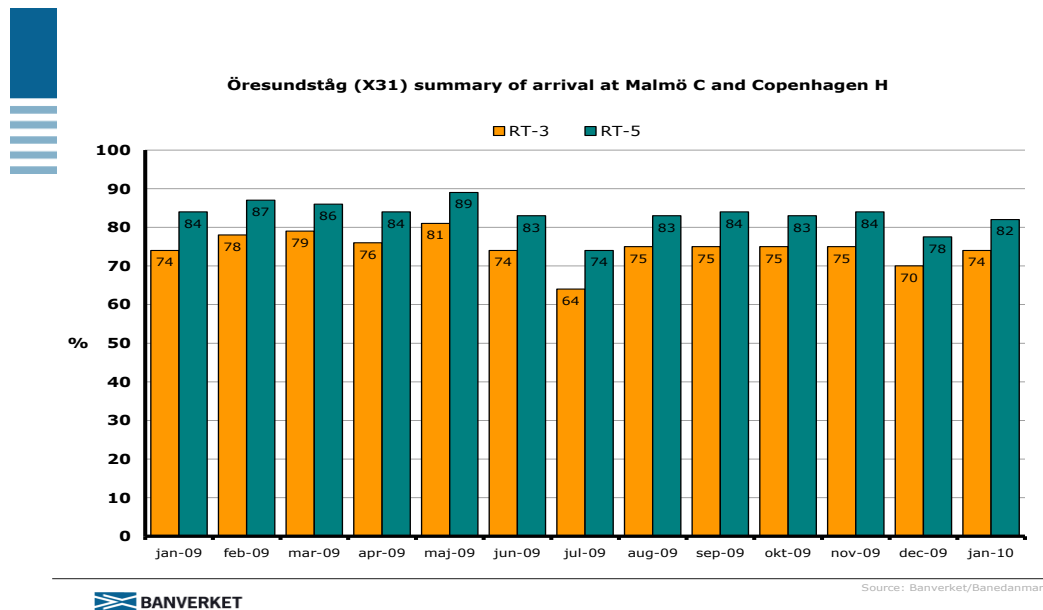
### Recommendations

- assess the maintenance process of the train sets in order to improve the reliability and availability of the trains
- assess the measures taken by DSBFirst whether these contribute as expected to the improvement of the punctuality and whether the root causes were found out
- assess the target of DSBFirst in order to ensure that the contribution is high enough in order to achieve the overall punctuality target of 90%



## 2.5 Delays from Sweden

The delays on the Oresund Bridge are in both directions too high and hinder a high punctuality. Only punctuality between 74% and 89% per month could be reached in the past (RT-5). The infrastructure companies, Banedanmark and Banverket do not know from each other what the root causes were for the delays. DSBFirst as well Banedanmark are aware of the not well established and direct contacts with Banverket.



One of the problems on the Swedish side is the construction of the new central station at Malmö. During the construction phase only 6 out of 12 platform tracks are available and for the incoming and outgoing trains is only a single line of a length of 1.5 km available. This line section is located close to the station. Despite of all these restrictions around Malmö train station, the traffic was only reduced by about 10%. Banverket is convinced that the situation can be handled. However this is obviously only the case when trains are running without any delays. If delays occur the situation turns very fast in a difficult situation with cancellation of trains and even higher delays what we could experience ourselves.

In order to minimize the risk of transfer of delays from Oresund to Kystbanen DSBFirst has decided together with Trafikstyrelsen to place a standby train set at Copenhagen Central, which can be activated by the dispatcher in the operation centre of Banedanmark when a train from Sweden is more than 7 minutes late.

To improve the co-operation between the Swedish and the Danish side, Banedanmark and Banverket took the initiative to reactivate the working group Pöls which exists already since the opening of the Oresund Bridge but after some initial meetings no further meetings took place anymore.

In a meeting with Banverket in Malmö we were told that also in the Swedish rail network punctuality is not satisfying. Banverket has a high interest to improve punctuality together with Banedanmark and DSBFirst and would like to reactivate the earlier good contacts.

### Comment

Today Malmö C. is a terminal station. The situation on Oresund traffic will completely change when the new station Malmö Central will be finished in December this year and the trains

can run through the new station. Of course the time table has to be adjusted to the new situation.

The three DSBFirst lines in southern Sweden are between 200 and 400 km long. A lot of track sections in this part of Sweden are single lines with a high impact on punctuality in case of incidents.

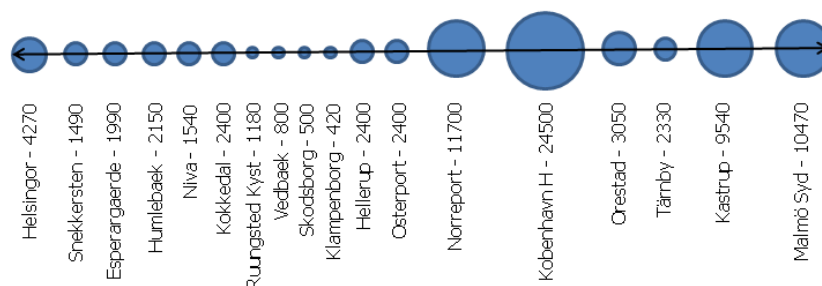
### Recommendations

- The co-operation on operational level between Banverket, Banedanmark and DSBFirst and the other Stakeholders shall be reactivated and structured.
- Clearly defined and measurable objectives shall be set and committed among the parties. It is important that the different reporting parameters and the measures of improvement will be unified and streamlined in order to ensure same understanding of the challenges and results of improvement actions.
- The strong support from Trafikstyrelsen and also from the managers of this process is needed in order to speed up the continuous improvements.

### 3. Assessment of the overall structure of the DSBFirst traffic and protection of the services on "Kystbanen" against delays from Sweden

The concept of the time table 2010 of DSBFirst traffic is the same as it was for the call for tender for these services. Despite some well known disadvantages the time table has not been changed till today. Due to the decreasing punctuality a new time table concept was developed by DSBFirst, DSB and Banedanmark. Now the task force is discussing whether this concept should be worked out and go in operation in August 2010. According to information given by DSB passengers and communities are in favour of the new concept.

