95 RON with ETBE: A panacea for the RFS?

ARA BARSAMIAN and **ELISEO CURCIO,** Refinery Automation Institute

Since the US Congress mandated the Renewable Fuels Standard (RFS), the refining industry and renewable fuel producers, mainly US ethanol producers, have been at odds with each other: refiners have resented paying significant capital for renewable identification numbers (RINs) to meet their renewable volume obligations (RVO); ethanol producers have been clamoring to increase the gasoline ethanol content to 15 vol% or more; and consumers have been impacted by the enormous subsidies for renewables at the pump.

Is it too good to be true? An obvious solution is to use bio-ETBE, widely used in Europe, Latin America and Japan in concentrations of up to 22 vol% (about 10 vol% ethanol equivalent). Ethyl tert-butyl ether (ETBE) is an ether made with bio-ethanol, containing about 45 vol% ethanol.

When compared with ethanol, ETBE advantages include:

- It can be blended directly at the refineries
- It can be shipped via pipelines
- It has low vapor pressure (no 1 psi waiver needed)
- Low Reid vapor pressure (RVP) reduces volatile organic compound (VOC) emissions
- High octane and low RVP promote reduction of aromatics (carcinogenic precursors)
- Less water absorption, less corrosion, no azeotropes
- Proven user of 10 vol% ethanol-equivalent in gasoline without harmful effects
- Upgrades low-octane naphtha and conventional regular to 95 RON
- Provides RIN credits by using bio-ETBE
- Higher mileage due to higher energy density.

After the California-promoted hysteria against using methyl tertiary-butyl ether (MTBE), potential users were wary of lawsuits, although bio-ETBE is radically different in terms of health hazards. It is interesting (and ironic) to note that while the use of MTBE is prohibited in the US, we do export it to others.

ETBE is produced in the US in minuscule amounts for export. This can be remedied by converting existing MTBE facilities to ETBE by substituting bio-ethanol for methanol.

Blending gasoline with ETBE. In addition to the advantages mentioned here, ETBE uses cheap naphtha that is inexpensive and abundant thanks to shale crude production, in addition to using also cheap butane.

Successful blending tests runs were conducted with 22 vol% ETBE, equivalent to using 10 vol% ethanol, shown in **FIG. 1;** 33 vol% ETBE, equivalent to using 15 vol% ethanol, shown in **FIG. 2;** and 44 v% ETBE, equivalent to using 20 vol% ethanol, shown in **FIG. 3.**

Getting the US Congress, the oil refining industry and ethanol lobbies to agree on using more ethanol (in the form of bio-ETBE) and moving to a 95 RON standard is the next step. ●

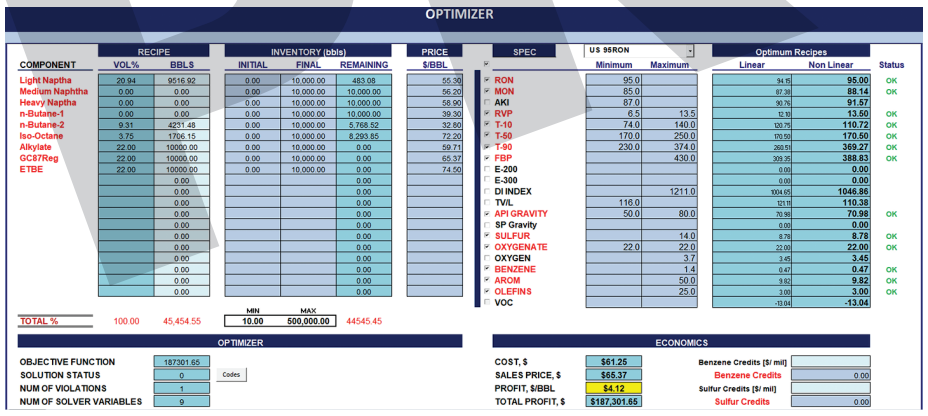
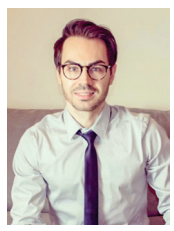


FIG. 1. Example 1: 95 RON with 22 vol% ETBE.

