



**43rd Turbomachinery
30th Pump SYMPOSIA**

GEORGE R. BROWN CONVENTION CENTER
HOUSTON, TX | SEPT. 22 - 25, 2014

THE “REPAIR OR REPLACE” DECISION OF BOILER FEED PUMP IMPELLERS

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SIEMENS



Problem Statement

- Current boiler feed pumps are reliably running 5 to as many as 20 years before being overhauled.
- When an overhaul is required, the inner assembly of a high pressure pump can be removed and replaced by a refurbished inner assembly.
- The removed inner assembly should be disassembled, inspected and refurbished.
- The inner assembly contains impellers that, depending on the inspection data, will either need repair or replacement (if not reusable “as is”).
- The decision of whether to repair or replace an impeller is a difficult decision and is the subject of this case study.

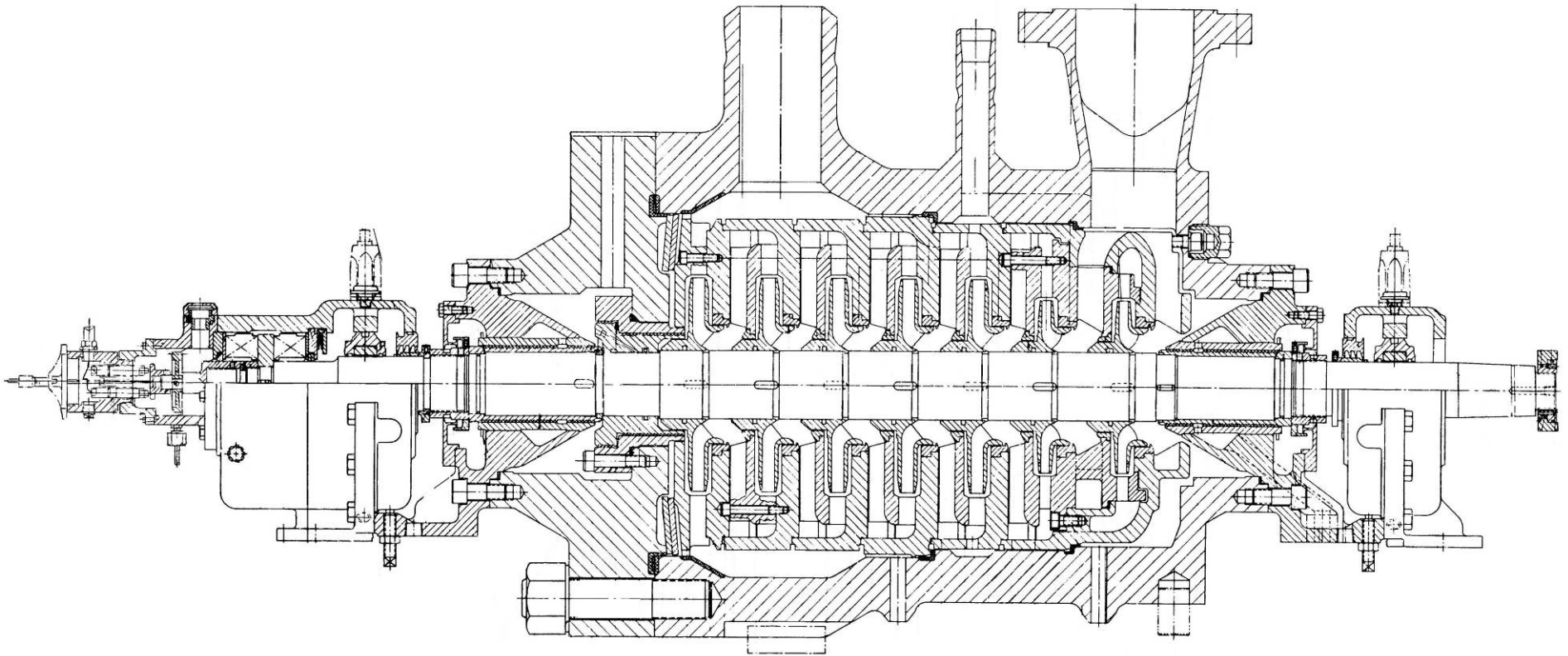
Pump Type

- The type of pump for this case study is a high pressure double case type pump. It is usually a high speed, turbine driven boiler feed pump in power plants of 500 to 800 megawatts.