Amount of passengers per day

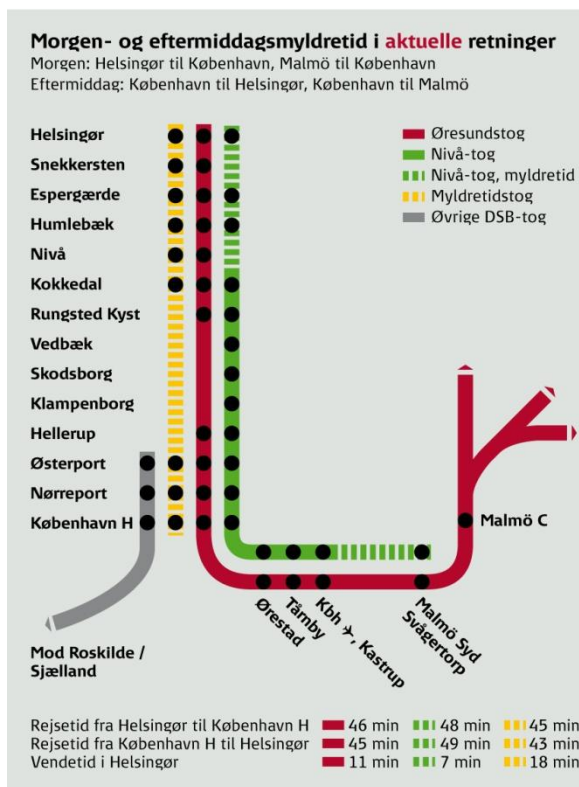


In the graph below the present (left side) and the new (right side) time table are described. Each coloured line signifies a 20 minute service. Solid lines signify all day service and dotted lines peak hour service.

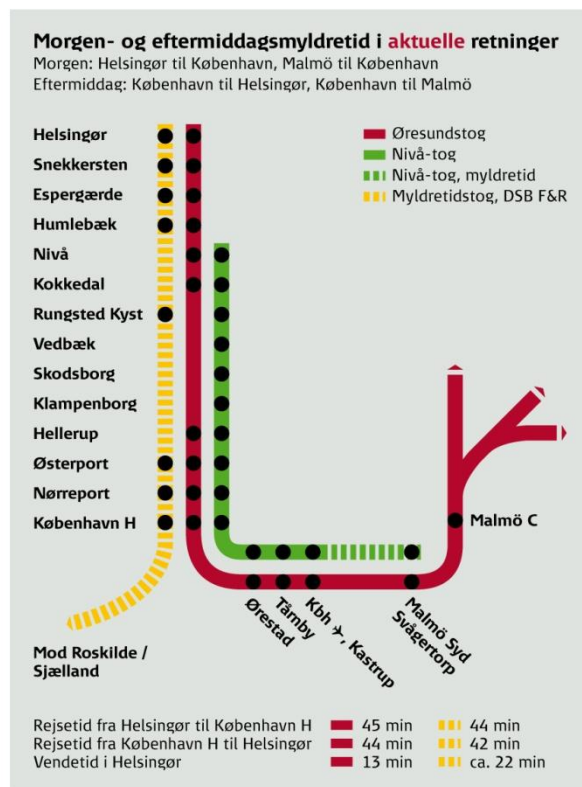
Overall, the new timetable fits better to the number of seats required on the different sections of the service: too many seats north of Niva and not enough between Kastrup and Malmö. The comparison of the passenger frequency per station shown in the graph above and the number of trains in the concerning sections shows this very clearly.

The number of trains in the critical sections (Helsingör station and between Copenhagen Central and Osterport) can be reduced by three trains by extension of the trains coming from the western part of Denmark to Helsingör (marked as gray line on the left side in the graph below). In the new concept the trains from the gray and the yellow line can be merged together to the new yellow line.

### Nuværende mønster på Kystbanen (K09 / 2009)



### Forslag til nyt mønster på Kystbanen (Best practice)



By eliminating one stop in the red line (e.g. at Rungsted) the robustness can be increased by gaining 2 minutes in each direction. This gain can be used to extend the stopping time in Copenhagen Central and Kastrup.

Additionally it will be an advantage to reduce the number of passengers in the crowded Oresund system (red line) and to increase it in the emptier Niva-system (green line). The customer satisfaction will increase due to less crowded trains and increased punctuality.

By reducing the number of trains in Helsingør in the peak time from 9 to 6, a standby train can be placed there all day, and by keeping the Niva-system in Niva all day long, an additional standby train can be placed there all day.

Lastly the standby train can be removed to Kastrup from its today place at Copenhagen.

With this new time table concept a higher punctuality can be expected, and when everything runs well, the possibility exists to eliminate one or two of the standby trains.

According to the new concept the turnaround time at Helsingør, Kastrup and Niva is expected to be about 30 minutes.

The extension of the Niva-system to Malmö South concerns only 3 trains in the morning and 3 in the afternoon.

The situation between Kastrup and Malmö will change from December 2010 on due to the opening of the new station in Malmö. Malmö Central is at present a terminal station and from December on trains can run through in a tunnel.

The new concept has been discussed in a Taskforce meeting and to our knowledge all participants are in favour to continue the work based on the presented concept.

## Comments

The present time table 2010 obviously has some disadvantages which have been mentioned above. Because it was the basis of the call for tender for the traffic awarded to DSBFirst Trafikstyrelsen was afraid to change anything until today due to the risk of juridical claims issued by the loosing companies. According to updated information (13.3.2010) of the lawyers the risk is considered as manageable taking into account certain conditions. It is expected that the robustness of the timetable can be improved and punctuality as well. That effect shall be forecasted and the expected results monitored by the taskforce. Taking the time table "August 2010" as a basis a big chance exists to develop an even more robust time table for the year 2011 taking into account the new station of Malmö.