ARA BARSAMIAN is the President and CEO of the Refinery Automation Institute LLC (RAI) and has more than 48 years of experience in gasoline, diesel and biofuels blending operations and technology. Recently, he has been involved in the IMO 2020 bunker blends, recipes and ISO 8217 specs. Earlier in his career, he was a Group Head with Exxon Research & Engineering Co., President of 3X Corp. and Vice President of ABB Simcon, all in the area of fuels blending. Mr. Barsamian holds BS and MS degrees in electrical engineering from City University of New York.



LEE ELISEO CURCIO is a chemical engineer and CFO at RAI. For the past five years, he in the areas of gasoline, diesel, bunker blending, ethanol non-linear property correlations and octane boost, and naphtha and butane blending. He also teaches the gasoline, diesel and bunker blending optimization section of RAI's blending public course. He previously worked previously at Catholic University of Louvain in advanced modeling and optimization. He holds BS and MS degrees in chemical engineering with honors from the University of Calabria in Italy.

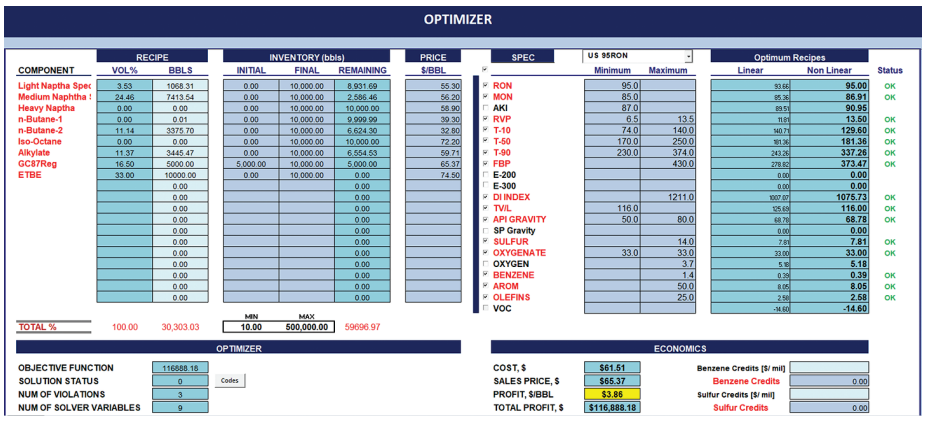


FIG. 2. Example 2: 95 RON with 33 vol% ETBE.

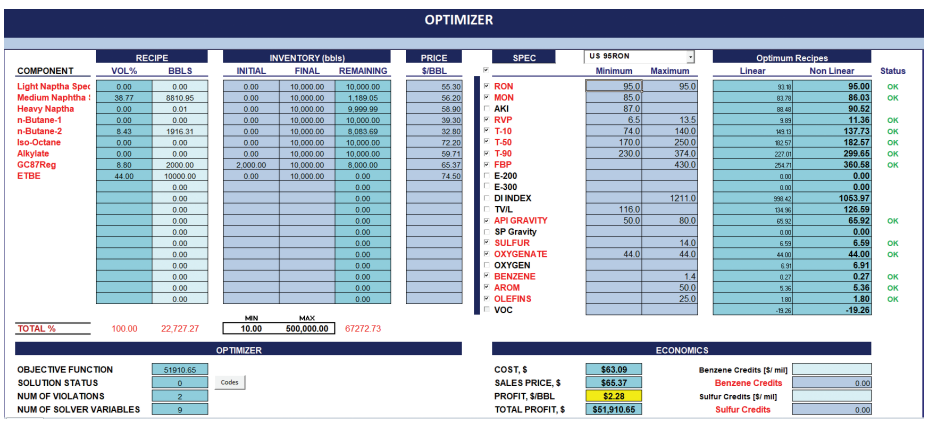


FIG. 3. Example 3: 95 RON with 44 vol% ETBE.

UPCOMING AFPM EVENT

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