Case Study Outline

- Pump Description
- Background
- Impeller description
- Examples of impeller inspection data
- Making the decision to “repair or replace”
- Conclusions

Background - Pump Assembly (high speed, multistage, turbine driven)



Pump Stage Component Terminology

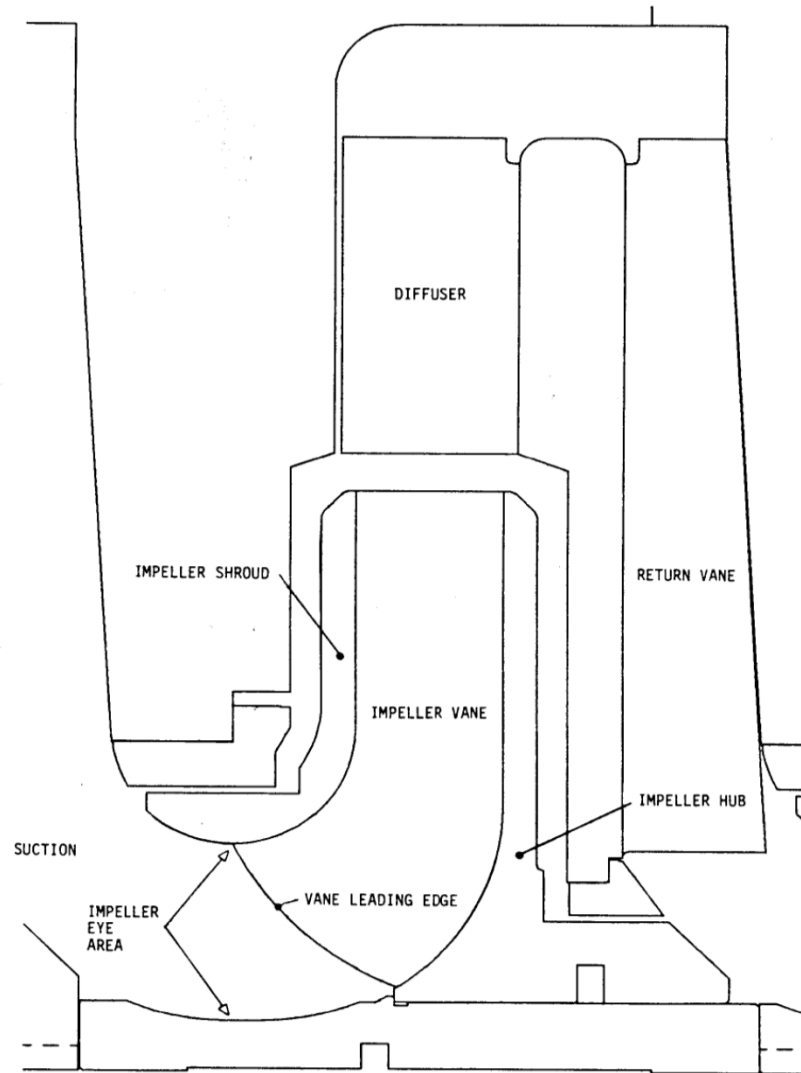


Figure 3. Pump Stage Terminology

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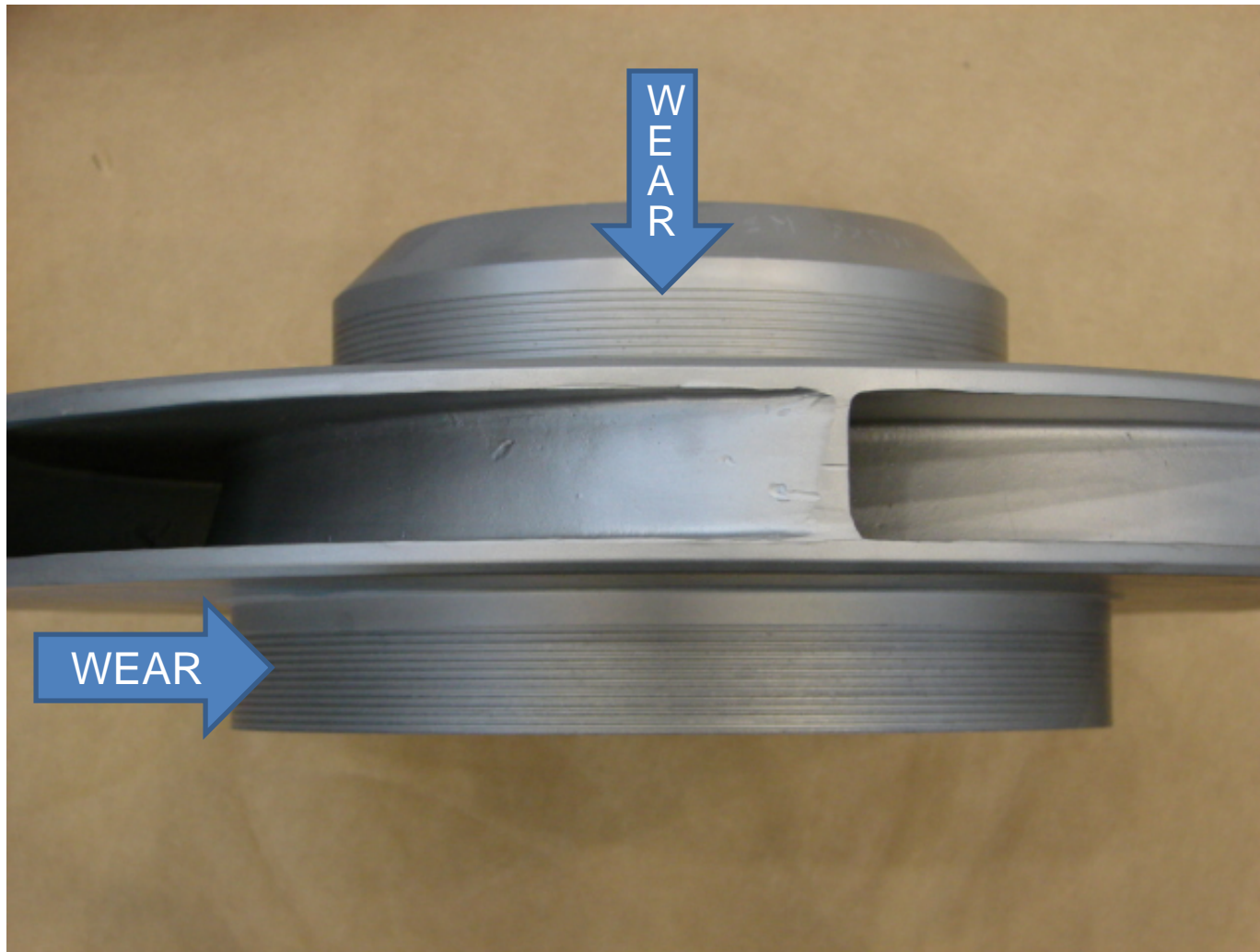
Recommended Impeller Inspection

