

TECHNICAL MEMO



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Subject: Dryer Feed Rates
Claremont, MN

Included herein are normal operating rates and proposed short term throughput limits for centrifuge and syrup feed rates for unit operations corresponding to STRU 24 and 47. The analysis was performed to characterize dryer process feed rates to establish a technical basis for the development of suitable short-term throughput limits for operations referenced in Al-Corn Clean Fuel's (Al-Corn) pending permit air permit publication.

KFI is an Engineering Services company with experience in the design and operation of corn-based fuel ethanol production facilities and has served in the role of design engineer at the Claremont, MN facility for more than 20 years. Most recently KFI provided engineering services for the most recent plant expansion and has analyzed the facility unit operations and advised AlCorn on operational rates and suggested maximums for short-term throughput limits.

Attached is a block flow diagram illustrating expected normal and recommended maximum syrup and centrifuge feed rates to Dryer A/B and Dryer C at a plant throughput of 140 MMGPY. Normal feed rates were developed utilizing an idealized design case materials balance developed around Al-Corn's upstream unit operation process conditions and typical equipment operation. Many factors can create conditions resulting in operations outside of the design case materials balance including operating variations due to planned and unplanned maintenance activities, operating condition changes resulting from normal operating and upset conditions associated with a bioprocess facility, and annual feedstock (seasonal corn crop changes) variability. Cumulatively, these variations in operating conditions were evaluated to determine proposed short-term throughput rate limits that would provide operational flexibility to the facility to manage typical operating and maintenance conditions at the dryers while maintaining total production capacity across the facility.

Bioprocess Variability – Al-Corn operates a continuous batch bioprocess facility. Bioprocesses like fermentation of corn starch, a seasonally varying feedstock, to ethanol will introduce process variability that requires downstream flexibility in equipment operations. The proposed short-term throughput limits anticipate that fermentation variability will consequently result in varying feed rates of whole stillage and syrup to the dryers requiring a maximum feed rate that is higher than the normal feed rate conditions. These variations may be transient due to inconsistencies of a single fermentation batch, or could extend to an entire seasonal variation of feedstock quality due to the crop year.

Operations and Maintenance Flexibility- The rotary drum dryers and corresponding emissions treatment devices are mechanical equipment with a significant number of rotating parts. The complexity and service of the equipment requires a rigorous preventative maintenance program to maintain consistent operations. Because of this, a whole stillage buffer tank and syrup buffer tanks are included in the plant design to allow the plant flexibility to continue operations with the remainder of the plant. These buffer tanks provide for feed flexibility to the process for regular

and unplanned maintenance activities. In the case of scheduled maintenance activities, the plant can transfer a portion of feed from one set of dryers to the other to minimize impacts of maintenance on other process equipment in the plant. As such, process feed rates may be maximized on an individual set of dryers while the other set of dryers is offline. Proposed maximum feed rate cases were designed anticipating these operations and maintenance activities.

Over a longer term, the throughput rate from the DDGs dryers will always migrate to the yield generated from each ground bushel of corn as syrup and/or stillage are not imported to the site. Dryer application rates as proposed below are limited by burner sizes on the respective dryers and the emission control devices installed on these dryers are engineered to the full burner rates.

Dryer AB

TO/HRSG	STRU 24	5.39.22	Syrup feed rate <= 80 gpm (3 hour block avg)
TO/HRSG	STRU 24	5.39.24	Centrifuge feed rate <= 800 gpm (3 hour block avg)

Dryer C

Distillation/Dryers/RTO	STRU 47	5.47.28	Syrup feed rate <= 125 gpm (3 hour block avg)
Distillation/Dryers/RTO	STRU 47	5.47.29	Centrifuge feed rate <= 1100 gpm (3 hour block avg)

140 MMGPY DRYER FEED RATES

WHOLE STILLAGE

1,345 GPM (NORMAL)

