A Shopper's Guide to Self Regulating Tide Gates (SRTs)

By Jeff Juel, owner Juel Tide Gates

Q. What should a person look for when shopping for an SRT?

A. Price and value (Obviously!)

Price is pretty easy to get a handle on – just ask for price quotes from the SRT suppliers. (See attached.[1])

Value is a little more complex.

- The SRT should do its job consistently and it should operate reliably.
- It should be durable.
- It should be simple to operate and maintain.
- It should be made using the highest quality materials.
- It should be fail-safe.
- The supplier should stand behind their SRT.

Compare the side-hinged flap gates provided by Juel Tide Gates[2] to Golden Harvest's model GH-850…

Reliability

The VBFG™ by Juel Tide Gates opens between 80 and 90 degrees to the headwall whenever the water level on the downstream or tidal side of the gate is equal to or lower than the water level upstream. It does this consistently regardless of the tide curves. The GH-850 opens between 20 degrees and maybe 70 degrees to the headwall - depending on the amount of outflow. In some locations and under certain tides and flows, the GH-850 will suffer Tide Gate Entropy Death[3] and will open very little or will not be open at all for extended periods of time. The Juel Tide Gate is immune to Tide Gate Entropy Death.

In 2006 Golden Harvest encountered Tide Gate Entropy Death with the installation of their first (or was it their second?) installation of their model GH-850 tide gate at Edison Slough. This tide gate had a very severe recurring case of Tide Gate Entropy Death. On January 14, 2009 Jeff Juel retrofitted the Edison tide gate with his ingenious

[1] The attached quote from Plast-Fab does not include the commission or the price from Juel Tide Gates for the control mechanism, installation, life-time maintenance, etc. The quote from Golden Harvest is for the delivered SRT- no installation.
[2] The Variable Backflow Flap Gate - or VBFG™, consists of a side-hinged flap gate fabricated by Plasti-Fab and a control mechanism fabricated, installed and "tuned" by Juel Tide Gates.
[3] See the Q&A section on my web site www.jueltide.com for a description of the cause of Tide Gate Entropy Death.

and elegant patent pending VBFG™mechanism. The Edison Slough tide gate has been working reliably and flawlessly ever since.

In spite of not using a float to detect and control when the gate closes, a properly tuned VBFG™ closes consistently within a very small range of upstream water levels.

The SRT should operate in a way that accommodates adaptive management and allows the operator to maximize environmental benefits without compromising flood control and drainage. With an elegant yet simple and fail-safe design, along with Juel Tide Gates' commitment to life-cycle engineering, this is a given.

With Golden Harvest's "deliver it and forget it" approach and the complexity of the control system, there is little or no chance that the gate's operation will be optimized to maximize environmental benefits.

Durability

The original restrained side-hinged self regulated flap gate was designed and installed by Jeff Juel while working for the Seattle District US Army Corps of Engineers in 1995/1996. (His design predates the coining of the term "Self Regulating Tide Gate".) There are five "copies"[4] of his design in operation in Aberdeen. The original design was fabricated by Plasti-Fab of Tualatin Oregon and used a composite gate leaf with stainless steel fabricated components and is very heavy-duty. These gates have survived for 12 years with no failures.[5]

The Chehalis River in Aberdeen has a considerable large woody debris load. Near the end of the construction of the flood control project in 1996, there was a high river flow that carried a number of large logs down the river. When the river stage dropped, it left a 25 foot long 30 inch diameter log high and dry on top of one of the open tide gates at Mill Creek[6]. It caused no damage whatsoever. That is a durable tide gate!

The GH-850, on the other hand, uses light plate steel and aluminum. This may be adequate for some locations, but who knows? The installations of the GH-850 that I am aware of (Edison Slough and McElroy Slough) are in locations that are much less demanding than the banks of the Chehalis River. It will be interesting to see what happens if a GH-850 ever closes on some floating debris and then experiences a high seating head. Given the forces involved and the light duty construction, I'd put my money on the debris.

[4] I mean "instances". The "copies" of my Aberdeen tide gate design are at Edison Slough and McElroy Slough.
[5] See my web site www.jueltide.com for a letter from the City of Aberdeen regarding the reliability of the original SRTs that I designed. The city is only concerned about flood protection. Failures related to fish passage are not a concern, in fact they'd prefer that the streams running through town not be salmon-bearing. It lessens their restrictions on ditch and culvert maintenance. Tide Gate Entropy Death probably happens periodically, but they don't report it.
[6] The USACE may have the photo I took of this log stored away somewhere in their archives.

Simple to Operate and Maintain

Jeff Juel's original design - and the GH-850 - operate with a fairly complicated hydraulic restraint system. The elevation of the float in the float well must be adjusted seasonally if less tidal flushing can be tolerated during the flood season. The system uses hydraulic fluid that can leak, and a fluid reservoir that must be checked and topped-off. If the system is malfunctioning, the hydraulic system's components will need to be tested and the malfunctioning component identified. This is no small feat. The hydraulic components should also be serviced and inspected periodically, and the hydraulic fluid changed at some interval.

With the VBFG™ by Juel Tide Gates, the control mechanism is elegantly simple[7]. There are no fluids or complicated components. An 11 year old can understand how it works and could probably diagnose a malfunction in less than 5 minutes[8]. It is simple to adjust the operation of the gate so that it closes earlier or later. It is simple to temporarily disable the gate so that it allows no backflow whatsoever. (This may be desirable during flood events.)

There are four parts involved in the VBFG™ control system: a line[9], a sheave, a tension regulator and a means of adjusting the tension in line. The parts are easily replaced and they are inexpensive. Juel Tide Gates provides a life-time guarantee[10] on the tension regulator and all of the components of the gate control system.

Highest Quality Materials

The GH-850 uses 304 stainless steel and aluminum. (Aluminum?!) The Juel Tide gate fabricated by Plasti-Fab[11] is made using 316 stainless steel. 316 stainless steel is more corrosion-resistant and is a more expensive grade of stainless steel than 304. 316 is the proper grade of stainless steel to use in salt water or brackish environments.

The gate leaf used in a VBFG™ by Juel Tide Gates is manufactured by Plasti-Fab and is composed of fiberglass over a steel skeleton. Plasti-Fab has made hundreds of water control gates using this construction method. Their gates are heavy duty and they are used in corrosive environments. The original gate leaves at Aberdeen still look like new (other than the slime and a few barnacles) after 12 years with no maintenance. The tension regulator and the VBFG™ mechanism use the highest quality materials available – stainless steel and high density polypropylene.

Fail Safe

The VBFG™ tide gate control mechanism is the epitome of fail-safe. There are hardly any parts. If any of the parts break, they will break when the flap gate is closed and the gate will then become a free-swinging flap gate

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[7] Simple, but not obvious… in fact a number of engineers opined that the VBFG mechanism would not work.
[8] My 11 year old son could do it in 3 minutes.
[9] Stainless steel wire rope is used in 3 out of the 4 gates I've retrofitted to date.
[10] The Juel Tide Gates Guarantee covers replacement parts and installation.
[11] Plasti-Fab was the fabricator of the original side-hinged flap gates in Aberdeen.

that opens wide for outflow and closes in standing water – and that's not catastrophic at all. Replacing the failed part can be accomplished in a few hours and the parts are inexpensive and readily available.

With the GH-850, the components of the control system consist of: a float, a hydraulic cylinder, a pressure compensating flow control valve, a check valve, a pressure relief valve, a hydraulic pump, hydraulic lines, and a hydraulic fluid reservoir[12]. If the float gets stuck in the float well, an excessive amount of water could pass the tide gate causing flooding. If the hydraulic cylinder or the check valve fails, the gate could stay closed when it needs to be open to pass water – resulting in flooding. If a line breaks or a seal fails, you have a hydraulic fluid leak to deal with.

On the other hand, the Aberdeen SRTs have performed reliably to date. This is due primarily to the reliability of the components. The system is not inherently fail-safe.

Integrity

Jeff Juel stands behind his work. He keeps in contact with the people he works for and makes sure that they are satisfied. He has the actual people who are responsible for his tide gates in his cell phone and contacts them regularly. He promises that if he installs a VBFG™ control system on your tide gate and it doesn't work, you don't have to pay him – and he's been paid every time so far[13]. He has numerous letters of appreciation from the clients who he has done engineering work for over his 25 years of engineering achievement.

In contrast, the Edison Slough SRT was installed in 2006. It never worked for any length of time before Tide Gate Entropy Death would set in. Golden Harvest simply gave up on it. (I assume that they got paid in spite of this?)

(they're speechless)

[12] This list is based on the assumption that Golden Harvest completely and accurately reverse-engineered my original Aberdeen design.

[13] I'm still waiting for $44.03 from Diking District 7 in Snohomish County for a flap gate retrofit at the Cherry Valley Pump Station. I only invoiced them on 6 January 2009, so I probably will give them another couple of weeks before I resort to a collection agency.

9665 S.W. TUALATIN-SHERWOOD ROAD
PO BOX 100 v TUALATIN OR 97062
PHONE: (503) 692-5460 FAX: (503) 692-1145
E-MAIL: rstewart@plasti-fab.com
WEB: http://www.plasti-fab.com

Juel Tide **Email:** 01-16-09
Attn: Jeff Juel | **Quote No. 090116105**

Project: Dept. of Fish & Wildlife - NC | **Engineer:**
Bids:

Qty		Price	Total
1	Heavy Duty Fiberglass Tide Gate 8'0" x 8'0" with: T-316 heavy duty stainless steel hinge assembly Neoprene seals		$27,500.00
		NET Sub Total	$27,500.00
		Submittal Binders & O&M Manuals - $200 for first 6, additional at $20 ea.	$200.00
		Shipping & Handling	$1,350.00
		TOTAL NET FFA	**$29,050.00**

NOTES:

Jeff I reviewed this with Harry. What we will need to do is meet with you to work out the actual design criteria. The hinge system could likely be much simpler and much less expensive. We will have to decide on a grade of stainless and thickness. This is a very quick safe number that I am sure we can improve on.

Commission: ADD Your Commission

Submittal Charges: Submittal Charges apply to:
1) Submittal Packages that require binding
2) O&M Manuals

Charges do not apply to mailed copies of Approval Prints.

Charges are per printing. $200 for the first (6) copies and $20 each for all additional copies. Preliminary and Final copies will be considered (2) printings and will each require the $200 initial charge.

General unformatted O&M Manuals are available free of charge from the Product CD, Website or E-Mailed.

Freight: Freight is quoted FFA, FOB Factory.

Prints: All orders require approval prints. Prints will be sent to customer within 2-3 weeks of order placement or complete application information, whichever is later. Not including day of receipt of order, weekends or Holidays.

Shipping: Shipping will be 7-9weeks after approval of prints, not including day of approval receipt, weekends or Holidays

Terms: Plasti-Fab terms are 1% NET 15 or NET 30. All orders require Credit Approval and a credit application must be completed. Credit Applications are good for (1) year from date of completion.

Validity: This quote is valid for 90 days.

Taxes: Taxes are not included on this quote. Upon receipt of Purchase Order, please forward either your Tax Resale No, Exemption Certificate or Tax Rate this order will be subject to.

Escalation: The quoted price is subject to escalation if the shipment date exceeds 180 days (6 months) from the Purchase Order Date.

Terms & Conditions: All orders are subject to Plasti-Fab Terms and Conditions, found at: www.plasti-fab.com/tandc

Quotation: The equipment quoted above is based upon:

1) Information received, which did not include Specifications or Contract Drawings
2) Contract Drawings
3) Specifications
4) Additional information provided during Engineer Consultation

This quotation is only for the equipment specifically listed above and does not include any additional items referred to, inferred or assumed to be included by any specification, correspondence or conversation.

This Quote has been proudly prepared by: Randy Stewart, Western Region Account Manager
Ph (503) 783-5206 * Email: rstewart@Plasti-Fab.com

Golden Harvest, Inc.

Golden Gates™

Phone: 360-757-4334
Fax: 360-757-1135
Email: sales@goldenharvestinc.com

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Burlington, WA 98233
Web: www.goldenharvestinc.com

Quoted by: DAVID WISE

QUOTATION #08-0908 PAGE 1 OF 1

TO:
Saybr Contractors, Inc.
3852 S 66th St.
Tacoma WA 98409

ATTN:
Karen S.

PHONE:
253 531-2144

FAX:
253 536-2068

DATE: September 5, 2008
QUOTE EXPIRES: 30 days
JOB: Julia Butler Hansen Nat'l Wildlife Refuge Habitat Cathlamet, WA
BID DATE: September 8, 2008 2 PM PDT
ENGINEERS: U.S. Army Corps of Engineers – Portland Dist. Jeremy Britton
PHONE: 503-808-7851
FAX: 503-808-4605
FOB: FACTORY (Full Freight Allowed)
SHIPPING NOTE: Split shipments will be at buyer's expense
TERMS: Net 30
SUBMITTALS: **2-4 weeks following receipt of order.**
DELIVERY: **12-14 weeks following submittal approval.**
ADDENDA REC'D:

CONFIRMING QUOTATION GHI IS THE NAMED MANUFACTURER

SPECIFICATION: 49 20.00 25 tide gates
SECTION:

GATES MEET OR EXCEED SPECIFICATIONS: NO EXCEPTIONS.

#	LOCATION	GATE	SIZE	TYPE	QTY	TOTAL
1	INDIAN JACK, DUCK LAKE, WINTER SLOUGH, HAMPSON SLOUGH	SRT-1,2,3,4	72 X 72	MD GH-850 SIDE HINGED RESTRAINED TIDE GATE. ALUMINUM AND 304 S-STL. FRAME, DOOR, HYDRAULIC CYLINDER, HYDRAULIC CONTROLS, HYDRAULIC CONTROL BOX, TORQUE TUBE, FLOAT & TUBE ASSEMBLY, HINGES, HARDWARE, HINGE BUSHINGS & MOUNTING BRACKET	4	$50,875.00 EA.
2	BROOKS SLOUGH	SRT-1,2,3,4	64 X 60	MD GH-850 SIDE HINGED RESTRAINED TIDE GATE. ALUMINUM AND 304 S-STL. FRAME, DOOR, HYDRAULIC CYLINDER, HYDRAULIC CONTROLS, HYDRAULIC CONTROL BOX, TORQUE TUBE, FLOAT & TUBE ASSEMBLY, HINGES, HARDWARE, HINGE BUSHINGS & MOUNTING BRACKET	1	$45,500.00
				TOTAL GATES	5	$249,000.00

Field service:

(2) Trips, consisting of 2 days per trip.

1. Stainless steel anchor bolts are included for concrete mounted frames.
2. Slide gates per specification.
3. Sales tax not included.
4. Mill finish on aluminum/stainless steel surfaces.