- Visual
- Dimensional
- Magnetic Particle or Dye Penetrant

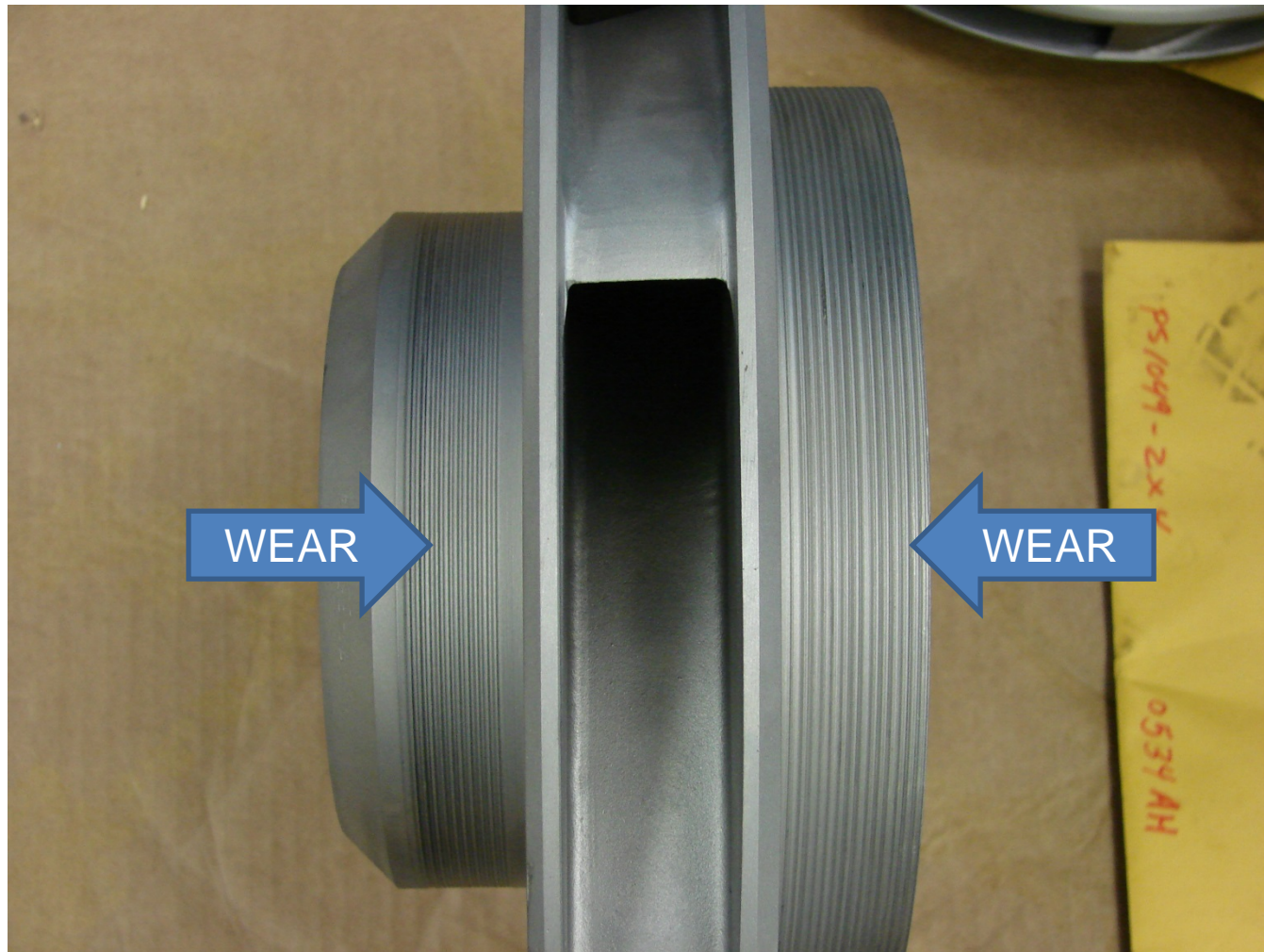
Impeller Materials

- 17-4PH
- CA6NM
- Both materials can be welded, but require pre-heat and post-heat treatment during the welding process.
- Because the post-heat treatment is at a high temperature, all critical dimensions will require welding.

