Thu 4/6/2006 10:57 AM
Dan—What is your take on this information/graph? Doug has asked for more information (see bottom). He pre-supposes he will get information---We are not obligated to give any information about ICE. Should we?? Rod

---

From: DudleyDevices@aol.com [mailto:DudleyDevices@aol.com]
Sent: Tuesday, March 28, 2006 9:14 AM
To: Wittinger, Rodney J NWP
Cc: Ramirez, Dan E NWP; Sheldon, Lee H NWP; Ebner, David A NWP
Subject: Ice Harbor Data Set Reduction

Dear Rod,
The attached is my reduction of the Ice Harbor data that Dan Ramirez sent to me. One graph is just the data, the second has some geometric additions to extrapolate and project a new best cam line, and the third adds Constant Power lines to facilitate a guess as to how much the gates and blades should be moved to get to the new optimum point at the same power level.

I was unable to make any use of the 27 degree data, so it was omitted from the graph. The rest of the data is very noisy, requiring lots of "smoothing," averaging and guesswork to get the result shown, but this is where it ends up. Better data will increase the confidence level.

The data was very noisy because the number of averages and number of samples were both set at 5 & 5, instead of a larger number. The Quick Start guide recommends 200 & 200.

The next release of the software - I'll be sending an updated copy soon - will default to 200 & 200. I set the defaults at 5 & 5 in the software because it makes my diagnostic work go faster instead of 200 & 200 for your convenience. My bad. I'll change it next time.

Dan said this data does show what happened, so here's my best shot at telling the story.

First, the gate sweeps at fixed blades don't go far enough to the right, just like the data from McNary. Had this been collected along the Constant Generation lines, it would have looked like that data set, and have extrapolated extensions to the Efficiency and Constant Power lines to estimate where the best cam line should be.

In the attached graphs, the heavy lines are created by the ITB software.

Blue horizontal = Blade angle
Blue curved upward to right - Flow
Red curved upward to right - Power
Green, curved upward to right = Efficiency

It the test had gone far enough to the right (increasing gate at fixed blades) the Efficiency curves should crest over to come down as far on the right side as they do on the left. These didn't go far enough to capture the unit Efficiency performance so the data is inconclusive. (If the ITB is used as a live display and the averaging is working correctly, this problem will be identifiable at a glance and you'll never return from the field again with an incomplete data set.)

The colored hairlines coming down from the Efficiency crests (and from the extrapolated crests that are projected to estimate where they would be) come down to intersect with the Blade lines they correspond to. At this intersection a circle is drawn to show the Gate/Blade pair that will produce the best efficiency at that blade angle.

To show how the Constant Power Curve's behavior could be used, the second graph adds the Constant Power lines from the McNary data set. This is just for reference to show the curvature and tilt of a similar unit's Constant Power lines. They are both large Kaplans and I believe they will have some similitude in this characteristic.

This allows a guesstimate to be made as to where the same power could be generated at better efficiency.

My conclusion is that this data is not sufficient to redefine the cam with a high degree of confidence, but it does show that it is off by over a degree of blade rotation in the same direction as the McNary cam.

