University of Latvia
Institute of Physics

PbBi related activities in IPUL

(Institute of Physics of the University of Latvia)

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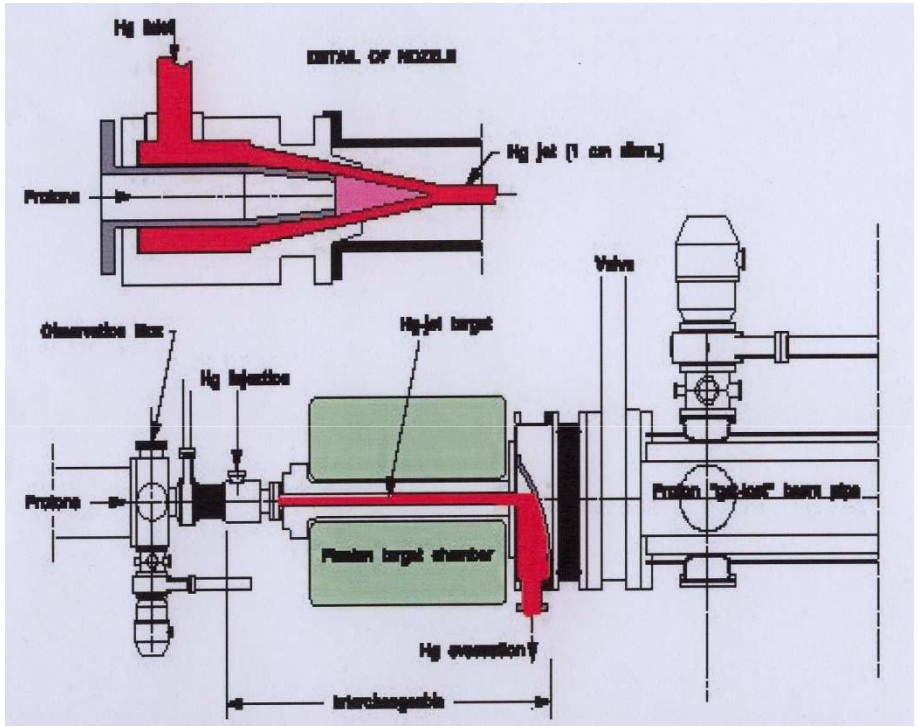
EURISOL multi MW windowless target prototypes

Originally proposed target design



The originally proposed Hg – jet formation
Diameter of jet 10 – 20 mm;Q=2.5 l/s;
V= 30 m/s; **p>50bars!!!**

Transverse film experiments on InGaSn loop

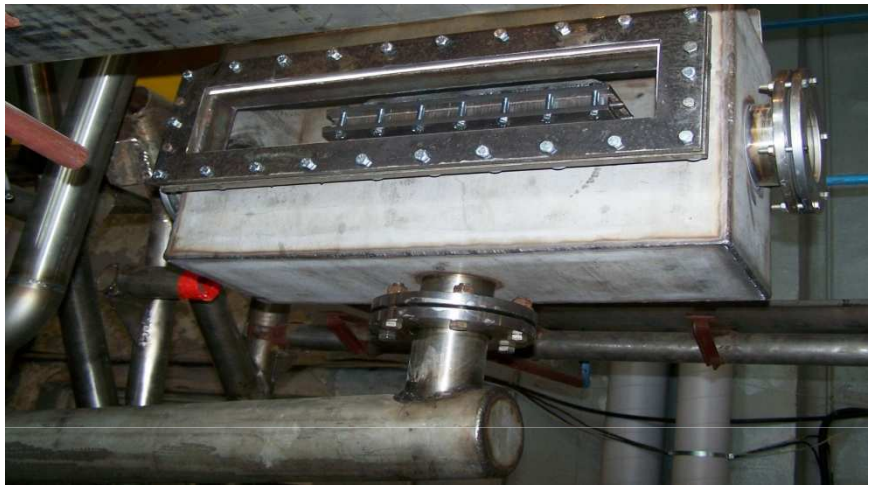
Transverse film experiments on Hg DN 60 loop

