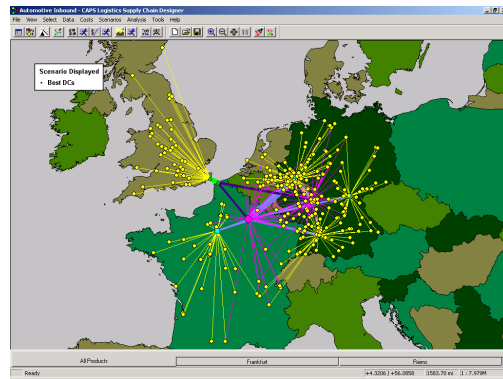


Logistics network optimisation and CO2 Emissions



As the scientific evidence about climate change becomes overwhelming, companies need to evaluate their supply chains to contribute to the global response. Supply chains are complex and must remain competitive, but CO2 emissions must now be part of the analysis. You may want to address issues such as:

- What is the best number and locations of production or distribution sites?
- Which products should I make/assemble/store/cross dock at which locations?
- Which vendors such I use?
- Which customers should be served from which sites?
- What is the cost of serving customers?

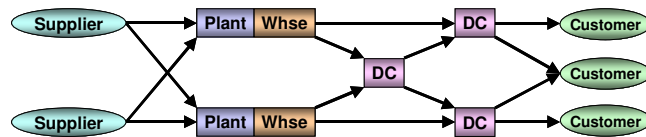


The costs in a supply chain are all interlinked. As the number of sites increases, the site costs will tend to increase, but transport costs will tend to decrease. Ensuring that these trade offs are quantified accurately is key to successful modelling. Taking into account the emissions generated by the supply chain adds another dimension to the analysis.

We have been using the Infor Network Design tool (formerly known as CAPS) for this type of project for many years, and have now added the capability to model CO2 emissions. Network Designer allows you to define complex networks using realistic costs and constraints, and then optimises the flows, opening and closing sites as necessary. CO2 emissions can now be part of this optimisation.

Defining the network

Sites are defined as demanding, supplying or flow through and are connected with lanes, which represent the possible transport movements. Lanes can represent different transport modes, such as road, sea, rail and air. There is no limit to the tiers in the model. Supply and demand can be defined at product level, allowing the flow on sites and lanes to be costed and controlled accurately. Where production is being modelled, bills of materials can be used to convert products into other products.

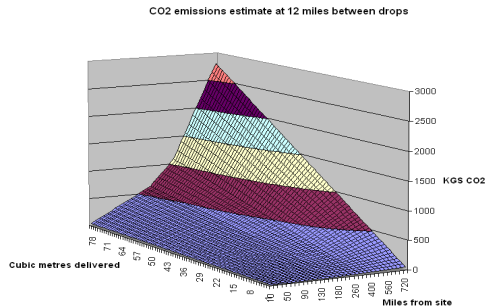


Costs

Site costs can apply to a site, or a product at a site, or on a production line at a site. Costs can be fixed or variable and may be related to a country or region as well as a product. Lane costs can be fixed or variable and can be set up to represent own vehicle costs, full load and part load rates tables, and different modes.

Emissions

Metrics on CO₂ emissions are available from a number of sources, including the UK's National Atmospheric Emissions Inventory. These can be applied to the transport lanes in Network Designer, with different transport modes having different levels of emissions. This could be done in a simple manner, such as the CO₂ per tonne mile, or using more sophisticated calculations that take into account delivery size and density in a multi drop operation.

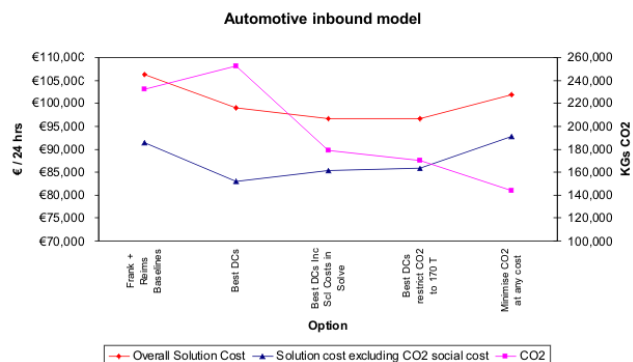


Optimisation

Network Designer uses CPLEX, a proprietary MILP solver, to calculate the optimum supply chain given the costs and constraints. An integrated scenario manager controls the modelling process, keeping a record of the data changes and constraints used in each scenario. When the solver has reached the optimum solution, the product flows are displayed graphically for ease of understanding. Detailed reports showing the costs, flows and emissions are also available.

Scenarios could be set up to calculate:

- The CO₂ emitted by the current supply chain
- The emissions generated by a new cost-optimised supply chain
- The supply chain that gives the lowest CO₂ emissions
- What strategy would be best if the social costs of CO₂ were taken into account
- The facilities that would be needed if there was a limit imposed on the CO₂ emissions



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