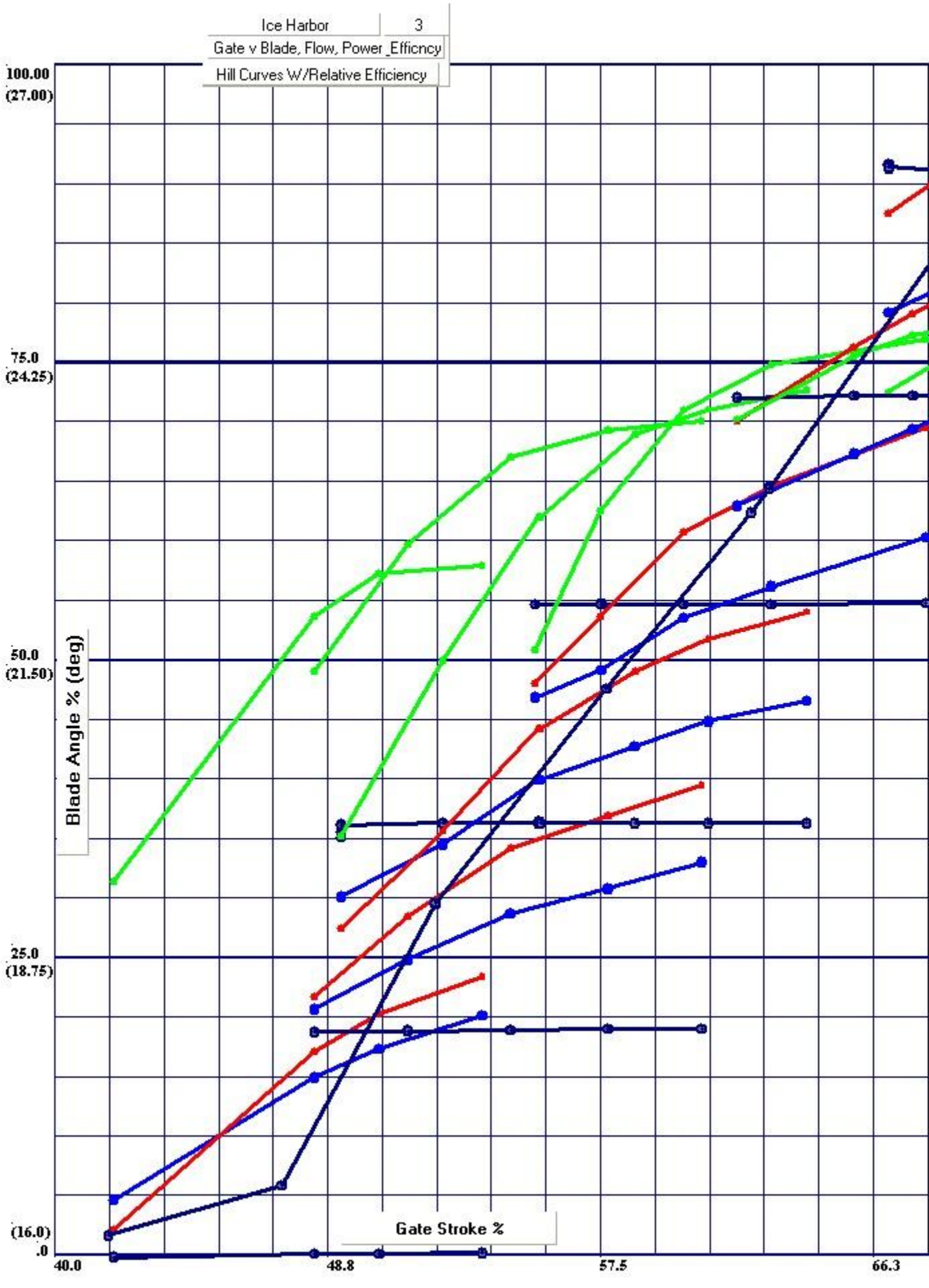
Best,
Doug

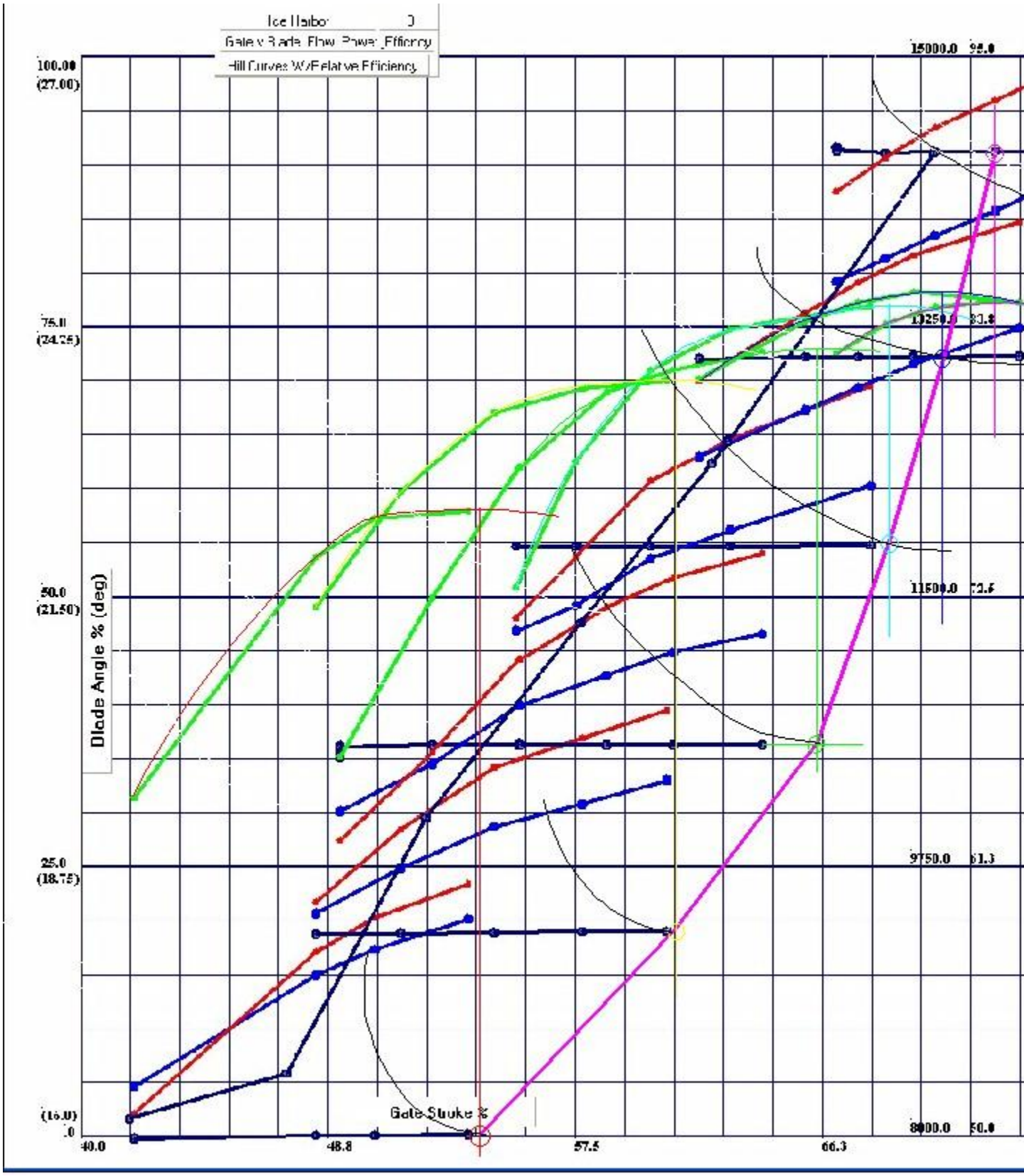
p.s. I spoke with Dan yesterday, he seemed to like the idea of an isolated series signal tap into his transducer's 4-20mA signal output. This will allow the ITB to be hooked up in parallel with your other equipment and transparently collect data at the same time as his planned testing.
I have built and tested this isolation module and will give it to you free of charge to facilitate additional ITB testing – if I can have copies of the resulting data.

