



## E85 Blending Skid Final Follow-Up Report

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## **PROJECT SUMMARY**

The objective of the installation of an E85 blending skid was to eliminate splash blending E85. Splash blending has proven less cost effective and provides a poor consistency in the final blended product quality. This was accomplished by installing a blending skid that blends ethanol and denaturant or unleaded gasoline as it is loaded for transport.

To provide the infrastructure needed to blend E85 the installation of a skid mounted system, a pump, and piping needed to be added to the existing equipment at Blue Flint to pump from the blend product tank to the ethanol truck load out skid. The blending skid controls were integrated into the existing ethanol load out skid controls providing a single load point for any blended product. Having on site blending capabilities allows for greater flexibility in how product can be moved to market. On site blending allows for E85 to be loaded onto anything from a partially loaded truck with an open compartment to an empty truck where all compartments are filled. This leads to lower freight costs. In addition every truck can be sampled after loading to assure quality specifications are met. The installation of this blending skid could be applied to any ethanol plant or gasoline plant that has a customer that requires E85.

The blending skid along with testing performed at the facility has ensured that E85 blended at BFE meet E85 ASTM Standards. This allows BFE to supply E85 to the fuel retailers keeping pricing more consistent and increasing usage which assures that consumers get a quality product at a competitive price.

## OBJECTIVE

There existed a need for a supply of E85 (85% ethanol and 15% gasoline) motor fuel to the retail fuel stations in the state to fuel the approximately 30,000 FFV's (Flexible Fuel Vehicles, vehicles that can utilize gasoline or E85) in the state with E85. Blue Flint Ethanol (BFE) located in Underwood, North Dakota, through this grant, installed a side stream blending skid to blend E85 at their facility. BFE markets the E85 to retail fuel outlets as a motor fuel. This has led to improved product quality, lower price opportunities to the consumer, and better supply options to retail fuel stations.

## RESULTS

**Price Impact:** E85 is comprised of a blend of ethanol and petroleum therefore; production costs and market value for E85 is determined by both of these inputs and their markets which changes daily. BFE produces and markets ethanol and purchases the blend material, petroleum, for the production of E85. Given the high level of concentrations of ethanol in E85 ethanol production facilities are motivated to price E85 at competitive pricing to encourage the use of ethanol and reduce the amount of ethanol that is shipped to out of state markets. Shipping costs to move ethanol to out of state markets are higher than selling ethanol blended as E85 into local markets. This inherently allows for competitive E85 pricing in markets where E85 is produced and marketed directly by the production facility. This shipping cost can range from three cents to 25 cents per gallon.

E85 blending capability at our facility allows us to assure that a quality product will be delivered to the market while allowing us to directly market our product to retail stations. This direct marketing to retail stations takes one step out of the supply chain. That step is the “wholesale jobber” or “blender” step. By eliminating this step from the supply chain of E85 it is anticipated that the price at the retail pump will be two cents to five cents lower per gallon.

Prior to the installation of the blending skid infrastructure at BFE splash blending techniques were used, as is common in the industry. Splash blending is the combining of ethanol and gasoline in a truck or final product tank in two batches. This method of blending results in poor quality control, inconsistent supply and high transportation costs. The higher transportation costs associated with bringing in partial loaded trucks to splash blend has been eliminated by having the ability to blend product on site. It is estimated that this cost, which is specific to our location and the location of the blend stock and destination market is approximately two cents per gallon.

All of the anticipated elements of price impact described above have proven to allow for lower retail E85 prices at the pump by the installation of the blending infrastructure at BFE.

**Market Expansion and Penetration:** While market expansion was a key objective of the installation of the blending infrastructure to date there has not been significant improvements in market expansion. Market expansion is impacted by many elements but is ultimately determined by retail stations making the decision to either install an E85

pump or install a blender pump. These decisions are primarily decided on anticipated market for product which is driven by number of E85 customers in the service area of the station and anticipated profits from sales of product. Availability and pricing of E85 are drivers in the decision process on installation of E85 pump or blender pump infrastructure. Supply of E85 direct from the producer with quality assurances will be a key driver in the conversion of more facilities as time passes. The ability to blend E85 at BFE will provide market expansion as we implement the ND Blender Pump grant program recently approved by the ND state legislature. E85 is one of the two feedstock's to these blender pumps. As blender pumps are installed throughout the state E85 markets will expand.

**Quality Control / Customer Satisfaction:**

This side stream blending skid provides the capability to blend petroleum and ethanol at the appropriate ratios to create E85. It has proven to provide a quality product that has met all of the required quality specification for E85. Customer satisfaction has improved primarily related to the logistical opportunities that are created by having the on-site blending capability in addition to no quality related issues with product. On site blending allows retail fuel customers to combine E85 loads with additional products moving to markets in the same area or at the same facility. Customers can load one of the compartments in their transport tanker with E85 as they arrange logistics for products to market. In addition BFE can provide product delivered to the station by partnering with transportation moves of other products in a similar manner.

The following table shows quality data for loads loaded using the blending infrastructure at BFE. All E85 blended at BFE has met all ASTM standards for product.

<b>Ethanol: Vol%, Results of E85 blend since blending skid installation</b>			
<u>Result</u>	<u>Limit</u>	<u>Result</u>	<u>Limit</u>
71.71	70 min	70.74	70 min
70.74	70 min	70.74	70 min
72.68	70 min	70.74	70 min
70.74	70 min	70.74	70 min
73.65	70 min	74.62	74 min
72.68	70 min	74.62	74 min
72.68	70 min	74.62	74 min
70.74	70 min	74.62	74 min
72.68	70 min	81.79	79 min
70.74	70 min	81.79	79 min
70.71	70 min	82.38	79 min
74.62	70 min	80.44	79 min
70.74	70 min		

### **PROJECT COST AND SCHEDULE**

The project was completed in approximately 45 days. The capital costs for this project were estimated to be \$100,000. The actual costs for the project were as follows:

Pump, Motor:	\$10,206.35
Skid Costs:	\$88,875.00
Electrical:	\$20,013.00
Structure:	\$1202.32
Total:	\$120,296.67