

# Normetex Pump Replacement

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Normetex Pump Alternatives Rev Date: 4-9-13

# Objectives

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- Determine specific pump requirements
- Evaluate alternatives to the Normetex pump
- Short-term Actions  
(in-house activities until a new pump is available)
- Proposed Path Forward

# Normetex Background

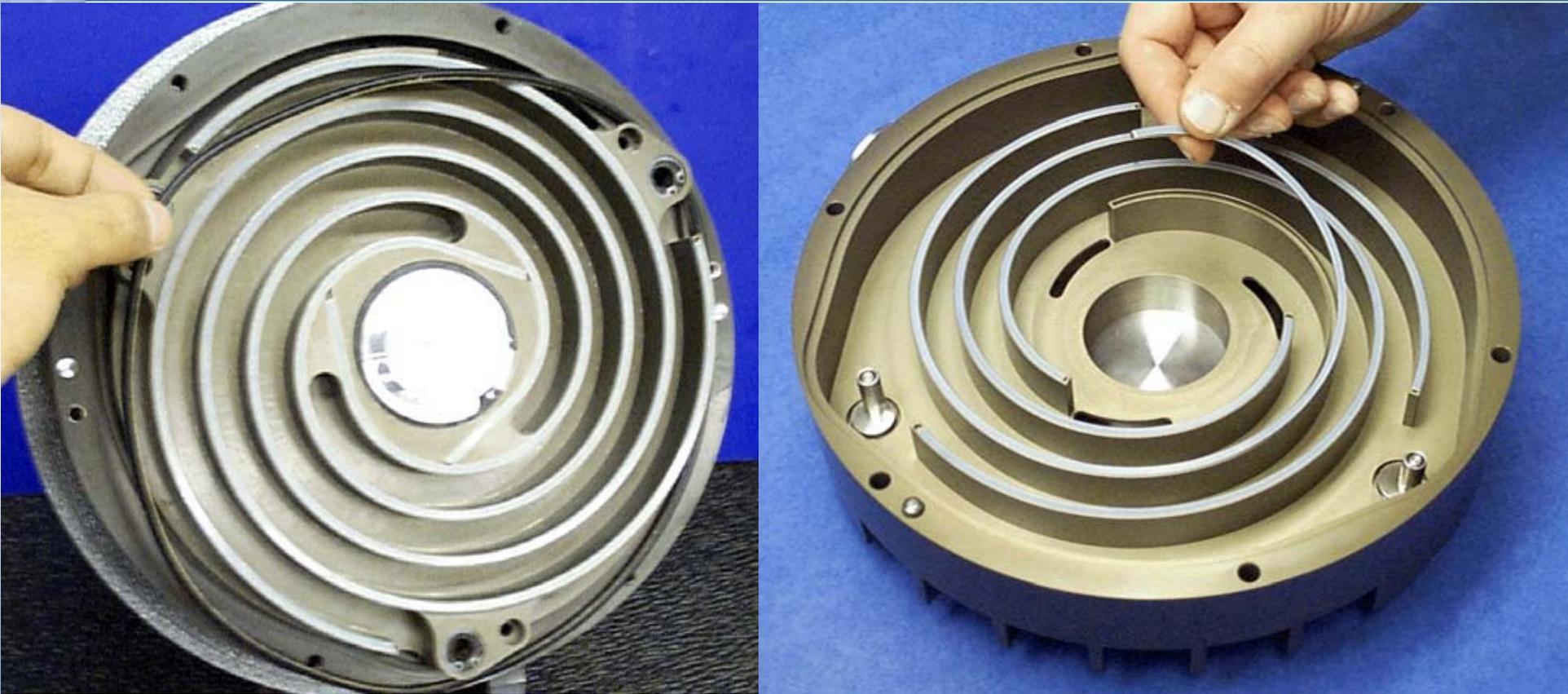
- Normetex is truly a unique pump - the Met-Bel / Normetex pump train provides a hermetically sealed, clean (no lubrication, no particulate & no polymer exposure), micron to 20+ psi pumping range
- Basic Normetex Features:
  1. All stainless steel
  2. No polymers
  3. Hermetically sealed
  4. Completely dry – no lubrication within the hermetic seal
  5. No rubbing contact
  6. 30,000+ hours between maintenance
  7. Expensive – about \$66,000 each
  8. Rebuilds – difficult with mixed success