## Recommendations

- The work based on the presented new concept is to be continued and Banedanmark should develop a detailed time table including simulations with the tool Railsys. After assessment and optimization of the time table it shall be put into operation in August 2010 if no major risks occur.
- A strong co-operation and partnership between Banedanmark, Banverket, DSBFirst and DSB is to be established in order to develop the time table for December 2010 when the new Malmö station will be opened.

## 4. Objectives of punctuality for all players in the Oresund traffic

The objective of punctuality in the Oresund traffic can only be reached if each of the involved stakeholders (Banedanmark, DSB, DSBFirst, SJ, DB Schenker etc.) is willing to provide his part of the necessary contributions.

### 4.1 Proposal for a target system

The overall target is attributed by means of five categories of targets to the different companies and within each company to the different areas of activities:

Target category	Indicator
Punctuality for clients (Punctuality of trains multiplied by number of affected passengers)	Punctuality for clients in % Maximal delay minutes multiplied by number of affected passengers
Quality of product	Punctuality of trains in %
Quality of product	Delay minutes of trains
Quality of production	Maximal number of disturbances per million of route kilometres
Quality of product	Number of disturbances caused by a system

The responsibility for reaching the targets can be clearly attributed and the degree of fulfilment of the goals can be measured at each level.

One representative example is the target system of SBB (see annex 1 to this report). This transparent and integrated system has the advantage that all participating bodies are acting towards the same overall target and are qualified accordingly. In this way a competition between different incentive schemes can be avoided and the common overall target remains always clear.

## 4.2 Initiation of target system

Prior to the initiation of such a target system, certain adaptations regarding the reporting of the delays and the irregularities are necessary:

- For all disturbances the number of delay minutes (primary and secondary delays) must be reported. Currently, mostly only the number of events is monitored what does not give a clear picture about the consequences.
- The minutes of secondary delays (sum of delays from all trains concerned by an incident), must be attributed to the player which has caused the incident and not – as it is current practice – uniquely to Banedanmark.

The initiation of such a target system requires a preparatory period of about 1 year.

### Recommendation

- An integrated and harmonised target system covering all levels in the hierarchy has to be introduced systematically. This will lead to a systematic and sustainable improvement of the punctuality.

## 5. Assessment of the time table and the number of trains on the line section Kastrup - Copenhagen C. –Osterport

Neither for the time table 2009 nor for the time table 2010 has the train traffic between Malmö C. and Helsingör been simulated.

However Banedanmark has simulated the node Copenhagen with the lines Copenhagen Airport – Copenhagen C., Copenhagen C. – Osterport and Copenhagen C. – Hoje Taastrup by means of the System Railsys in view of the time table 2010.

This study has shown that for the lines Copenhagen Airport – Copenhagen C. and Copenhagen C. – Osterport minimal intervals between the trains of 4 respectively 3 minutes are feasible.

A pre-condition is that the trains are not hindered in Copenhagen C. or Osterport by shunting movements.

Currently, the following maximal number of trains is circulating:

- Line Copenhagen Airport – Copenhagen C.: 10-12 trains per hour in each direction. According to the simulation 15 trains are possible.
- Copenhagen C. – Osterport: 14-16 trains per hour in each direction (value in peak hour 18 trains per hour). According to the simulation 20 trains are possible.

Hence, the capacities determined by the simulation are not over passed. However, with more shunting movements or more delays than expected and simulated, the capacity will decrease and punctuality as well.

In view of a stabilisation of the time table from August 2010 onwards, we support the proposal to circulate during the peak hour not anymore separate trains between Roskilde und Osterport as well as between Copenhagen C. and Helsingör (see chapter 3), but through running trains between Roskilde and Helsingör. This will allow to alleviate at least partially the bottleneck between Copenhagen C. and Osterport.

For the timetable 2010, the slot for the Niva-trains has been adapted in such a way that between Copenhagen Airport und Copenhagen C. a 12/8-minute interval has replaced the

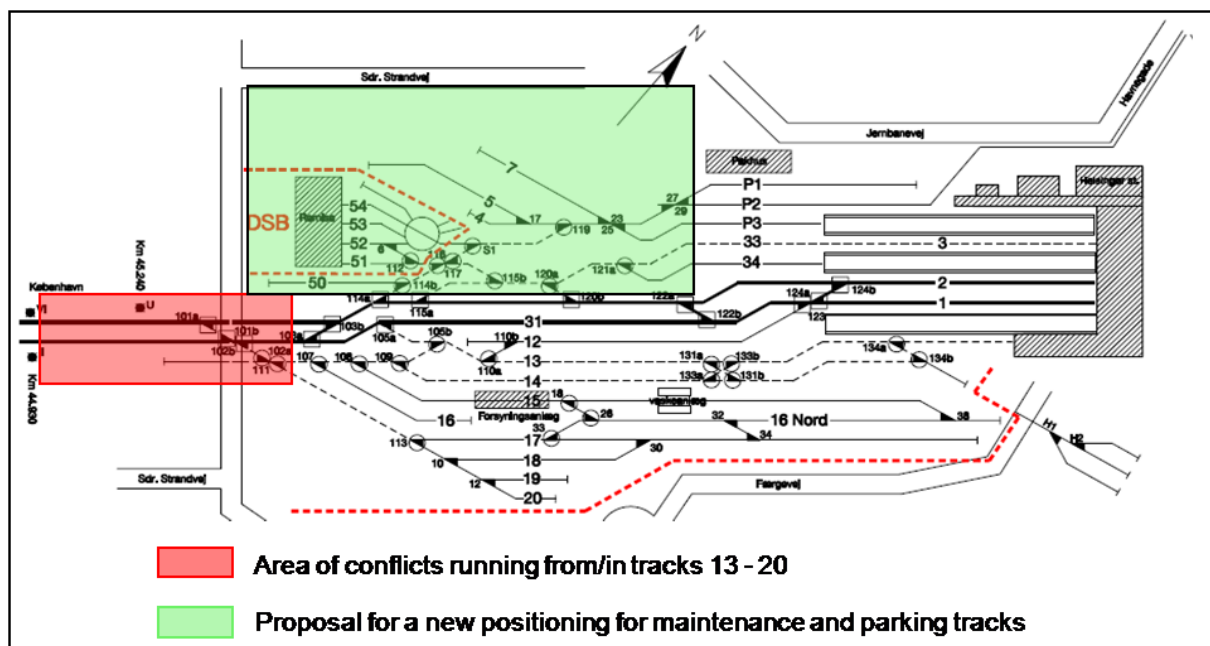
former 10/10-minute interval. In this way, the window for the freight train has been enlarged what proves to be beneficial.

