Extended Pooling Problem with the Summer Time (EPA) Complex Emissions Constraints

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Problem Statement

The *extended pooling problem* appends the Environmental Protection Agency (EPA) Complex Emissions Model and associated constraints to a standard pooling problem [Misener and Floudas, 2009, Misener et al., 2010]. Refinery feed stocks and fuel additives $i \in \mathrm{I}$ are temporarily stored in $l \in \mathrm{L}$ intermediate storage nodes or *pools* before being blended into $j \in \mathrm{J}$ final products on a predetermined network of connections between feeds i and pools l (T_X), pools l and products j (T_Y), and feeds i and products j (T_Z). Each reformulated gasoline product j must satisfy constraints specified by legislation such as 40CFR80.41 [2008] to set standards on the volatile organic, $\mathrm{NO_X}$ and airborne toxic emissions for each product j:

$$\begin{aligned} \mathrm{VOC_j} &\leq \mathrm{VOC}_{j,\,\mathrm{MAX}} \quad \forall\, j \in \mathrm{J} \\ \mathrm{NOX_j} &\leq \mathrm{NOX}_{j,\,\mathrm{MAX}} \quad \forall\, j \in \mathrm{J} \\ \mathrm{TOX_j} &\leq \mathrm{TOX}_{j,\,\mathrm{MAX}} \quad \forall\, j \in \mathrm{J} \end{aligned}$$

These emissions are computed with the EPA Complex Emissions Model [40CFR80.45, 2007] based on a function of $k \in \mathrm{K}$ fuel qualities that are known for each feedstock i. The objective of the extended pooling problem is to minimize cost by determining the globally optimal flowrates through the network topology.

References

40CFR80.41. Code of Federal Regulations: Standards and requirements for compliance, 2008. http://www.gpoaccess.gov/cfr/retrieve.html.

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