Strategic planning in Banedanmark

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Agenda

- Short introduction to my section Strategic Planning
- Life cycle cost optimization models in Banedanmark
- Planning of track renewal projects

Strategic Planning

Functions and tools

Over all planning and coordination of larger projects in Banedanmark

- Strategic Planning Tool
- Life Cycle Cost optimization models
- Price database for predicting costs of new projects

Reporting to the board and the Ministry of Transport and Building

Life Cycle Cost models

Technical and economical optimization

Analysis models for track, bridge and catenary assets

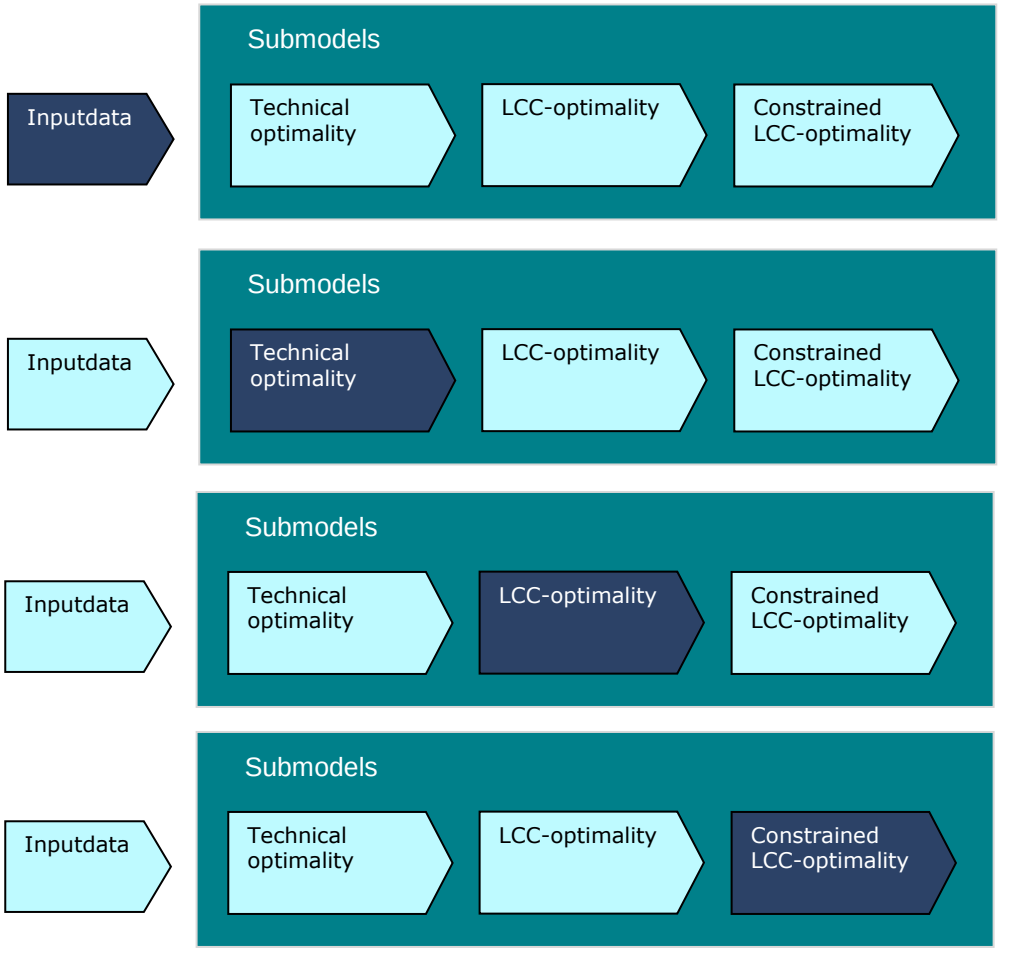
- Optimization using dynamic programming
- Developed by Prognoz
- Banedanmark delivered the mathematical compendium
- Opdates added regularly

Objective function:

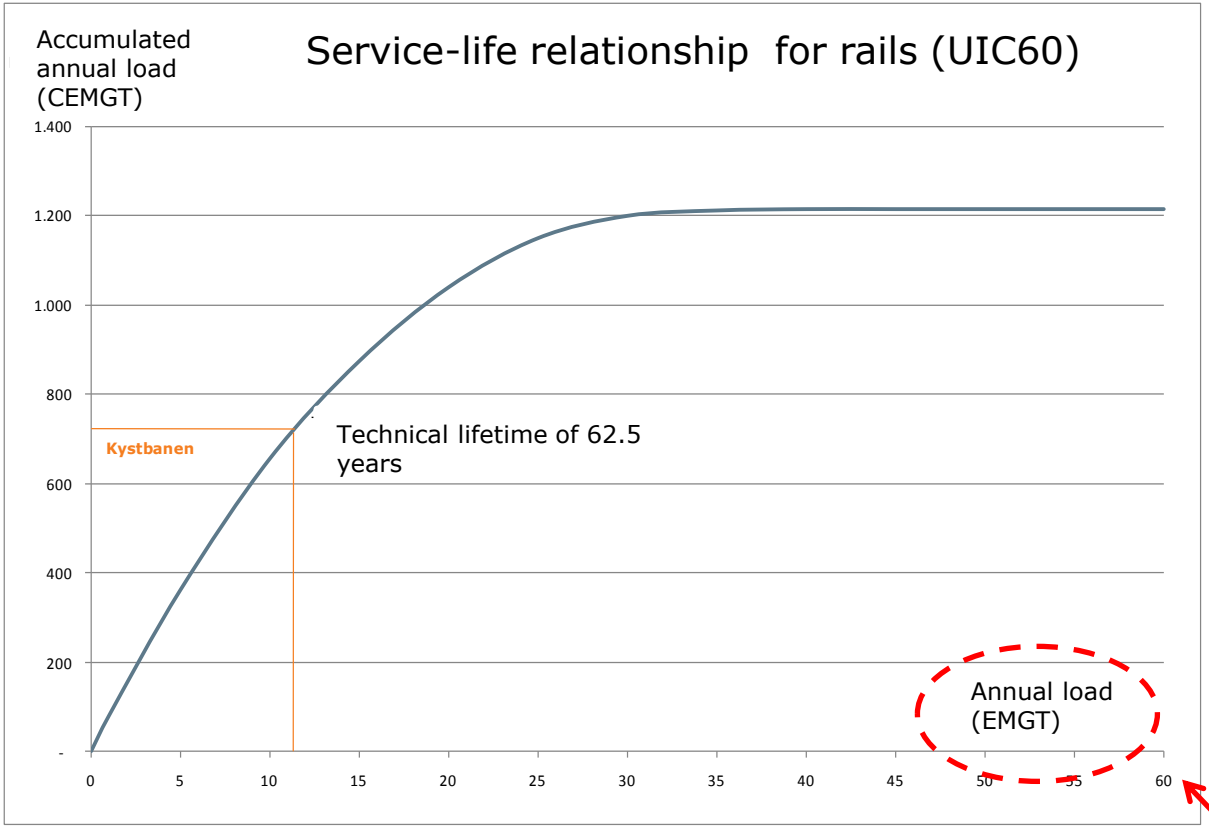
Minimize The total costs C_{total}

$$C_{total} = Renewal_{total} + Maintenance_{total} + THC_{total} + Penalty_{total}$$

Model structure



Central technical factor



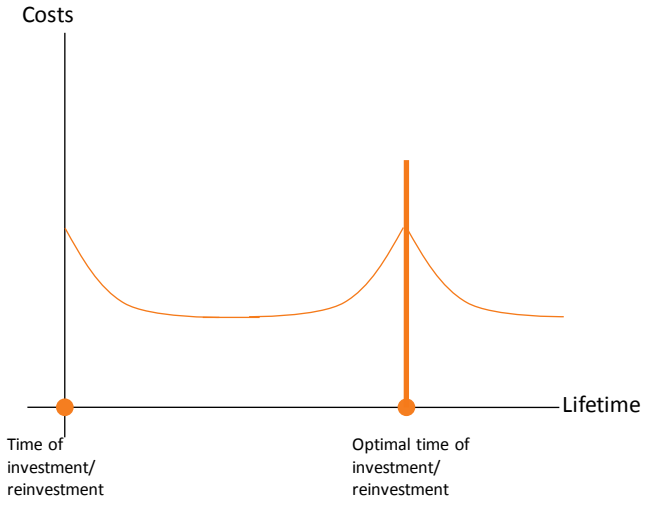
Technical lifetime is not fixed

Changes are due to e.g.
- traffic development
- changes in the timetable
- changes in rolling stock