## Recommendations

see chapter 3

## 6. Evaluation of operation in Helsingör

### 6.1 Track layout



The terminal station at Helsingör has 4 platform lines:

Track	Length	Track usage
1	210 m	Regional trains, Trains from/to Hillerød
2	274 m (197 m)	DSBFirst, Trains from/to Copenhagen
3	277 m	DSBFirst, Trains from/to Copenhagen
13	169 m	DSBFirst, Trains in peak time

The eastern part of track 2 cut off by a derailer from the rest of the tracks and is used by regional trains to Gilleleje.

The following secondary tracks are used by DSBFirst:

Track	Track usage
P1, P2 West, P3	Shunting yard
14 - 19	Maintenance, Cleaning, waste disposal, water, refilling, train set parking position
50	Turnout track for tracks P1-P3 and P33

### Deficiencies in the track layout

The tracks 13-20 of the former freight yard have been reused without any modification for the DSBFirst trains for shunting- and maintenance. The connection to the rest of the tracks does not comply with the requirements of a modern train-operation. The geographically better located tracks 51-54 are neither complying with a maintenance and shunting yard (turntable, length of tracks, missing electrification).

Between the platform lines and the lines 13-20 there is no direct connection. If a train is moved from the platform lines to the tracks 13-20 and the other way round the train has to be put in one of the main tracks in direction Snekkersten and after change of the cab it has to be removed again in the other direction.

In consequence shunting movements take a lot of time (in average about 25 minutes) but have only short time slots. That means that already small deviations have a negative impact to the regular train operation.

Since 30.12.2009 there is a temporary speed restriction in place for incoming and outgoing trains from track 2 due to track deviations. That results in a loss of trip time of 61 seconds.

## **6.2 Timetable**

In addition to the basic service of all 20 minutes the trains of the Niva-System run in peak time in the morning and in the evening in a 20 minutes cycle to Helsingör as well. There are 6 trains per hour.

Furthermore there are 3 additional trains running from Helsingör to Copenhagen between 7 and 8 o'clock. So in total 9 trains run between 7 and 8 o'clock from Helsingör to Copenhagen.

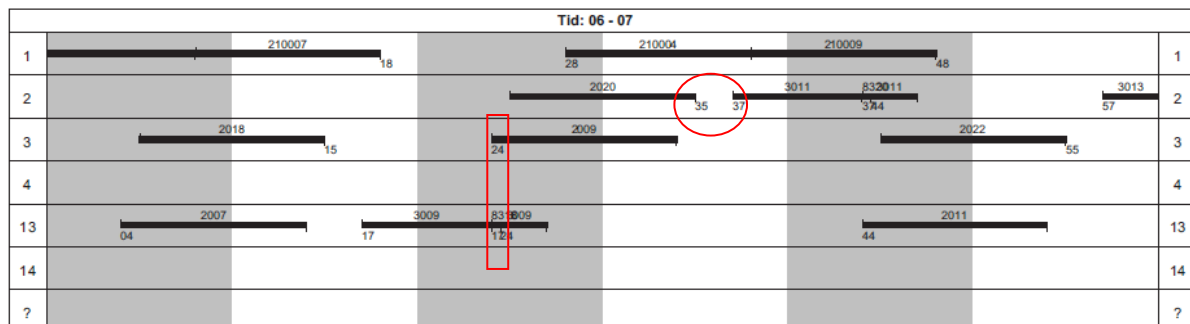
In the evening additional trains arrive from Copenhagen on 16:08, 17:08 and 18:08.

The question arises whether an offer of services in this density makes sense and whether a reduction of running trains for an improvement of the punctuality would be possible. According to the passenger frequencies of the concerning stations (see chapter 3) it is possible.

If the time table according the new concept goes in operation in August 2010 the number of trains in the peak time is reduced and the situation will recover.

## 6.2.1 Track occupation

Rapport kart den 28.01.2010 kl: 16:37  
 Sporgraf - Helsingør - onsdag d.06.01.2010 Tidsinterval 0:00 - 24:00



During peak time critical situations (marked in red) are recognised. They have an immediate negative impact to other trains already at small deviations. Two examples are shown in the graph above:

- Arrival of train at minute 24 in track 3 and departure of train in track 13 at the same time (consider track layout red conflict zone)
- Track 2 departure of a train at minute 35 and arrival of a train at minute 37