Loop DN60

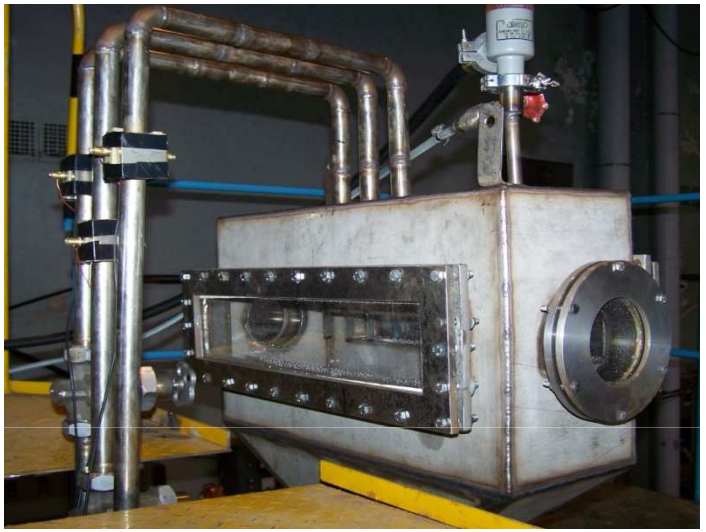
P=2 bar; Q~1.5 l/s

Experiments on DN100 Hg loop

Test section

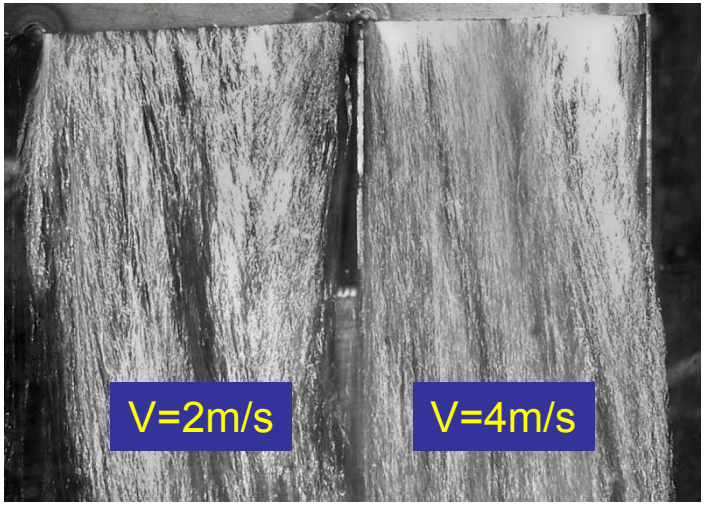


Windowless sectioned target



Velocity 2m/s, dimensions – 300x16 mm

Two target sections with different flowrate



PbBi loop for investigation prototype of 100kW Target body

EURISOL project (CERN), max. Temperature - 600°

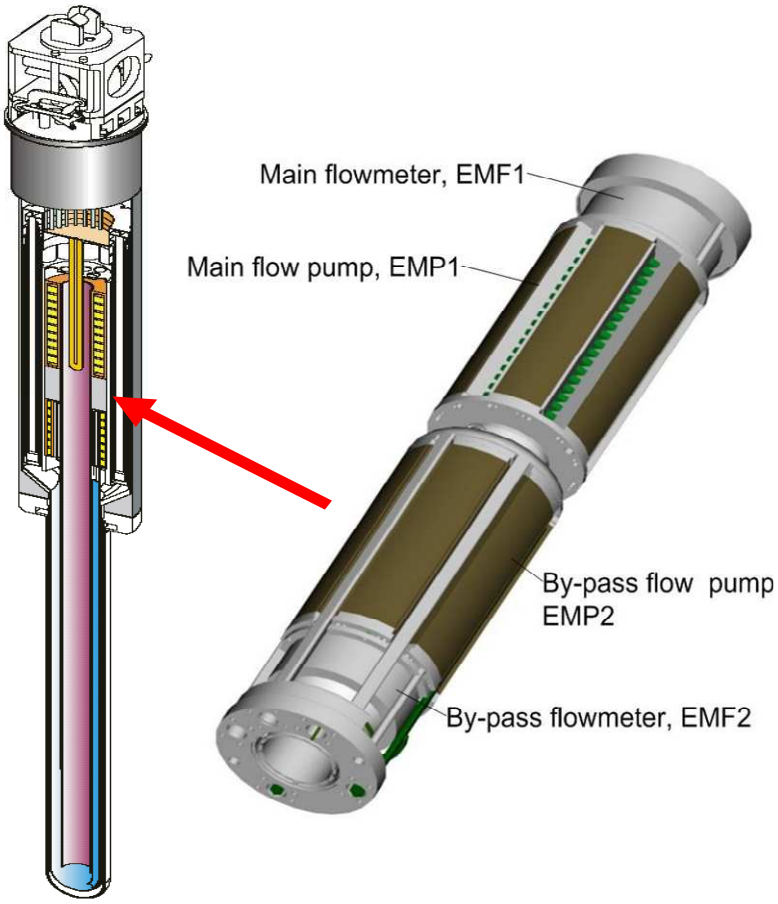
PbBi and PbAu eutectic corrosion experiments