**NOTE:** It may be possible to relax some of the polymer restriction.

# Pump Considerations

- With Normetex obsolete, we need to evaluate our true process/safety constraints in the selection of an alternative. Issues to be considered when evaluating alternative pumps (note there are currently 59 Normetex pumps across Tritium Facilities that will need to be replaced over time):
  - Dry operation: what level of hydro-carbons (lube / methane) or Krytox could be tolerated in the process equipment or product (i.e., ppm, 0.1%, etc.)? **Virtually none**
  - Polymer exposure to process gas (tritium): how much can we live with? Which polymers cause more trouble? (SRNL continue to study polymer exposure) **Some OK**
  - Cost: how much is available to develop a replacement? **Very Important – Find the money**
  - Material: can we live with carbon steel or iron instead of stainless steel? **Iron ??**
  - Leak rate: what is really acceptable in our process? **Hermetic seal 1e-7 cc/sec Helium**
  - Particulate: is polymer particulate a concern? (11 micron filters before/after each pump)
  - Footprint **not a problem**
  - Piping configuration **make pipe jumpers**

# Typical Scroll Pump Tip Seal

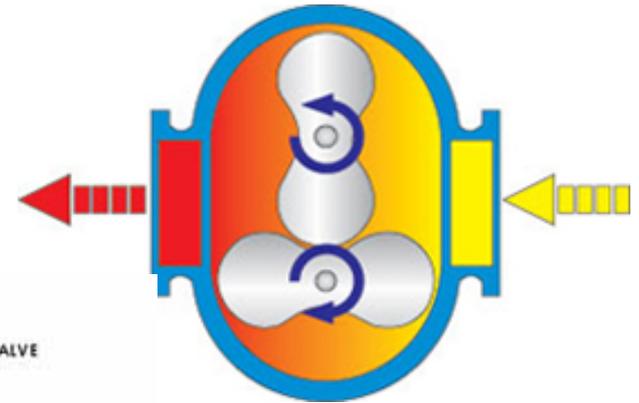


Varian pump with Viton O-ring & Polymer tip seal.  
Also note eccentric shafts with bearings inside the process gas boundary. This configuration is typical for vacuum scroll pumps.

# Normetex Replacement Options (potential candidates)

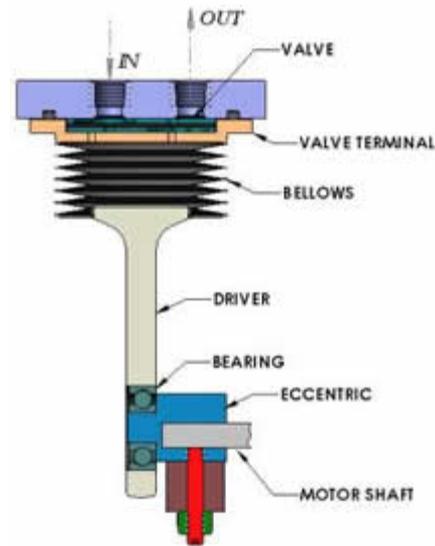
## 1) Scroll Pumps

- 1) Air Squared
- 2) Edwards
- 3) Varian/Agilent
- 4) Busch
- 5) Anest-iwata



## 2) Multi-stage Roots Pumps

- 1) Pfeiffer
- 2) Kashiyama
- 3) Ebara



## 3) Piston – Metal Bellows

- 1) Met-Bel (Senior Aerospace)

# Options Considered

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A: Use the closest existing pump on the market to a Normetex