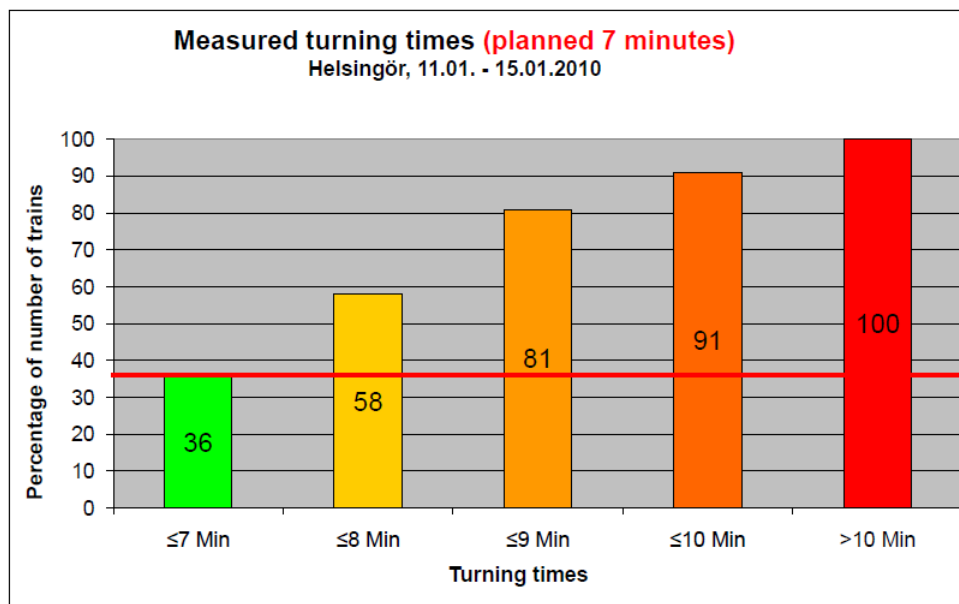
## 6.2.2 Turning times

The turning times in Helsingør are different depending on the time of the day.

Trains	Daily	Peak time morning	Peak time evening	Evening
20xx Malmö-Helsingør – Malmö	31 minutes	11 minutes	11 minutes	24 minutes
30xx Extension Niva-Helsingør-Niva		7 minutes	7 minutes	

The analysis of all trains with a turning time of 7 minutes made from 11<sup>th</sup> to 15<sup>th</sup> January shows that the scheduled turning time is too short. Only 36% of the trains were ready for departure within the planned time slot.





The big range of required turning time between 4 minutes and 20 seconds to 10 minutes is eye catching. For the turning times >10 minutes we assume that there was a failure. A deep analysis of the turning times was not possible for us in the given time frame.

### Summary

- The track layout of the train station Helsingör, especially the layout of the maintenance and shunting yards is not corresponding to the density of trains running in this area. It causes complicate and time consuming operational procedures.
- The timetable in peak times with up to 19 running trains per hour is at the limit of infrastructure capacity.
- There are only very short time slots for shunting between shunting yards and the platform lines. Already short deviations have a negative impact on punctuality.
- The planned turning times of 7 minutes are too short and according to our measurement mostly they are longer and it is not possible to compensate late arrival.
- The temporary speed restriction at track 2 causes a loss of trip time of 61 seconds. The remedial work is planned not before spring 2010.

### Recommendations

- Shift the maintenance and shunting areas to the area of the former DSB locomotive-depot with optimised access from the platform lines.
- When applying the new time table concept in August 2010 the number of trains in Helsingör during peak hour will be reduced and turning times will be at least 13 minutes
- When adjusting the time table minimum turning times of 11 minutes have to be foreseen to have a reserve time to compensate late arrivals.
- Make analysis of turning process and implement corrective actions to shorten the turning times. Process elements are for example start up time of technical systems, self-diagnostic of the train, test of the brakes, impact of different day time, different behaviour of the drivers.
- According to the results of the analysis the turning process has to be improved step by step by a continuous improvement process.

## 7. Organisation, processes, contracts

### 7.1. Strengthen the impact of the task force

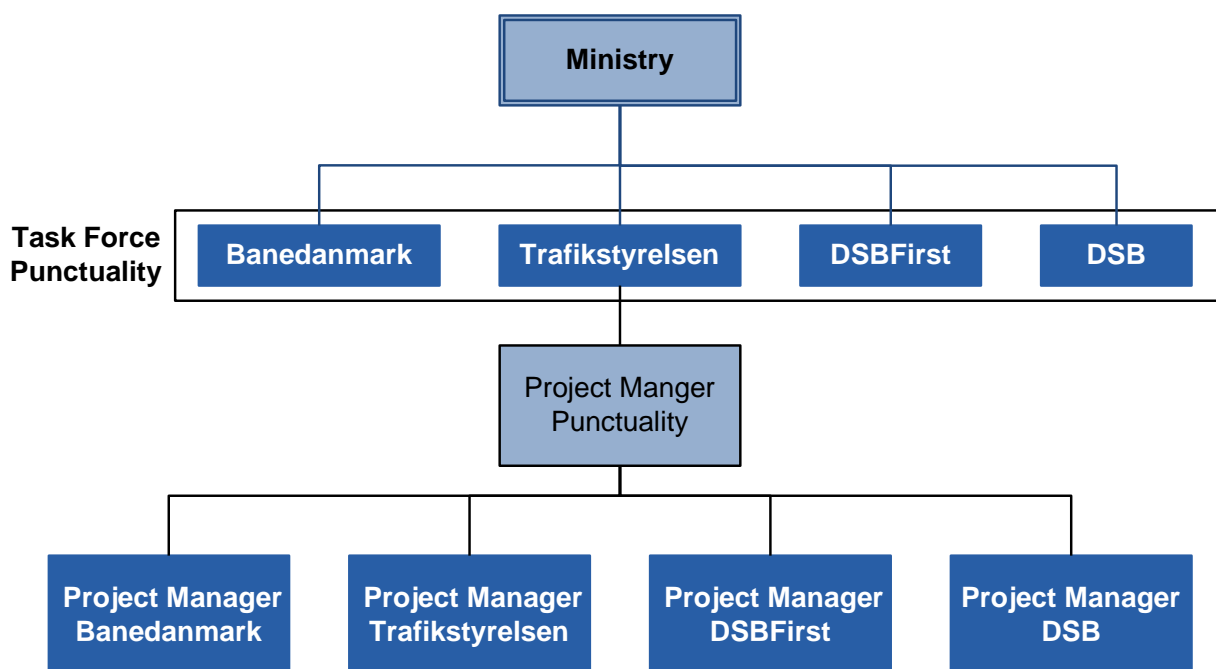
In our report we mentioned several times that people on all levels are working hard to achieve the punctuality target. However the success is not yet fully visible. Each unit and company has to assume their responsibility and shall manage their part of the overall continuous improvement process.

According to our observations the four stakeholders (Trafikstyrelsen, Banedanmark, DSBFirst and DSB) are not enough aware of the leadership of the taskforce. We consider this as a sign that the taskforce may need to be strengthened furthermore.