Impeller With Shroud and Hub Seal Wear



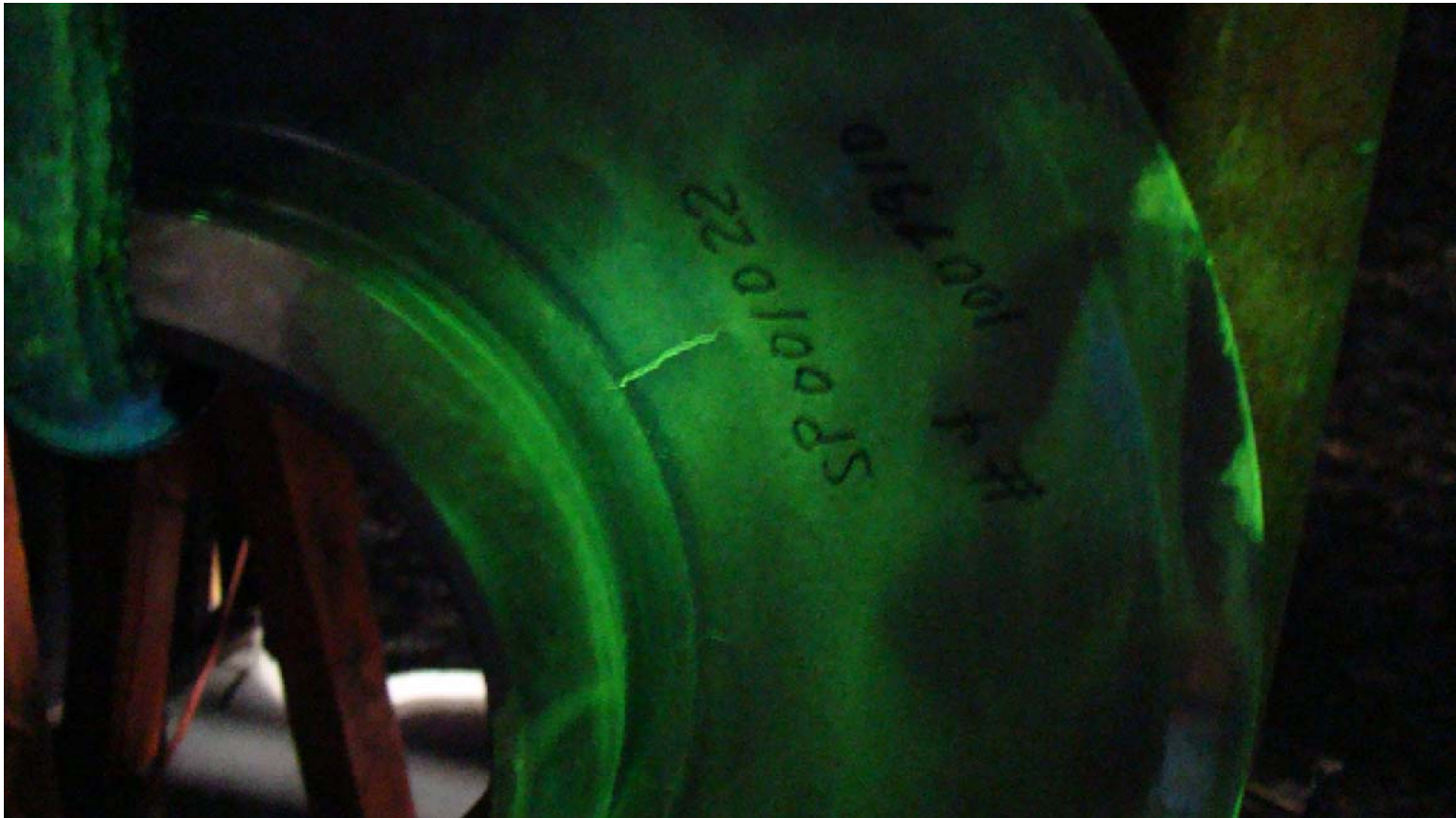
Impeller With Shroud and Hub Seal Wear



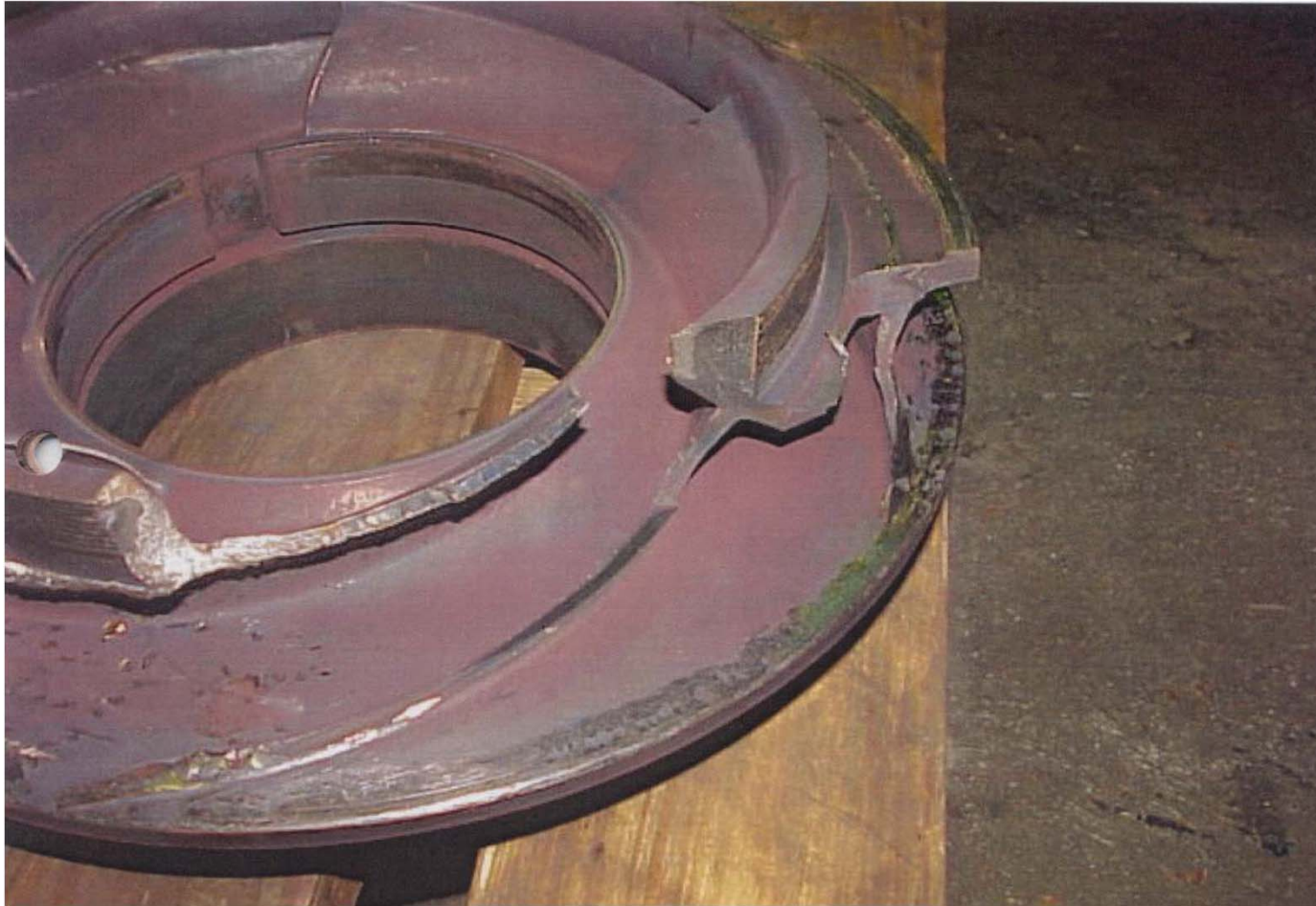
Impeller With Vane Cavitation Damage



Impeller With Cracks

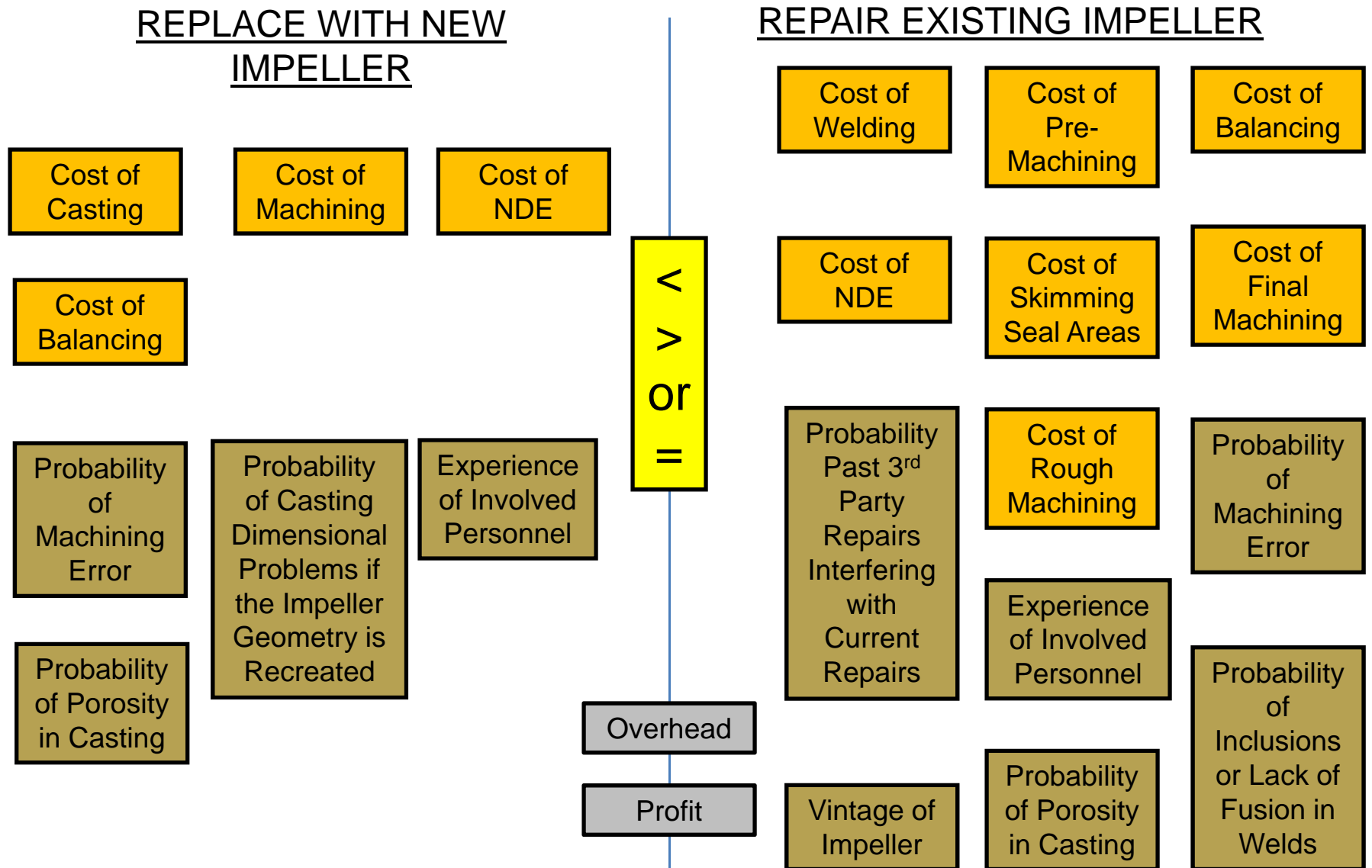


Failed Impeller With Catastrophic Damage



The Repair or Replace Decision

Cost Equation Components



Conclusions

- There are many factors that influence whether and impeller is repaired or replaced:
 - Extent of damage
 - Impeller history
 - Impeller vintage
 - Material costs
 - Machining costs
 - In-process inspection costs
 - Experience of personnel
- The probability and cost of non-conformance must be evaluated before a proper decision can be made.