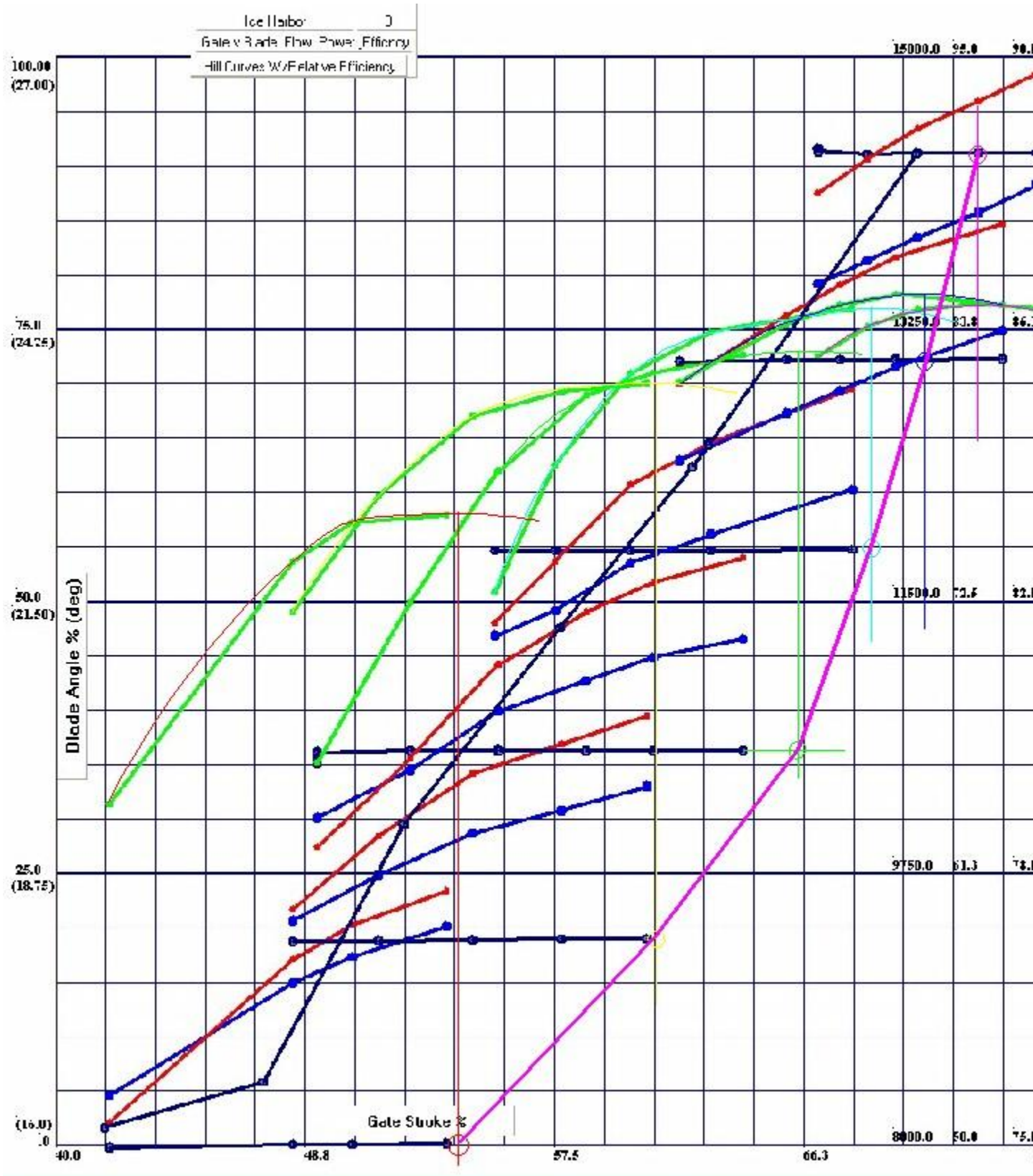
I recall you said as soon as I gave you my reduction of this Ice Harbor data set, I could have a copy of the other data set from your data logger. Please send this along to me so I can make the comparisons/contrasts with the ITB data set.

I would also like a copy of the “with” and “without” screens GDACS 3-D cam data file for Ice Harbor Unit 3. I assume like McNary, all of the units at Ice Harbor of the same design use identical cam definition files.

The ITB uses this data as a frame to showcase the collected data and cam reduction, making a more credible presentation of the results. These are data files on the Flash Memory card in the GDACS 3-D cam with a filename like: “TABLE.CSV” and “TABLEFS.CSV”, for without and with screens operation. May I have these please?


Ice Harbor
3
Gate v Blade, Flow, Power _Efficncy
Hill Curves W/Relative Efficiency
100.00
(27.00)
75.0
(24.25)
50.0
(21.50)
25.0
(18.75)
(16.0)
.0
Blade Angle % (deg)
40.0
48.8
57.5
66.3
Gate Stroke %


Ice Harbor
Gate v Blade Flow Power Efficiency
Hill Curves W/Relative Efficiency
100.00
(27.00)
75.0
(24.25)
50.0
(21.50)
25.0
(18.75)
(16.0)
.0
Blade Angle % (deg)
40.0
48.8
57.5
66.3
Gate Stroke %
15000.0
11500.0
9750.0
8000.0


Ice Harbor
Gate v Blade Flow Power Efficiency
Hill Curves W/Relative Efficiency
100.00
(27.00)
75.0
(24.25)
50.0
(21.50)
25.0
(18.75)
(16.0)
.0
Blade Angle % (deg)
40.0
48.8
57.5
66.3
Gate Stroke %
15000.0
11500.0
9750.0
8000.0