A dedicated full time project manager for this huge, complex and very important improvement task does not exist, and within the involved companies we didn't find such dedicated project managers neither.

One employee wrote us: "We are probably to self sustained and fragmented in the different units to really get the grip of why and what!"

In order to manage and to control the large package of required actions an overall accepted and professionally acting project manager may be appointed by Trafikstyrelsen. Such project manager shall have an acknowledged experience in punctuality management and shall have highly developed social skills acting as an integrating person since the stakeholders follow different business goals within their organisation. This project manager shall put into place all punctuality related actions and shall be backed up by a dedicated project manager from each stakeholder.



This assigned project manager of Trafikstyrelsen shall ensure that all project managers of the stakeholders will put into operation the agreed processes and actions. Already existing working groups like Pöls shall be integrated in the project organisation.

The overall punctuality target of 90% shall be broken down to the involved units, to their corresponding managers and then even down to each single employee. Each person contributing to traffic quality shall know what contribution is expected and how this contribution is measured and reported.

The today different reports have to be streamlined and unified. The management of each stakeholder unit needs to be informed in a clear and transparent manner according to their level of contribution in order to ensure a clear view over the most important problem zones.

The task force "Punctuality" shall act steering committee and shall support and accelerate all actions related to their own units.

By the time this project organisation is well established and improvements are visible an assessment should be made to find out if the goal of punctuality of 90% is ambitious enough.

In the SBB rail network the passenger traffic punctuality target on working days is 95% at a delay of 4:59. Such figures may be a benchmark for rail traffic in Denmark. We are convinced that on Kystbanen and on the Oresund traffic an overall punctuality of 93% is achievable.

As soon as punctuality has been stabilised and the targeted level has been achieved, the project manager shall migrate the project organisation towards ongoing line activities. Once it is proven that sustainable punctuality is achieved, the project organisation including task force shall be resolved.

### **Recommendations**

We strongly recommend

- to establish a powerful project organisation with a dedicated independent project manager appointed by Trafikstyrelsen
- to extend the mandate of the task force at least till may 2011 when the negative effects of the new time table are fixed.

## **7.2. Continuous improvement of punctuality**

In all our meetings and discussions we could notice that management and employees work with high engagement and with full commitment on the improvement of the punctuality. Data are gathered and a lot of reports for different stakeholders were drawn up. The problems were analyzed and a lot of measures taken and put into operation. However we could not notice that estimates were made on how a specific action contributes to the overall improvement of punctuality.

In our opinion the analysis of the individual important events and reports goes not as deep as necessary to find out the real root cause of the delay. This involves the risk that a lot of measures are taken but the expected improvement does not appear. If such a period of improvement efforts without major improvements lasts too long, frustration and discouragement of the people might be the consequence. We consider it as absolutely vital to complement the analysis work with intensive pattern recognition in all dimensions of the problem. With more intensive investigations probably "ill" trains can be found, information can be gained about which systems, subsystems or components have defects more often than others and who is responsible for that specific railway subsystem. Only with that information successful improvement programs can be started.

In all reports KPI's are used with set thresholds to be achieved. For us it was not possible to find out if the set thresholds are set correctly in order to contribute in a sufficient manner to the overall goal of 90% punctuality. Therefore a clear top down structure of the different KPI's should be made with a clear picture on how they are linked together. After this work the reports should be adjusted to the new structure of the KPI's.

One of the often used KPI is the number of delayed trains. This is a good criteria but it doesn't take into consideration the delay of the passengers. Therefore we propose to use more often the KPI "delay minutes" and KPI "delay minutes multiplied by the number of passengers in the affected trains". In the number of delay minutes not only the first delayed train is recorded (primary delay minutes) but also the delay minutes of the affected trains (secondary delay minutes). Using these two KPI's leads to the effect that the punctuality which is experienced from the passenger is measured and the work will be focussed on events with the highest impact on the punctuality of trains and passengers.

In our opinion in each involved company good processes are established to improve punctuality. But an overall closed process loop which comprises all involved companies and which comprises all necessary process steps is not established yet. The required process steps comprise:

- Issue reports and analyze them with pattern recognition
- find root causes
- propose, discuss, challenge and decide actions with estimation of the improvement impact
- control of implementation and measurement of improvement impact
- at the end: learn the lessons.

