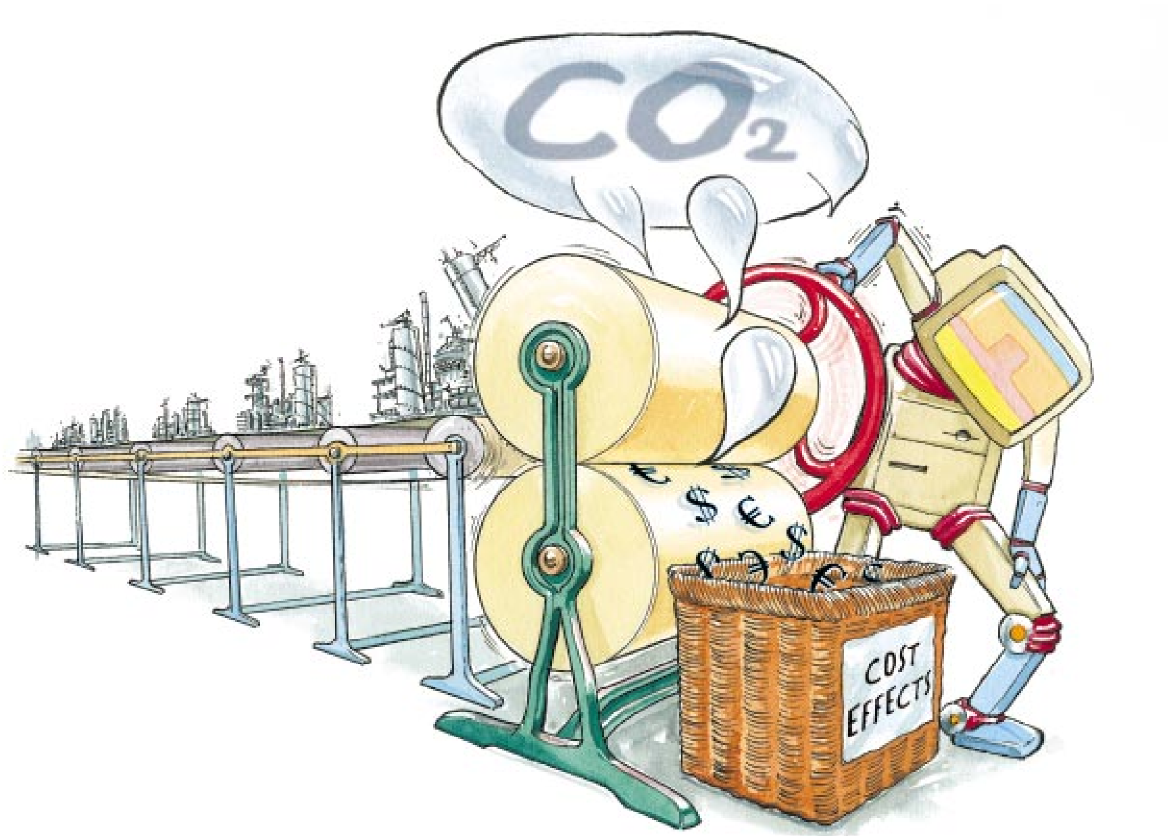
Estimating the implications of road fuels quality changes on the EU refining industry

CONCAWE has developed the tools and techniques to guide oil refinery cost and CO_2 emission studies.



Calculations of the cost and global CO_2 emission implications to European refining arising as a consequence of required measures such as the Auto/Oil I and potential future Auto/Oil II legislation need to be done in a very particular way using long-range regional industry-wide refinery planning basis and techniques. The methodology used to determine future costs needs to address the effects that will arise over a lifetime and must avoid technically unsound approaches. Pitfalls include making assumptions on non-forecastable factors such as future product prices, or adding together individual refinery solutions that leave a gap (e.g. between demand and supply) to be covered somehow by some unknown outsider.

