

Nynas Bitumen

Crude flexibility refines possibilities

Crude oil properties have a significant influence on bitumen characteristics and Nynas Bitumen has been expanding its feedstock knowledge to enable it to use alternative sources with confidence.

Reliance on a single raw materials source could be seen as a potential risk but sometimes there are good reasons behind limiting the supply chain. According to bitumen specialist Nynas Bitumen, its predominant use of Venezuelan

crude in recent years for bitumen production has ensured that its binders and emulsions were both consistent and of the highest quality.

Despite the benefits of using Venezuelan crude, Nynas decided several years ago to

carry out a review of other available crudes to assess their suitability for bitumen production. This stood Nynas in good stead when it managed to meet its customers' needs early last year even though production in Venezuela had ground to a halt. The general strike in Venezuela only partially affected the summer surfacing season but Nynas is now confident that its more diverse supply options not only work, but work well.

"The properties of a bitumen binder are defined partly by the crude feedstock used and partly by processing," says Nynas Bitumen Supply Chain & Technical Director Martin Carlson. "Venezuelan oil has always been our preferred source because it produces good bitumen and is perfect for the production of special binders and emulsions."

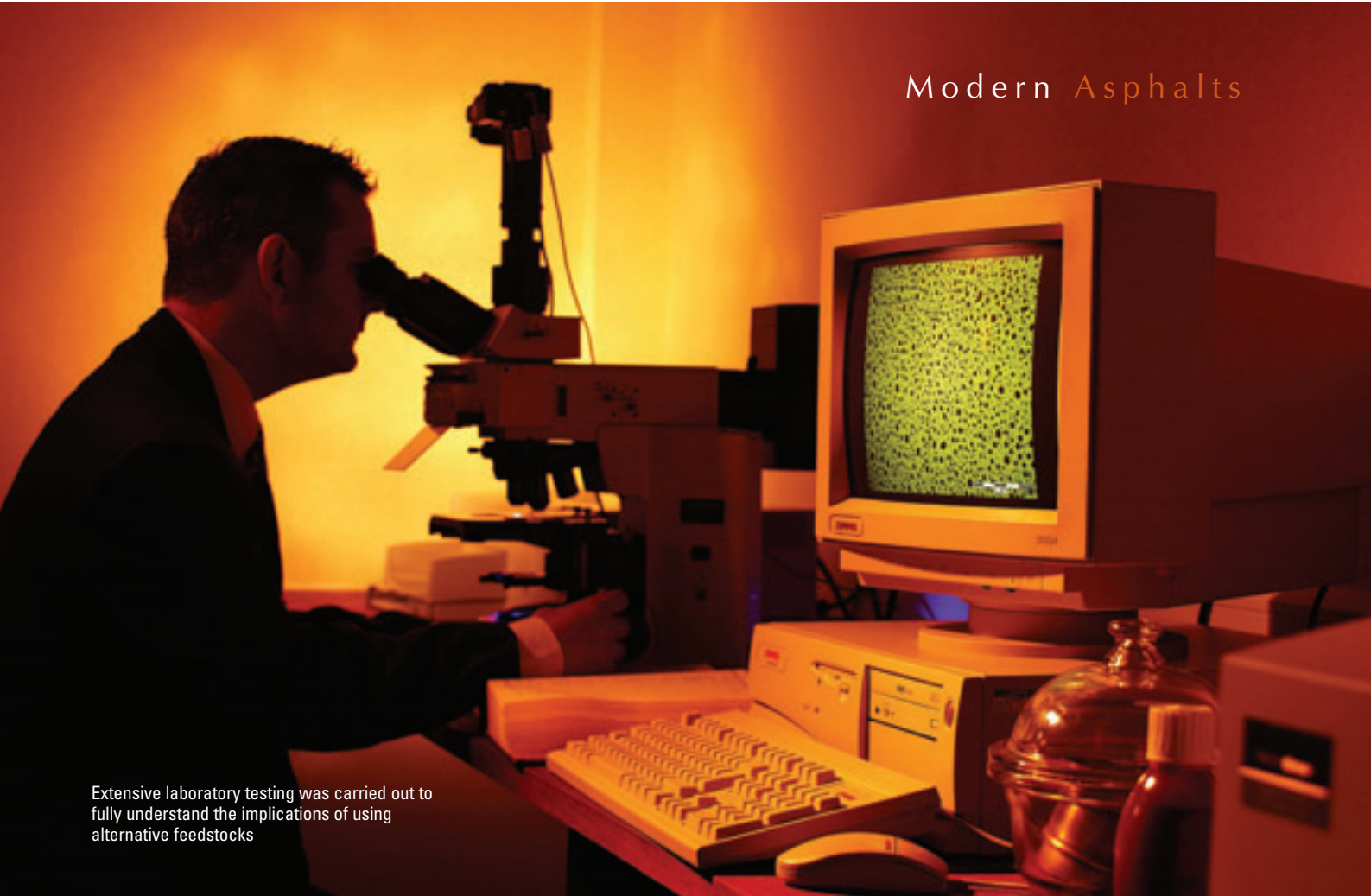
"Venezuelan crude is still our first choice but the feedstock review has increased our options." Martin Carlson