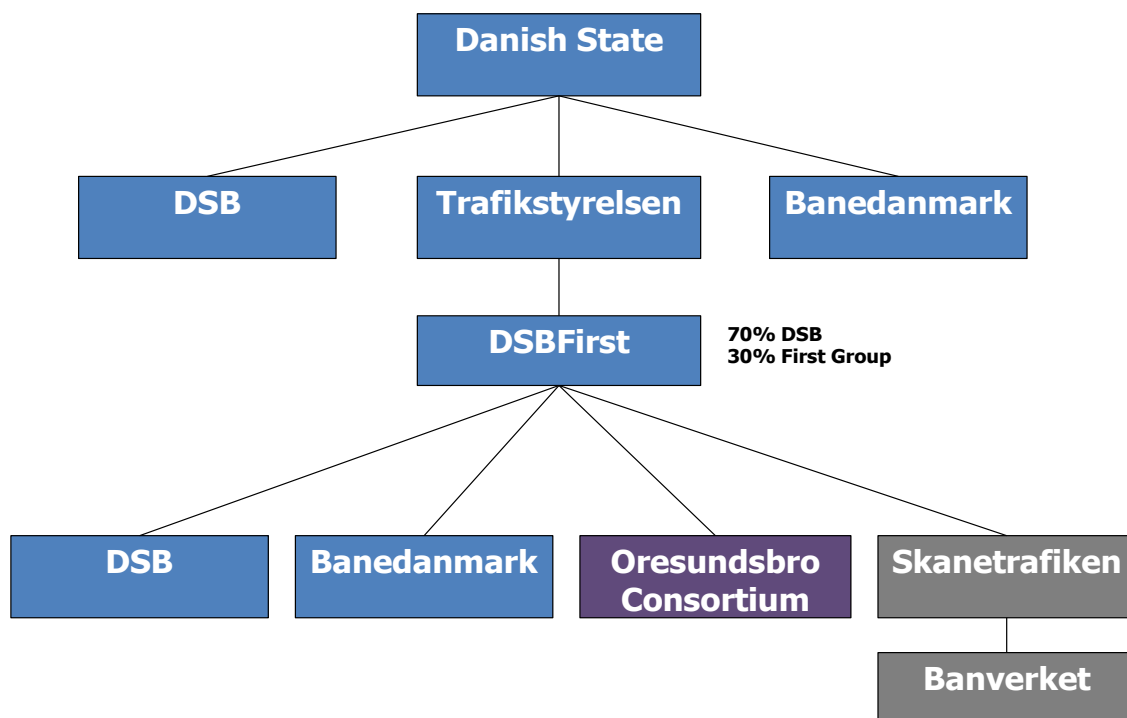
### **Recommendations**

- establish a powerful organisation under the leadership of Trafikstyrelsen with responsible project leaders in each of the four involved stakeholders (Trafikstyrelsen, Banedanmark, DSBFirst and DSB)
- establish a closed process loop to improve punctuality which comprises all involved companies and all required process steps
- use more often the KPI's "delay minutes" and "delay minutes multiplied by the number of passengers in the affected trains" in order to ensure that incidents causing high delay minutes are in the focus of the work
- improve the analysis with pattern recognition to find out the real root causes of the delays

### **7.3. DSB First contract structure**

The contractual relationship among the participants of the task force is quite different. Trafikstyrelsen, DSB and Banedanmark are owned by the Danish State and have contracts with the Danish State. There are no contracts between Trafikstyrelsen and Banedanmark or Trafikstyrelsen with DSB.

Within DSBFirst DSB holds 70% and First Group (a company which runs trains and buses worldwide) holds 30% of the shares. In the picture below the overview of the important contracts is given.



DSBFirst has signed contracts with DSB and Skanetrafik which are the owners of the trains in order to rule leasing of trains. Skanetrafik represents 6 regional communities in South-Sweden, which have ordered public traffic in their regions.

DSBFirst has also signed a contract with Banedanmark and with Oresundsbro Consortium in order to contractually fix the usage of infrastructures owned by these companies.

### 7.3.1 Contract between DSBFirst and Banedanmark

In the contract with Banedanmark a bonus/ malus payment is fixed concerning punctuality. Basis for this payment is the number of delayed trains caused by incidents of Banedanmark. If the percentage of delayed trains is below 91.5% Banedanmark has to pay for each train 700 DKK and if the percentage is higher than 95.5% DSBFirst has to pay per train a bonus of 700 DKK. The payment is capped per month by 250.000 DKK and per year by 3 Mio. DKK. A train is considered as delayed when the delay is more than 4:59 minutes. In order to reduce the delays of trains coming from Sweden a special agreement is made. If more than 10% of the trains, which are delayed in Kastrup coming from Malmö, arrive in Copenhagen punctually, Banedanmark gets an extra payment from DSBFirst.

These two agreements support the overall goal. If the thresholds of 91.5% and 95.5% are appropriate might be assessed separately.

### **7.3.2 Contract between DSBFirst and Trafikstyrelsen**

In the contract with Trafikstyrelsen a bonus/malus payment is fixed concerning quality of service. The basis for this payment is on one hand the number of delayed and cancelled trains caused by incidents of DSBFirst and on the other hand the passenger satisfaction.

The amount of the bonus/malus payment from Trafikstyrelsen to DSBFirst is based on the total compensation for train kilometres and part of the ticket revenue:

- Bonus/malus for punctuality, bandwidth is +/-5% of the total compensation of DSBFirst traffic
- Bonus/malus for passenger satisfaction +/-3% of the total compensation of DSBFirst traffic.

Regarding punctuality the bandwidth of the deviation from the target is +/-2.3 percentage points. This means that for instance a deviation of -2.3 percentage points from the target leads to a malus payment of 5% of the total compensation.

Other minor bonus/malus payment agreements are fixed:

- increase of number of passengers: per passenger 4 DKK
- per cancelled train 1.000 DKK

Due to the effectiveness of the bonus/malus payment on the total compensation of DSBFirst, the leverage is very high. In our opinion it is a highly sensitive incentive system.

### **7.3.3 Contract between DSBFirst and Skanetrafiiken**

In the contract with Skanetrafiiken a bonus/malus payment is fixed concerning quality of service. The basis for this payment is passenger satisfaction and the punctuality of the trains. In the calculation the number of delayed and cancelled trains and trains with reduced number of train sets caused by DSBFirst are considered. The whole delay in minutes of each train is monitored and is taken into account for the calculation of the bonus/malus payment. A delay of more than 20 minutes is considered as a cancelled train.

The payment is monthly calculated.

Regarding punctuality the bandwidth per percentage point of deviation from the target goes from 10.000 up to 40.000 SEK.

The malus payment for each cancelled train or each train with an early turnaround comes 30.000 SEK in peak time and 15.000 SEK in off-peak time.

The malus payment for each train, which runs in a shorter formation than planned, comes per missing train set 10.000 SEK in peak time and 5.000 SEK in off-peak time.

Other bonus/malus payment agreements are fixed:

- for passenger satisfaction
- for trains without staff

There is no limitation of the bonus/malus payment.

For us it is a rather complex system and was not easy to understand in detail.

