Data Analysis for
Unibright Foods, Bell Gardens, CA
Ammonia Refrigeration Plant

SUMMARY of OBSERVATIONS

Analysis is based on pre- and post- measurements associated with introducing IceCold product into refrigeration compressors serving Unibright Foods' Cooler and Freezer.

Measurement and monitoring include 1-min-interval data collected for the following parameters: Ambient Dry Bulb Temperature, Condenser Water Temperature, Cooler Supply and Return Temperatures, Freezer Supply and Return Temperatures, High Stage and Low Stage (Booster) Compressors' AC Currents.

Duration of data monitoring was ~two weeks before and after - on 9/18-10/3/2014 - for pre-treatment, and 12/10-12/25/2014 – for post-treatment.

Some observations are discussed below.

Table presents single-value averages and totals for all measured parameters (please, refer to Excel charts for detailed trend-logs, complementing single-value summaries):

	Date Time	Ambient	Cond Water	ES	ER	Cooler dT	Frzr ES	Frzr ER	Freezer dT	High Stage AC Curr	Low Stage AC Curr
Pre - Test	Avg	74.15	75.58	33.67	33.69	0.02	0.62	2.19	1.55	107.32	33.58
	Amp-hrs									6,439	2,015
Post - Test 2	Avg	61.25	74.06	32.80	32.88	0.08	(0.55)	1.25	1.79	104.41	26.75
	Amp-hrs									6,265	1,605
Savings										2.7%	20.4%

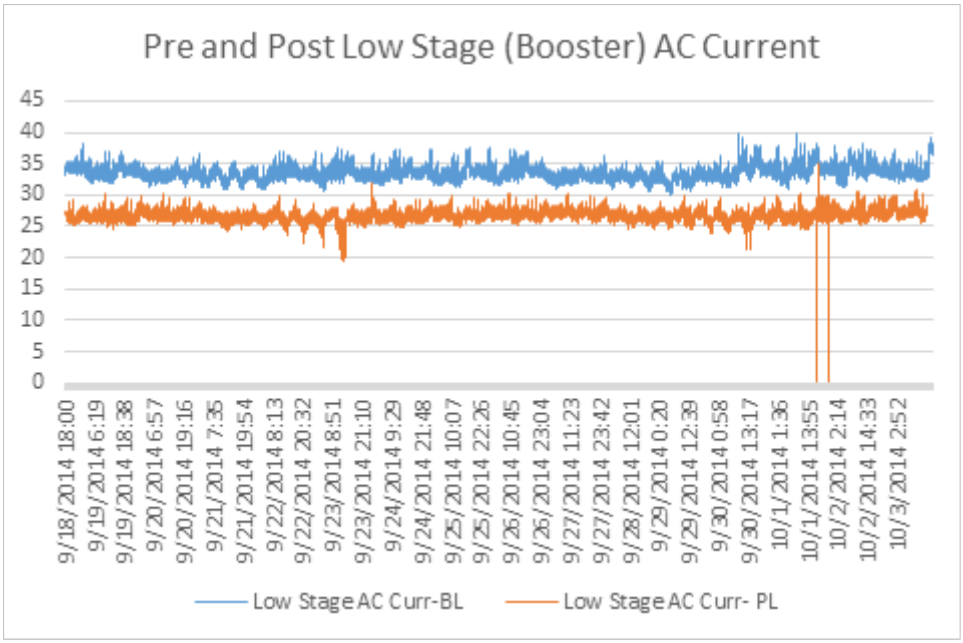
As Table indicates, and the corresponding trend-logs in Excel charts (not included here) confirm, the Low Stage AC Current (Amps) was in average ~20.4% lower in post-treatment measurements than in pre-treatment. Correspondingly, the total energy consumed (in Amp-hours, or – proportionally – in kilowatt-hours) was 20.4% lower as well. Similar comparison for High Stage AC Current indicates smaller improvement on 2.7%.

It should be noted, that post- measurements were performed in some colder (in average) outdoor conditions. However, comparison of subsets of collected data with identical outdoor air temperatures, still demonstrate improvement (savings) on ~20% for Low Stage compressor, as shown above.

The air temperature difference between pre- and post-treatment was minimal (negligible) for both – cooler and freezer supply and return air. Cooler Supply and Return Air deltaT was almost zero in both pre- and post-measurements, and Freezer Supply and Return Air deltaT was also very small (1.55 and 1.79 degF respectively).