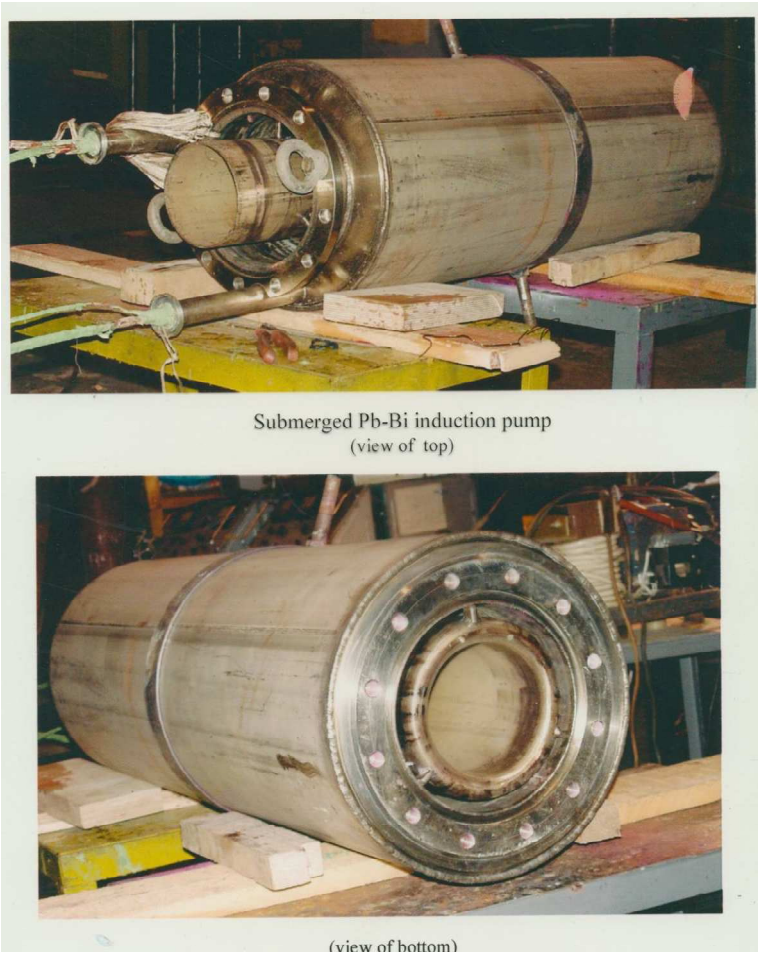
Lead – Bismuth &
Lead – Gold →

Twin loops for corrosion tests

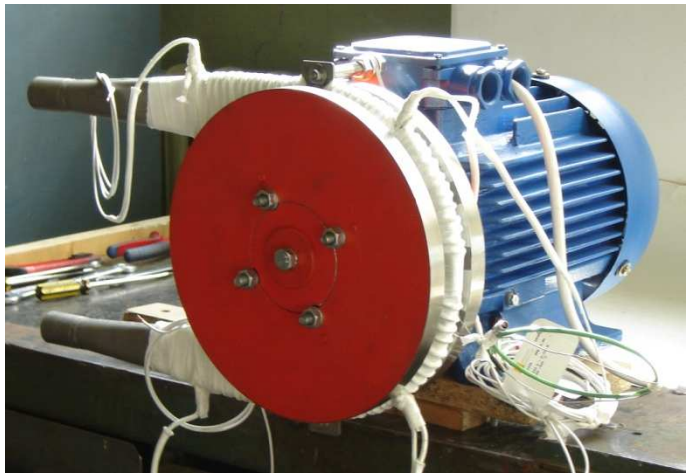
EM induction pumps

Submerged annular electromagnetic pump developed for PbBi





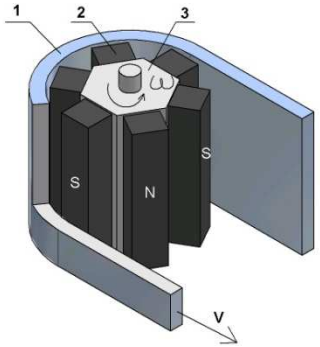