### 7.3.4 Comparison of the two bonus/malus systems concerning punctuality

Key issues in comparison of the two contracts regarding punctuality (1 DKK = 0.75 SEK):

	<b>Contract DSBFirst-Trafikstyrelsen</b>	<b>Contract DSBFirst-Skanetrafiiken</b>
Definition of delayed train	each train with a delay of more than 4:59	Every minute until the level of 20 minutes. Trains with a delay of more than 20 minutes are considered as cancelled (malus cap). Trains suffering delays due to technical defects are not considered as delayed.
Bonus/malus for Punctuality	Punctuality incentive is based on the total amount of compensation from Trafikstyrelsen to DSBFirst. The bandwidth is +/-5% of the compensation. The bandwidth of the deviation from the punctuality target is +/-2.3 percentage points	bandwidth per percentage point of deviation from the target between 10.000 and 40.000 SEK
Bonus/malus for customer satisfaction	Customer satisfaction is based on the total amount of compensation from Trafikstyrelsen to DSBFirst. The bandwidth is +/-3% of the compensation.	Customer satisfaction is divided in 4 levels.  Level 1: malus of 0.25 SEK per passenger Level 2 is neutral. Level 3: bonus of 0.25 SEK per passenger Level 4: bonus of 0.5 SEK per passenger
Bonus/malus for cancelled trains	1.000 DKK	30.000 SEK in peak time and 15.000 SEK in off-peak time
Malus for missing train sets	Not existing	10.000 SEK in peak time and 5.000 SEK in off-peak time for each train set
Malus for early turnaround	Not existing	30.000 SEK in peak time and 15.000 SEK in off-peak time

#### Summary

In Denmark punctuality and passenger satisfaction are highly incentivised, in Sweden not. In Sweden cancellation, early turnaround of trains and running in shorter formation are highly incentivised, in Denmark not.

As a consequence DSBFirst trains will be more often cancelled, will have more often early turnaround or will run more often in a shorter formation in Denmark than in Sweden because the malus is lower.

### **Recommendation**

- Trafikstyrelsen and Skanetrafiiken may have to review and to streamline their incentives and objectives with focus on punctuality and satisfaction of the passengers.

## **8. Other initiatives which will increase the robustness of the time table**

### **8.1. System RDS for monitoring of travelling times and recording of irregularities**

Banedanmark uses the system RDS for monitoring the real travelling times of all trains as well as for recording events and disturbances in its network.

Currently, events and disturbances are recorded in case of delays of more than 5 minutes by means of codes complemented by short explanatory reports from the dispatcher. This information is used for establishing various statistics on the reasons for delays as well as reports about the disturbances.

The threshold of 5 minutes prevents the registration of smaller, however possibly frequent disturbances. A better monitoring of the causes of the disturbances is obtained by registration of events and disturbances already at delays from 3 minutes onward. This threshold value has proven to be reasonable in practice; a lower limit would lead to data inflation. Due to the expected increased workload for data gathering the number of dispatchers may have to be increased for a limited period.

The RDS system does not only monitor the directly disturbed trains (primary delay) but also the delay of other trains involved in the incident (secondary delays).

According to the current evaluation practice, all secondary delays (number of trains and amount of delay minutes) are attributed to Banedanmark.

This practice does not seem reasonable to us. In our view, the secondary delay must imperatively be attributed to the provoking body. Only in this way the effect of the disturbance becomes entirely transparent for all involved parties.

### **Recommendations**

- Events and disturbances must imperatively be registered in the RDS system already from 3 minutes delay onwards.
- The secondary delays (number of involved trains and amount of delay and amount of delay minutes) must imperatively be attributed to the provoker of the irregularities (and not across-the-board to Banedanmark).

### **8.2. Disposition rules, predefined decisions and checklists**

In case of an event long lasting decision processes between the stakeholders need to be avoided. Therefore disposition rules and predefined decisions have to be set up.

Disposition rules defined which priorities have to be followed in case of delays.



Banedanmark has set up general rules for latency times for connecting trains including exceptions for certain railway stations and priorities for trains if there is only one operator concerned.

In case of an event, predefined decisions make quick actions possible for all stakeholders being concerned.

In the Operation Centre of Banedanmark there are predefined decisions established if one track of a double track line is closed. For each line section it is defined which trains will be still operated. All available train paths have been split accordingly between the different train operating companies.

### **Recommendations**

We strongly recommend the preparation of

- more predefined decisions (i.e. for total closure of stations or of specific but important track sections)
- checklists for actions in case of specific events like derailments, failure of train sets blocking track sections, accidents (suicide victims)
- checklists for dispatches on specific interlocking disturbances like lateral signal, point machine or track vacancy proofing systems (i.e. axle counters)

### **8.3. Platform Manager**

The taskforce proposes to put a platform manager in charge to shorten the stopping times in Copenhagen Airport and Copenhagen Central. We support this proposal.

There remains a challenge by implementing this measure: As there is traffic of different operators (DSB, DSBFirst, SJ) no agreement is found so far for the question who will employ and pay for the platform manager.

In week 4/2010 the role of the platform manager was tested at Copenhagen Airport with rather good results.

From our point of view only one platform manager shall take care of all the trains on one dedicated platform. This simplifies client information and facilitates the communication with the operation centre. We propose to put in charge „neutral“ employees of Banedanmark.

### **Recommendations**

- All stakeholders elaborate the scope of work for such a platform manager and clearly define his responsibility and empowerment.
- Banedanmark takes over the „platform manager“ function. Remuneration has to be agreed between Banedanmark and Trafikstyrelsen.

### **8.4. Locomotive driver change in Copenhagen Central**

There is a driver change on every train leaving in direction Malmö C. – Helsingör during the day between 6 am and 7 pm. This measure was taken by DSBFirst in order to ensure that a standby train can be run in case of delay of more than 7 minutes without any modification to the driver work planning.

Usually the driver change takes place within the planned 2 minutes stopping time at Copenhagen Central. In one case we observed that the train departure was delayed by 30 seconds due to driver change. The reason for this delay was the combination of high passenger volume and the fact that the driver's cab could only be reached by crossing the passenger compartment.

Despite this observation we consider the driver change at Copenhagen Central as a workable solution until the introduction of the new timetable concept.

### **Recommendation**

- The driver's change at Copenhagen Central may be eliminated after stabilisation of the timetable and relocation of reserve train from Copenhagen C. To Copenhagen Airport.

# Annex 1: Extract of punctuality target tree SBB

