

# PHYSICS OUTSMARTED?

A new Iludest distillation plant extends the limits of what is possible and enables the extremely pure separation of bitumen fractions in a packed distillation column — In this way the process engineers from Waldbüttelbrunn defy the thermodynamic limits of the ASTM Standards D2892 and D5236, and bring two seemingly incompatible requirements under one hat.



Physics outsmarted:  
Fischer Autodest 800AC/HV

Picture: Iludest

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ASTM standards have been the benchmark for everything in crude oil distillation for decades. They make crude oil qualities comparable and distillation parameters transferable from laboratory standards to refineries. With the Standards D2892 and D5236, the operator can cover the distillation process for crude oil and heavy hydrocarbon fractions and design his plants optimally. In the last few years however, crude oil qualities have changed. The proportion of heavy fractions is increasing. Refineries additionally develop new high-end mineral oil products which require a high degree of purity and therefore, more efficient working columns. The thermodynamic conditions specified by the ASTM standards are often no longer adequate to produce these required qualities.

Bitumen fractions with challenging boiling requirements and characterized by low overlapping fractions require a high separation capacity of the columns and high temperatures that can be achieved only under high vacuum conditions. "These are conditions which cannot be satisfied so far with the parameters specified by the D2892 and D5236 standards", says Dr.-Ing. Hans-Eckhard Koenen (Engineer), Team Leader "Thermodynamics" at Iludest/i-Fischer. For the delivery of this particular cus-



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tomter demand, the Waldbüttel-brunn Company who devised the solution has received the "PROCESS Innovation Award" at Achema, the second within the intervening period. The seven strong team of Iludest/i-Fischer engineers has managed to reinvent distillation again and again. This time round, the Fischer Autodest 800AC/HV has put the competition in its place. The special features of the distillation plant are that this apparatus covers a temperature range which extends the range of the ASTM Standards D2892 and D5236 still further—and that too in a single packed column at a vacuum down to  $10^{-3}$  Torr. The system therefore exceeds the boiling point of the bitumen fraction, i.e., achieves a temperature range of 560 to 600°C (equivalent to atmospheric pressure) This is clear if one examines the thermodynamic definitions of the two standards more closely, and this is what the team of engineers has actually done.

- ASTM D2892 is based on a packed column with a theoretical separation capacity of 15 theoretical plates, operated at a vacuum of 2 Torr and a boiling point of 400°C (at atmospheric pressure).
- In comparison ASTM D5236 is based on an open tubular column, a theoretical separation capacity of 2 theoretical plates, operated at 0.1 Torr, with a maximum boiling point range of 540 to 565°C (at atmospheric pressure).

On the crucial point of getting both standards under one hat, Koenen says: "High separation capacities are possible only with packed columns, but high temperatures are possible only with open tubular columns, because a deeper lower vacuum is possible here." In other words, if one wants to outsmart thermodynamics, one must develop distillation units that can withstand a high vacuum, because lower process temperatures are possible only at higher vacuum levels. Finally, the hydrocarbon chains crack at above 300°C, a process which one must avoid during crude oil distillation. The incentive for the development came from two customer requests, which fol-

Picture: PROCESS



"Based on our experiences from the previous project, we knew that this challenge could be solved."

DR. - ING. HANS-ECKHARD KOENEN  
ILUDEST/I-FISCHER

A question to Stefan Opis, CEO Iludest/i-Fischer

## "OUR PLANTS OFTEN HAVE A PAYBACK PERIOD OF A FEW DAYS"

**Mr. Opis, You speak of payback periods of a few days for your ASTM plants. How is this possible?**

**O P I S :** Refineries earn most of their money through the medium crude fractions. The crude oil qualities have fallen sharply in the last few years, so that the proportion of bottom-level "black" product is increasing and as a result profits are falling. Therefore refineries are blending raw feedstock as well as product fractions in order to optimize their investments and to increase the proportion of the profitable medium fractions. But for this, the operator needs accurate data for exercising control. And this is where our ASTM plants come into play. By using the data from our dis-

tillation units consistently, the refinery manager can exercise accurate control of the refineries and achieve a surplus yield of profitable products.

Even under the currently prevalent low market price conditions, it quickly adds up to several thousands of Euro per day. Thus, you have already easily recovered the price of our ASTM plant in less than 14 days.



Picture: PROCESS

### PROCESS-Tip

- The company is participating in the upcoming **ArabLab 2016** exhibition in Dubai, U.A.E. (March 20 - 23, 2016): Stand No. 802/902 along with BDH Middle East L.L.C.t.