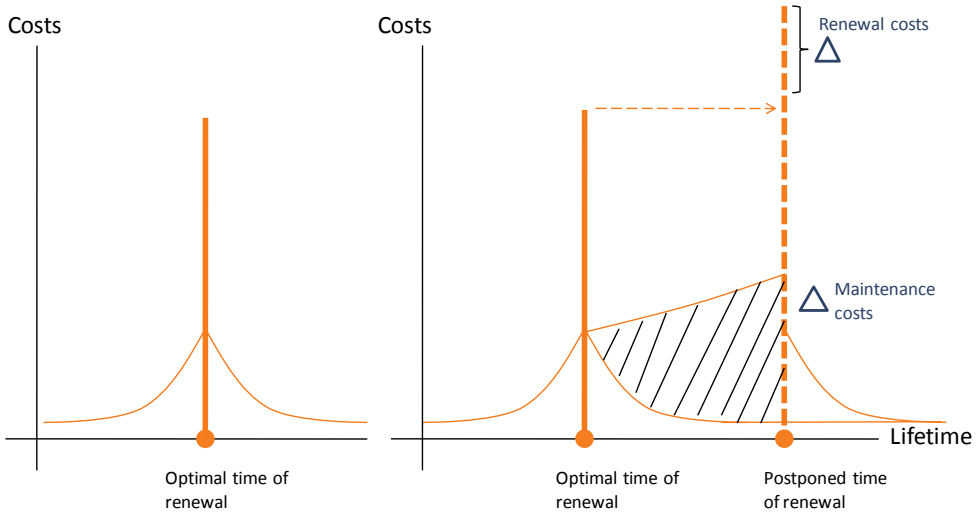
Bruttotons – equivalent. UIC standard used for calculation.

Renewal vs. maintenance

The Bath tub model



Postponed renewal



In case of postponed renewal:

- Increased maintenance costs
- Increased renewal costs
- Risk of temporary speed reductions (traffic hindrance costs)