Nynas' feedstock review started in 1998 – long before last year's production problems in Venezuela surfaced – with a view to creating a more flexible supply chain. "We felt that relying on one supplier was a potential risk and we wanted to look at the other options and opportunities available," says Carlson. "Taking a proactive approach meant that if we encountered a supply problem we would be able to open up other sources competently without running the risk of letting customers down, or supplying inferior materials. But the ability to draw on other crude oil feedstocks is also vital to support future growth of Nynas."

The review included a desk top analysis of data for more than 250 crudes from sources



Venezuelan crude produces good bitumen which is ideal for manufacturing high quality binders and emulsions



Extensive laboratory testing was carried out to fully understand the implications of using alternative feedstocks

all around the world to establish the suitability of each for bitumen production. A specially developed crude-bitumen model was used for this purpose. From the results, Nynas established which feedstocks can be used for bitumen production and that several crudes and blends, particularly those from Venezuela and the Middle East, produced excellent bitumen.

More detailed laboratory studies of a selected number of crudes were then carried out to give a better understanding of the impact on end properties of the binder from using different feedstocks. This testing not only looked at the rheological properties of

each bitumen but also investigated asphalt mixes made from each of the selected bitumens. "The asphalt samples were put through specially developed tests based on rut resistance, moisture sensitivity, low temperature properties and fatigue," says Carlson. "This allowed us to compare effectively the properties of each feedstock to narrow down the search for the best alternatives to Venezuelan crude."

The final stage in the review involved full scale testing of bitumen production at one of Nynas' refineries which also included investigation of any plant alterations needed to optimise the refining process. "Most of

the alterations needed to use an alternative feedstock on a long term basis are fairly minor and could be carried out relatively quickly," says Carlson.

As a result of the study Nynas now has been able with confidence to establish supply agreements with several companies, including Petroplus in Switzerland and Fortum in Finland, both of which produce bitumen from non-Venezuelan feedstocks. The reduction of Nynas' dependence on Venezuelan crude and enabled the company to continue supplying its customers with bitumen products efficiently and effectively despite the industrial action. "The strike did not prove to be the best way to solve Venezuela's problems. The fact is that the country is currently a more stable producer than many of the Middle Eastern oil producing countries," says Carlson.

"Venezuelan crude is still our first choice for bitumen production, particularly for producing specialist emulsions, but the feedstock flexibility review has increased our options. We are also confident that there are sufficient suitable feedstocks for at least the next 100 years. In the future the bitumen market may face stiffer competition from fuel producers for use of available crude but as long as there is fuel for cars, we should be able to find a good binder for the road itself."

REFINING FOR OPTIMUM PERFORMANCE

The characteristics of a penetration bitumen are governed by both the crude feedstock and the actual refining process.

But further property enhancements can be achieved by adding polymers, oxidising or mixing with water to form an emulsion.

Nynas' bitumen is refined by distillation, which is usually carried out at one of the company's five refineries in Europe – two of which are located in the UK. The process starts when the crude oil is pumped from the storage tanks, where it is kept at around 60°C, and passed through a heat exchanger to raise the temperature to 200°C. The feedstock is then

heated in a furnace to 350°C before it is transferred into an atmospheric distillation column where the physical separation starts to occur.

The lighter components of the oil – naphtha and kerosene – rise to the top whereas the heavier parts, known as 'topped' crude oil, fall to the bottom and are transferred to a vacuum distillation column (VDC). The VDC effectively lowers the boiling point of the oil and allows for further separation. Gas oil, which is used to produce speciality base oils or can be further refined to produce fuel, rises to the top and the heavier penetration bitumen is collected from the bottom of the column.