Following on from the poor profit margins experienced over many years, the EU refining sector tends towards caution when considering whether to undertake any refinery project that requires significant capital expenditure. Hence, to maximize the credibility of their cost study findings, analysts are tempted to calculate costs that include a minimum of investment solutions and instead use crude oil and product supply/demand alternative responses. After all, these are usually the effects that become visible in the short-term after a measure is first implemented.

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102--PLATT'S EUROPEAN MARKETSCAN
LONDON, NOVEMBER 09 1999 VOLUME 30 ISSUE 214
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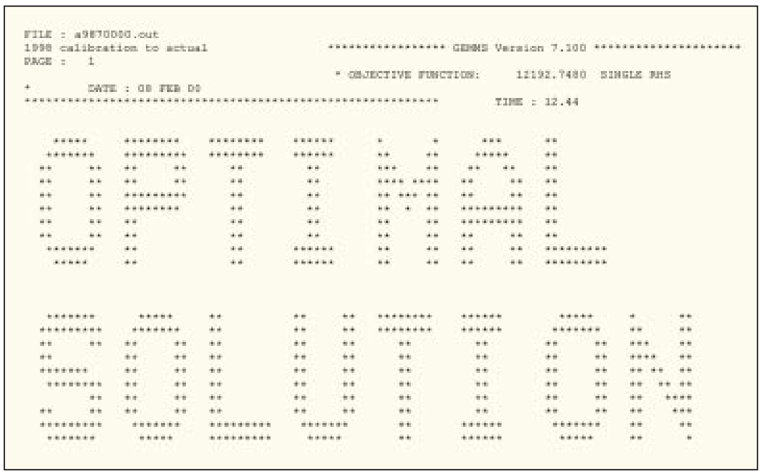
Figure 1
Platts marketscan is daily news on yesterday's prices and margins but unusable for events that lie in the future.

The difficulty is that it requires knowledge of future price margins between various crude oils and products. These prices are driven up by quality premia that are dynamic and responsive to the levels of demands and to the magnitude of the quality changes at issue. Assuming a price margin is, in effect, setting the answer to the cost effect.

To avoid such 'not cost-able' variable supply/demand solutions, planners can instead evaluate variable refinery solutions that utilize investments in appropriate new process units. By using LP models, analysts can ensure these processes are available if required to optimize the base case as well as to solve the quality cases. Meeting a fixed slate of products and using a single marginal crude ensures that all of the effects across all the products are taken into account and no gaps are left that have to be guessed at. It is necessary to ensure that no free spare capacity is available to fix quality issues for nothing. Any real long-term refining spare capacity is eventually closed down and apparent spare is actually in use covering daily variations/and profit opportunities. Finally, it is necessary to ensure that a sufficiently wide range of process options is included appropriate to the changes at issue both in nature and size to avoid an over-constrained cost model and unreasonable answers. Taking a difference between an optimized base case and the quality at issue case ensures that answers are minimally affected by forecasting errors in basic assumptions. Any under-forecasting of technical progress in quality change process technology generally produces only second order cost effect changes.

To make the cost model suitable for assessing the global CO_2 effects of fuels quality changes, it is necessary to ensure that the more carbon efficient energies such as natural gas are not allowed in as variables into solutions to help provide the quality improvements at issue. The maximum available/sustainable use of carbon efficient fuels is already implicit in the base case allocations between non-fossil energies, gas, oil and coal. On the other hand, any significant transport fuel heat value effects as a consequence of quality-changes should be accounted for in the fuel consumption levels on a basis that provides constant kilometres of transportation.

Figure 2
The difference between two LP model solutions of cases without and with the potential change quantifies the effects.



CONCAWE has developed its model of EU oil refining comprising an LP optimized supply/demand and refinery capacity, energy consumption and operating cost data generator and a separate investment cost allocation model. These have been tailor-made for determining the ongoing costs of oil product quality changes and to provide quantified global CO_2 emissions effects. All models make compromises in details of their representation of the real world and this special sort of refinery planning is thus something of an art form. At CONCAWE, the required development/response-testing time has been taken and the technical analysis of refinery experts is incorporated. Sound advice is available on the science behind the art that is adopted for serious studies of the implications of EU-wide and Member State initiatives.