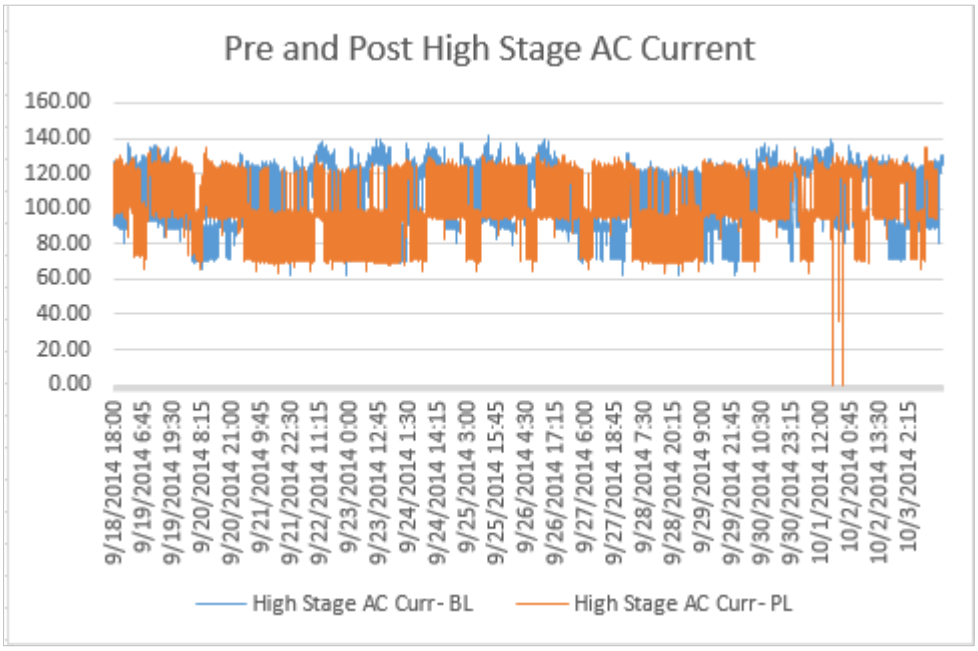
Comparison of Low-stage and High-stage AC Currents is shown below.

AC Current for Low-stage compressor on post-treatment is clearly lower than pre-treatment:

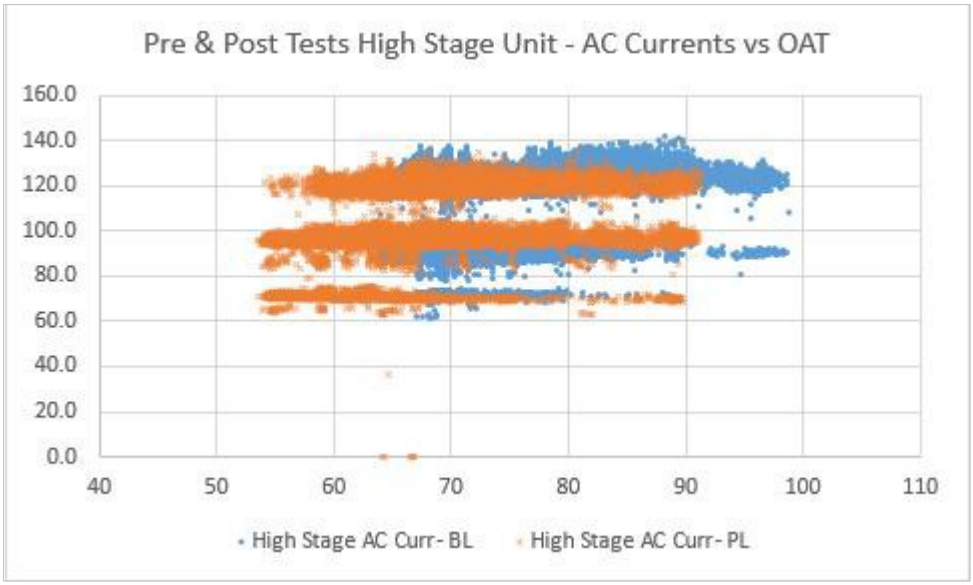


This Amps difference is translated in proportional difference (20.4% savings) in Amp-hrs, kWh and dollars.

High-stage compressor operates with permanent cycling on two levels (between three Current values) as it shown below:



While sufficient Amps and/or Amp-hours decrease wasn't detected for High-stage compressor, the three Amps levels for current's variations became significantly different in post-treatment, than they were in pre-treatment. The difference is presented below:



It's clearly visible that in post-treatment measurements, the difference between maximal and intermediate Amp-levels became smaller, and levels themselves – more consistent. While this Iced Cold effect requires additional analysis / investigation, it might be indication that high stage compressor operates after Iced Cold treatment "not as hard as before" treatment, which could be translated into extended equipment lifetime.

It should be noted that chart above is plotted for case-specific (pre- and post-) outdoor air conditions, which enables appropriate weather-independent comparison. Similarly Iced Cold effect on Low Stage compressor amperage for "aligned" weather conditions is shown below, indicating un-questionable improvements: