

OSPR/Chevron Oil Spill Response Technology Workshop

Developments at Elastec

Paul S. Smith

March 1, 2017



Converting Response Boat Outboard Engines
to Jet Pumps for Shallower Draft

SHALLOW WATER RESPONSE



Sponsored Research

- Jet pumps that replace the conventional propeller lower unit on outboard engines have been around for decades.
- Known to decrease performance. How much?

In 2013, Enbridge, Inc. of Calgary provided funding to assist Elastec in its research to quantify decreased performance.

Motivation

1. Increased emphasis on inland transport of oil by pipeline and rail



2. Increased risk of inland releases to rivers and lakes



3. Need for shallow water response assets

Motivation

Where's the channel?

The Test Vessel



30-Foot Kvichak/MARCO RRS

The Test Vessel

- **Dimensions**
- Length overall 9.3m (30' - 7")
- Beam overall 2.4m (8' - 0)
- Draft (empty) 0.78m (2' - 7")
- **Draft (loaded) 1.07m (3' - 6")**
- Displacement, lightship 3,200 kg (7,070#)
- Displacement, full load 6,800 kg (15,000#)
- Height (mast down - on trailer) 4.0m (13' - 0)
- Height (mast up - in water) 4.3m (14' - 3")
- Height (mast down - in water) 3.2m (10' - 6")

The Test Vessel (before)



30-Foot Kvichak/MARCO RRS

The Modification

- Purchased Jet Conversion kits from Specialty Manufacturing Company of San Leandro, California for 70HP Yamaha 4-stroke outboards - nominal 20" shaft length
- Modification took 3 - 4 hours on each engine with two "mechanics" (Don Johnson & me)
- Kits were well done. Everything fit.

The Test Vessel (after)



30-Foot Kvichak/MARCO RRS

The Result

Dimensions

- ~~• Draft (loaded) 1.07m (3' - 6")~~
- Draft (loaded) 0.77m (2' - 6 1/2")

Reduced operational draft (engines down) by almost a foot.

The Cost

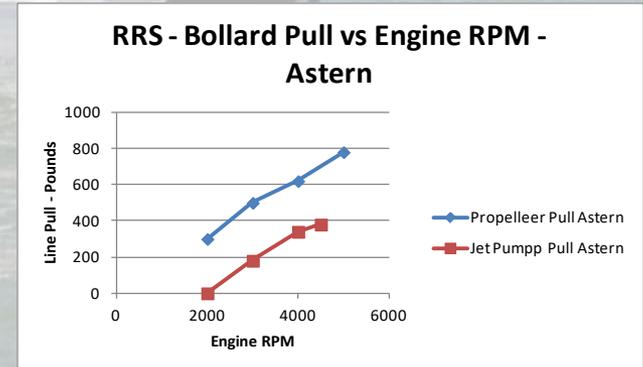
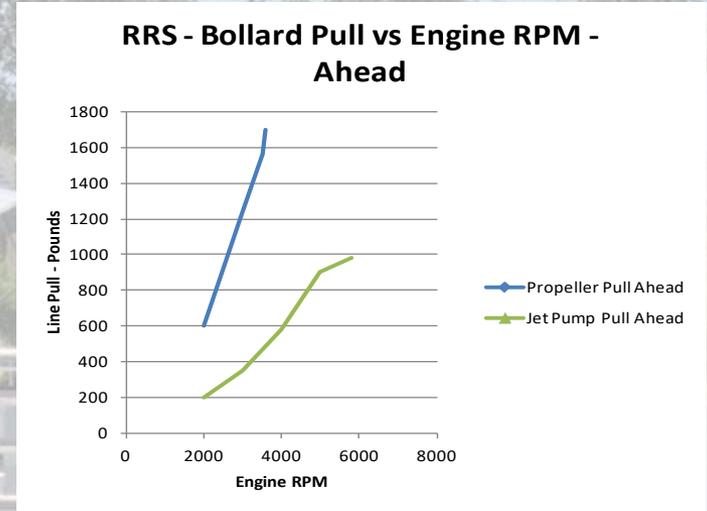
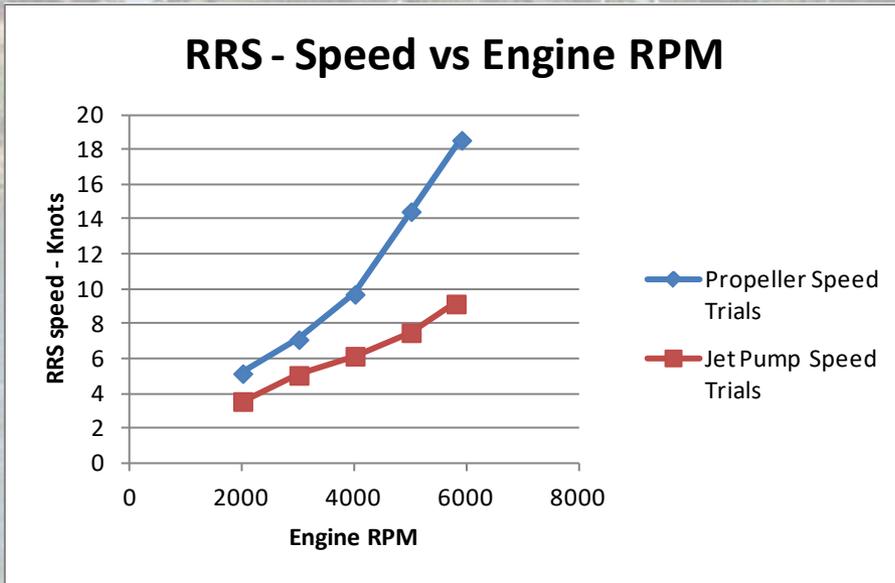
Performance

| | Open Propeller | Jet Pump |
|-----------------------|----------------|------------|
| Top speed (Average) | 18.55 knots | 9.15 knots |
| Bollard Pull (ahead) | 1700 pounds | 980 pounds |
| Bollard Pull (astern) | 780 pounds | 380 pounds |

- Reduced top speed and bollard pull by about half.

The Cost

Test results



The Cost

Observations on Bollard Pull test:

- Propellers:
WOT 3600 rpm
- Jet Pumps:
WOT 5800 rpm (ahead)
WOT 4500 rpm (astern)

Conclusion: Props were too “steep” for Bollard pull.
Pumps were well matched.



The “Bollard”

The Result

Observations:

- Difficult steering a straight course at low speed
 - Very difficult holding heading during ahead BP tests with jets
 - One operator overcorrected using steering wheel
 - One operator abandoned the steering wheel. “Split the sticks” to steer with differential power
 - Very easy to hold heading during astern BP tests with jets
- Above 3000 rpm (5 knots), jets handled perfectly, cornering flat. Full 360° in less than 2 boat lengths

Recommendations

Pros

- Draft reduction is very attractive.
- Free running handling characteristics are good for fast moving river.

Cons

- Towing and other low speed maneuvers ***will be challenging***
- Speed reduction is significant

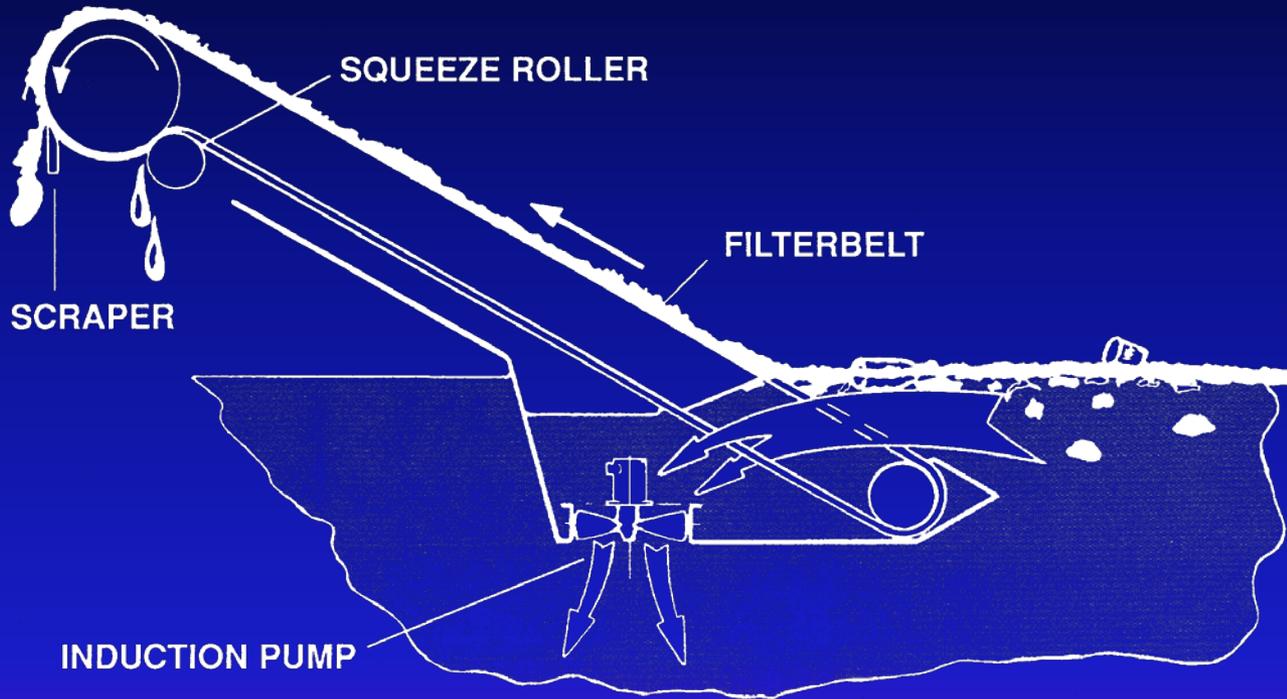
OSROs - Try it before you buy it.