B: Utilize a tip seal material minimally impacted by tritium

C: Utilize multi-stage roots pumps

D: Develop a non-lubricated hermetically sealed roots pump

E: Utilize Met-Bel pumps only in the process

F: Utilize a completely different style pump

# SHORT TERM ACTIONS

## SHORT TERM: A

BUY(3) EUMECA  
(NORMETEX)  
PUMPS

THIS IS MONEY  
THAT WAS ALREADY  
ALLOTTED

LONG LEAD  
TIME, PSD  
9/13

## SHORT TERM: B

BUY (5)  
OFF-THE-SHELF  
EDWARDS PUMPS  
FOR PURGE  
STRIPPER

REPLACE THE  
EXISTING NORMETEX  
SAVING THEM AS  
SPARES

CREATES (5)  
USED  
SPARES

## SHORT TERM: C

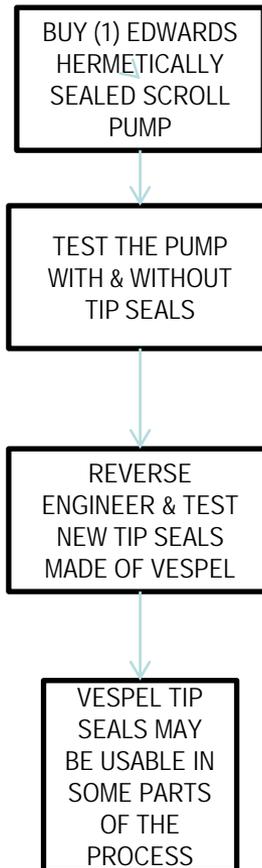
SHUT DOWN (4)  
REDUNDANT PUMP  
TRAINS IN TEF

REMOVE THE NORMETEX  
PUMPS FROM TEF AS  
NEEDED FOR SPARES

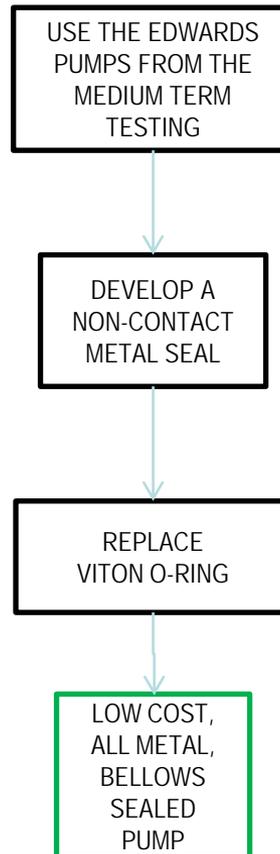
CREATES (4) USED  
SPARES

# MEDIUM & LONG TERM ACTIONS

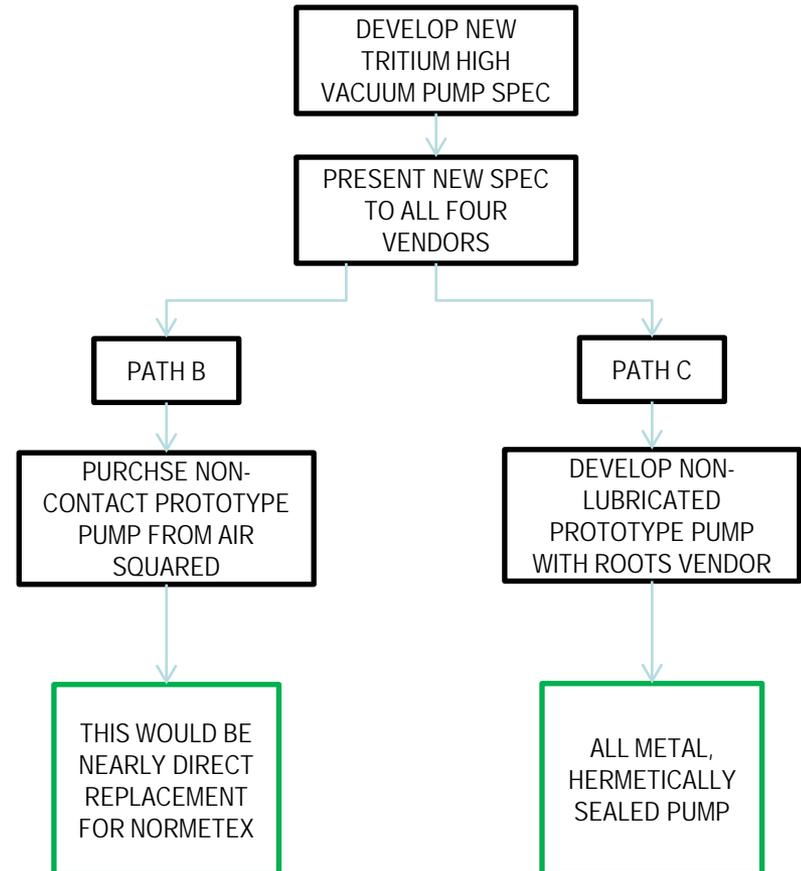
## MEDIUM TERM



## LONG TERM: A



## LONG TERM: B & C



# Current Status



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- Eumeca reports progress. Assembly of pumps to begin in May with delivery on schedule in September.
- Bearing bronze flat wire to replace Edwards tip seal PSD 4/18/13.
- No manufacturer of a multi-stage roots blower pump was able to meet the technical challenges of converting their design.
- Air Squared of Colorado is positioned to produce a prototype pump for SRS that will be a very close substitute for the Normetex and will meet the technical requirements discussed.