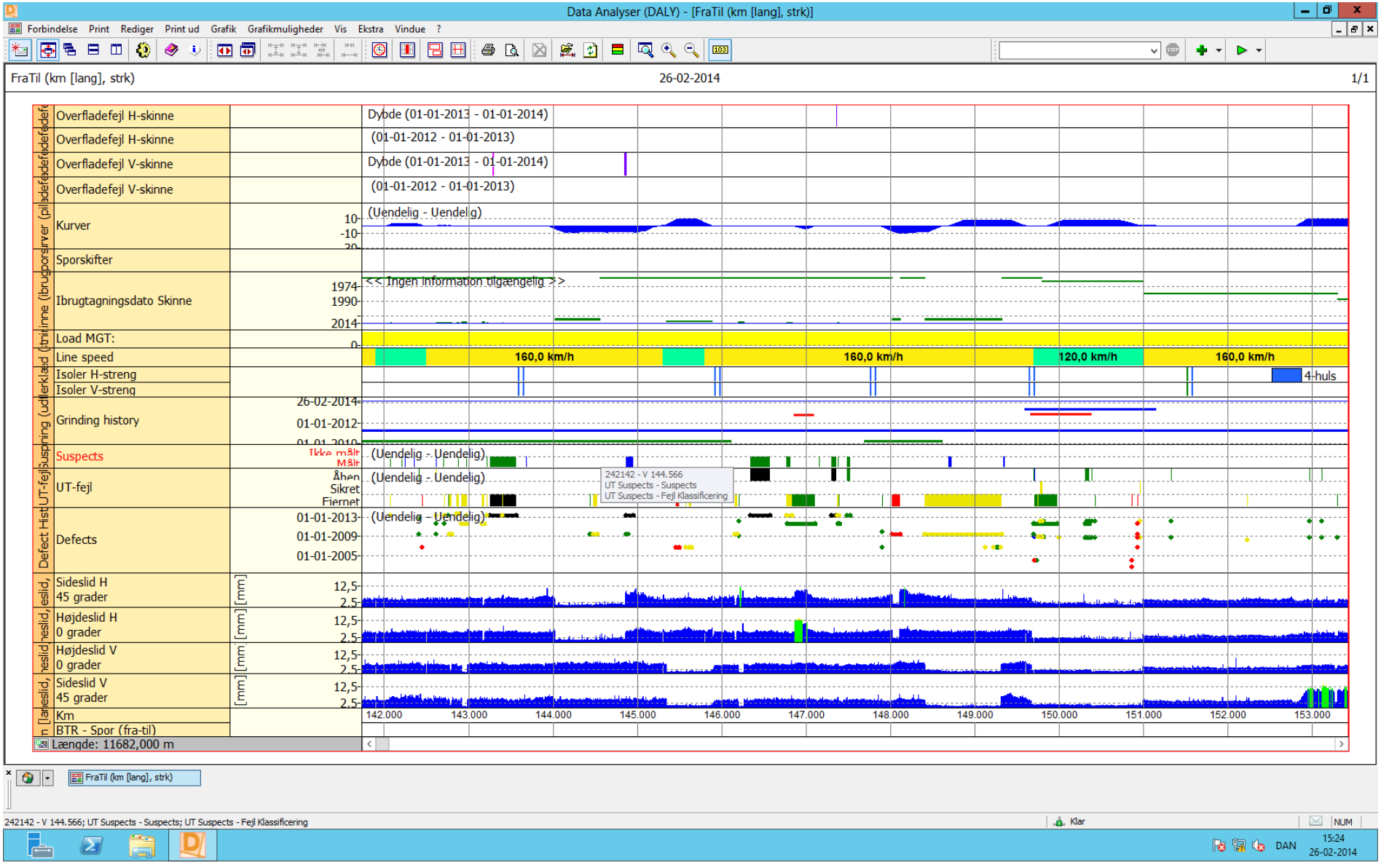
In case of early renewal:

- Penalty

Planning of track renewal projects

Optimization each year

- Over all renewal plan from model output
- New projects each year and each are planned with the optimal project scope
- Close collaboration with our technicians combining technical knowledge with mathematical optimization
- Sharpening of data via technical analysis gives us a better starting point


Data Analyser (DALY) - [FraTil (km [lang], strk)]
Forbindelse Print Rediger Print ud Grafik Grafikmuligheder Vis Ekstra Vindue ?
FraTil (km [lang], strk)
26-02-2014
1/1
Overfladefejl H-skinne
Dybde (01-01-2013 - 01-01-2014)
Overfladefejl H-skinne
(01-01-2012 - 01-01-2013)
Overfladefejl V-skinne
Dybde (01-01-2013 - 01-01-2014)
Overfladefejl V-skinne
(01-01-2012 - 01-01-2013)
Kurver
(Uendelig - Uendelig)
Sporskifter
Ibrugtagningsdato Skinne
<< Ingen information tilgængelig >>
Load MGT:
Line speed
160,0 km/h
160,0 km/h
120,0 km/h
160,0 km/h
Isoler H-streng
Isoler V-streng
4-huls
Grinding history
Suspects
(Uendelig - Uendelig)
UT-fejl
(Uendelig - Uendelig)
242142 - V 144.566
UT Suspects - Suspects
UT Suspects - Fejl Klassificering
Defects
(Uendelig - Uendelig)
Sideslid H
45 grader
Højdeslid H
0 grader
Højdeslid V
0 grader
Sideslid V
45 grader
Km
BTR - Spor (fra-til)
Længde: 11682,000 m
142.000
143.000
144.000
145.000
146.000
147.000
148.000
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150.000
151.000
152.000
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FraTil (km [lang], strk)
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Klar
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A wide range of data

Geometrical data

- Tracks, bridges, switches

Asset data

- Age, type, location, condition

Traffic data

- Type, amount, weight, impact on assets

Economical data

- Renewal costs, maintenance costs

Decision making

Not possible to model all constraints

- Renewal and maintenance costs are important factors
- Political decisions can change it all
- Trains have to keep running!