A Reintroduction of the MARCO Sidewinder
Vessel of Opportunity Skimmer

ELASTEC/MARCO PORTABLE FILERBELT SKIMMER



Remember the FilterBelt



MARCO FILTERBELT
OIL AND DEBRIS RECOVERY SYSTEM

How The MARCO Filterbelt Works

Remember the Filterbelt

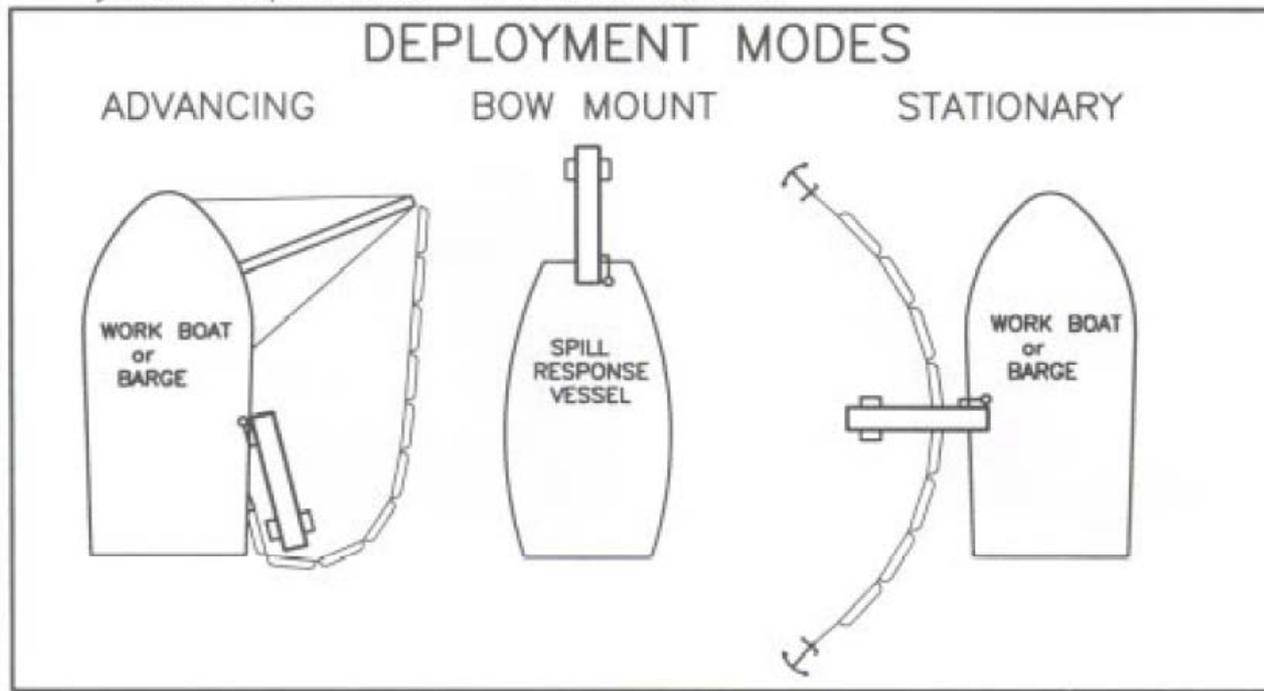


How The MARCO Filterbelt Works



Originally Designed for FRV Deployment - Advancing or Stationary

Length: Standard Length = 14'-9"
Available in lengths of 11'-9", 17'-9", or 20'-9".
Adaptable to freeboards up to 6'-7".
Hydraulic Requirements: 10 GPM at 1600 PSI.



Originally Designed for FRV Deployment



The Update from Elastec Bow Mount Deployment

ELASTEC / Marco
Portable FilterBelt Skimmer
Oil Recovery System



The Update from Elastec



Motivation – Vessels of Opportunity

- Sounds attractive



Motivation - Collect Post-Burn Residue



Thank you!