Electromagnetic induction pumps on permanent magnets

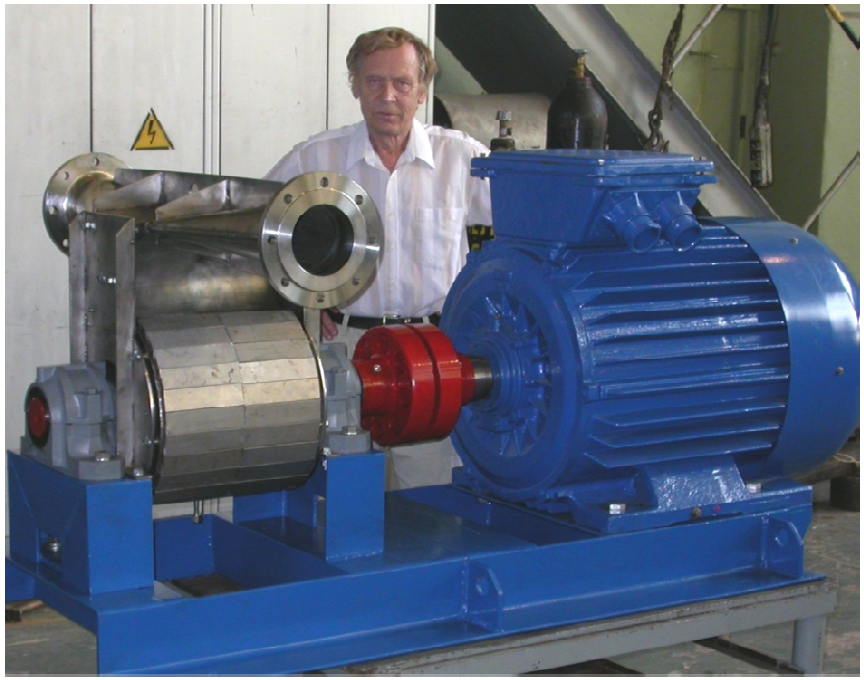


Pump for LBE alloy (T_{max} = 450^{0}C) designed, fabricated and tested at IPUL

PbBi pump - developed *P* = 6 bar, provided flow rate *Q* = 7 L/s.

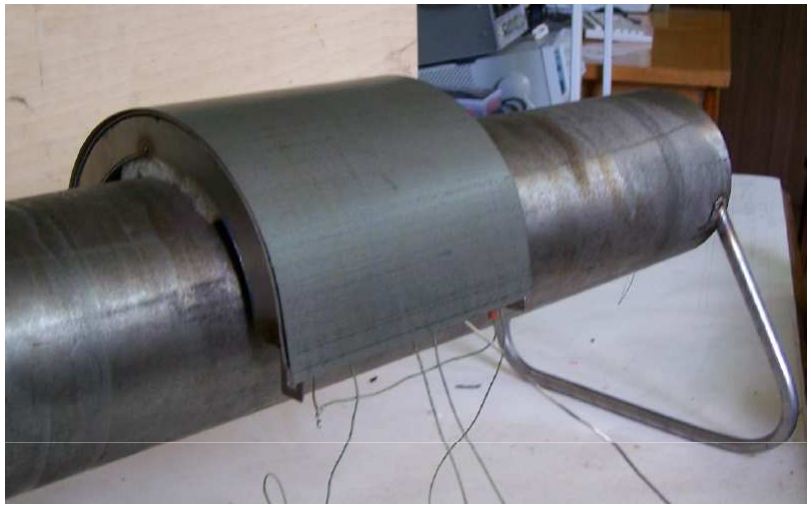
PMP principle scheme

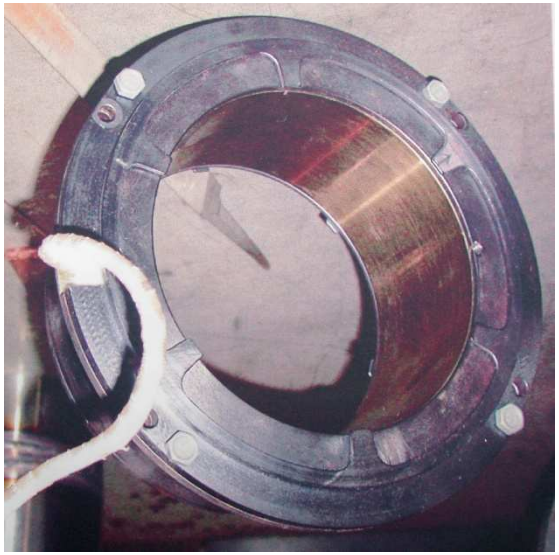




EM Induction Pump on Permanent Magnets for Mercury
Operating temperature up to200 ^{0}C
Developed pressure *P* = 6 bar, provided flowrate *Q* = 13 L/s (175 kg/s); Motor power for pump drive 90 kW

EM contactless Flow Meters





Functional diagram of the Flow meter

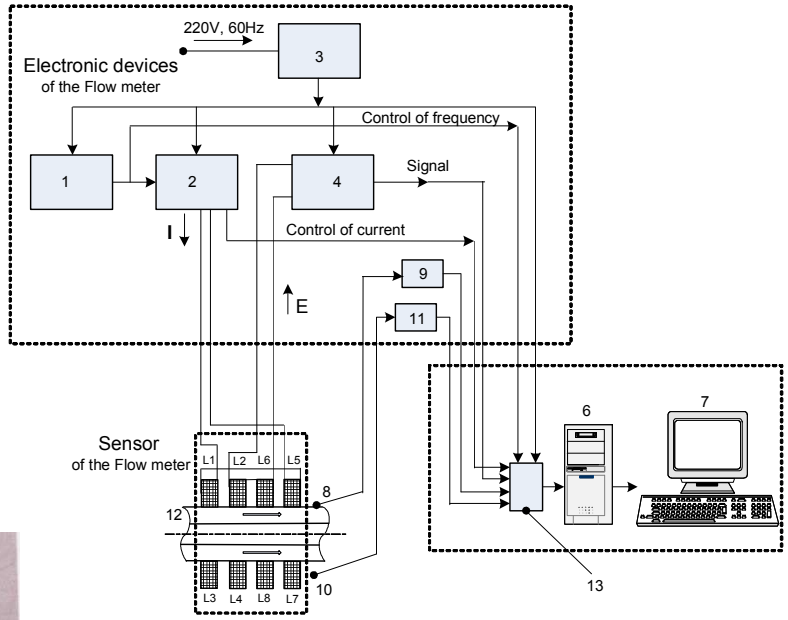
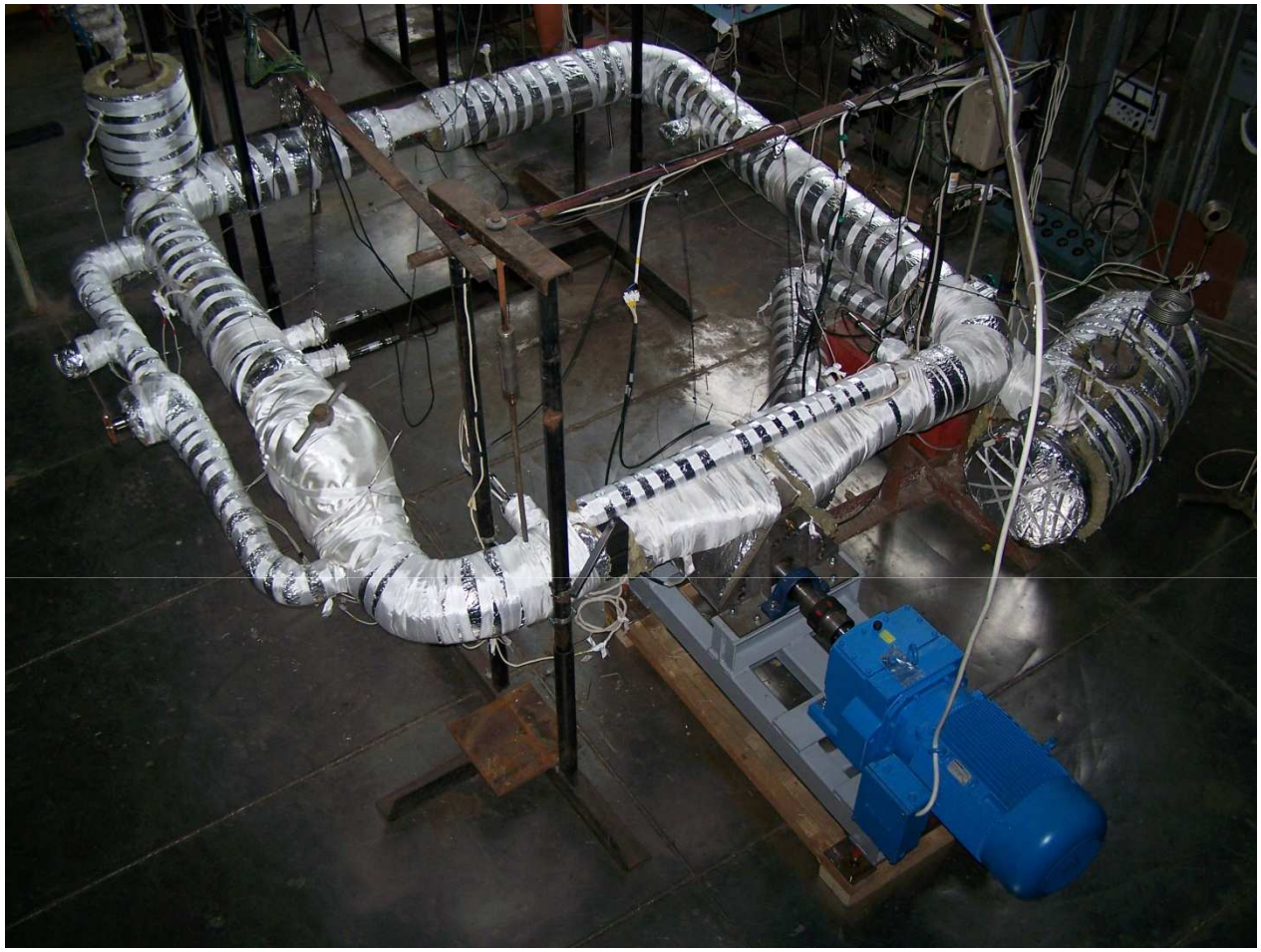


Fig.1
Functional diagram of the flow meter

L1, L3, L5, L7 - current inductors; L2, L4, L6, L8 - signal inductors ;
1 -high frequency Oscillator ;
2 - power amplifier, with current regulator ;
3 - power supply;
4 - preamplifier filter with;
6 - PC with measurement PC card;
7 - PC display of the Flow meter;
8,10 - Termocouples for digital compensation of zero signal.
9,11 - Preamplifier for the thermosignals;
E - high frequency electromotive force proportional to LBE flowrate
I - Current
12 - LBE Channel;
13 - Condition of signals for PC.

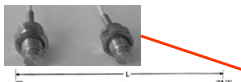


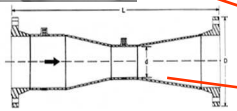
PbBi – loop for electromagnetic devices testing (EMP, Q – meters etc.)

(Operating conditions – pressure - up to 10bars; flowrate - up to 12L/s; temperature - up to 400ºC)

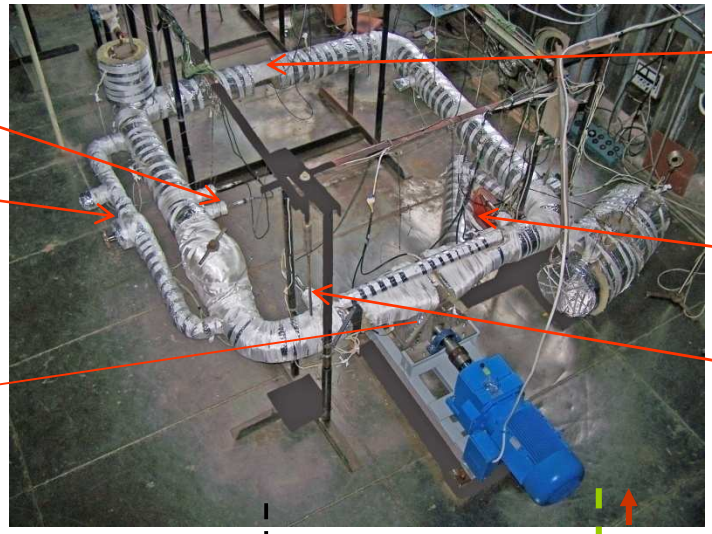
PressureSensors for Venturi

Measuring System of PbBi loop parameeters

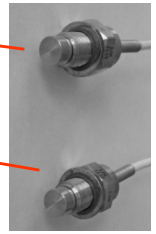




Venturi



Sketch of the removable sensor of the induction flow meter



Sensors for EMP pressure

The EMP on permanent magnets

Solid states relays

Current to heaters

Signals from Tc's

Temperature and current of heaters controllers

Three Phase
Frequency Converter

30 x Tc. Type K

Flow meter Signal

4 x Pressure sensors

National Instrument
Compct DAQ

Main PC With:
- LabView Program
- Data logging and Supervisory Control Module
- Citadel Database
- Historical Trend
- Remote Operation Control
- Local and External Ethernet Access

Additional PC With LabView Program.
for data acquisition and processing