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# Summary

- Trends – Challenges to overcome
- A system approach to upgrade an aging industry – future proofing
- Example.

# Challenges District Heating in EU

1. **Modernize** existing, aging infrastructure,
2. **Transform** – from fossil fuels to circular,
3. **Expand** - with growing cities,
4. **Establish** - new DHC in existing cities.



# Trends - threats

- Volatile new built sector
- Variable winter weather
- Lower heat supply per new connections
- Limit for denser cities
- Aging infrastructure
- Weaker Municipality Economies
- Loosing market share to heatpumps
- Uncertain CHP (power price)
- Decarbonized, but threats (waste, biomass)

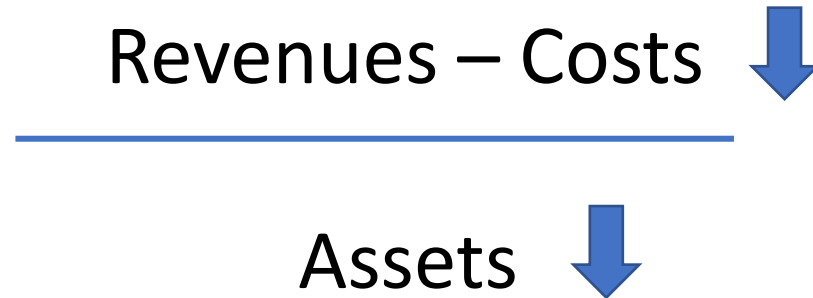


# Summary of interviews with CEOs

- More dividend (profit to owners)
- Operational efficiency better than selling more
- Distribution grid – Core – assets can live +100 years
- Old ducts transmit half of the energy volume
- Potential to better customer collaboration
- Need strategy for modern Maintenance and Asset Management

# Return on Assets (ROCE)

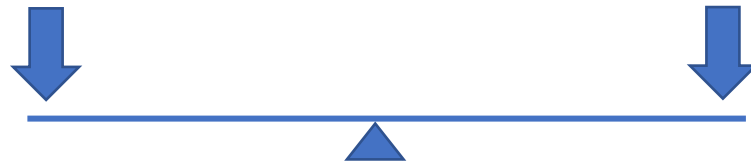
How to improve Return On Capital Employed  
and  
Reduce Risk?

$$\frac{\text{Revenues} - \text{Costs}}{\text{Assets}}$$


DuPont simplified

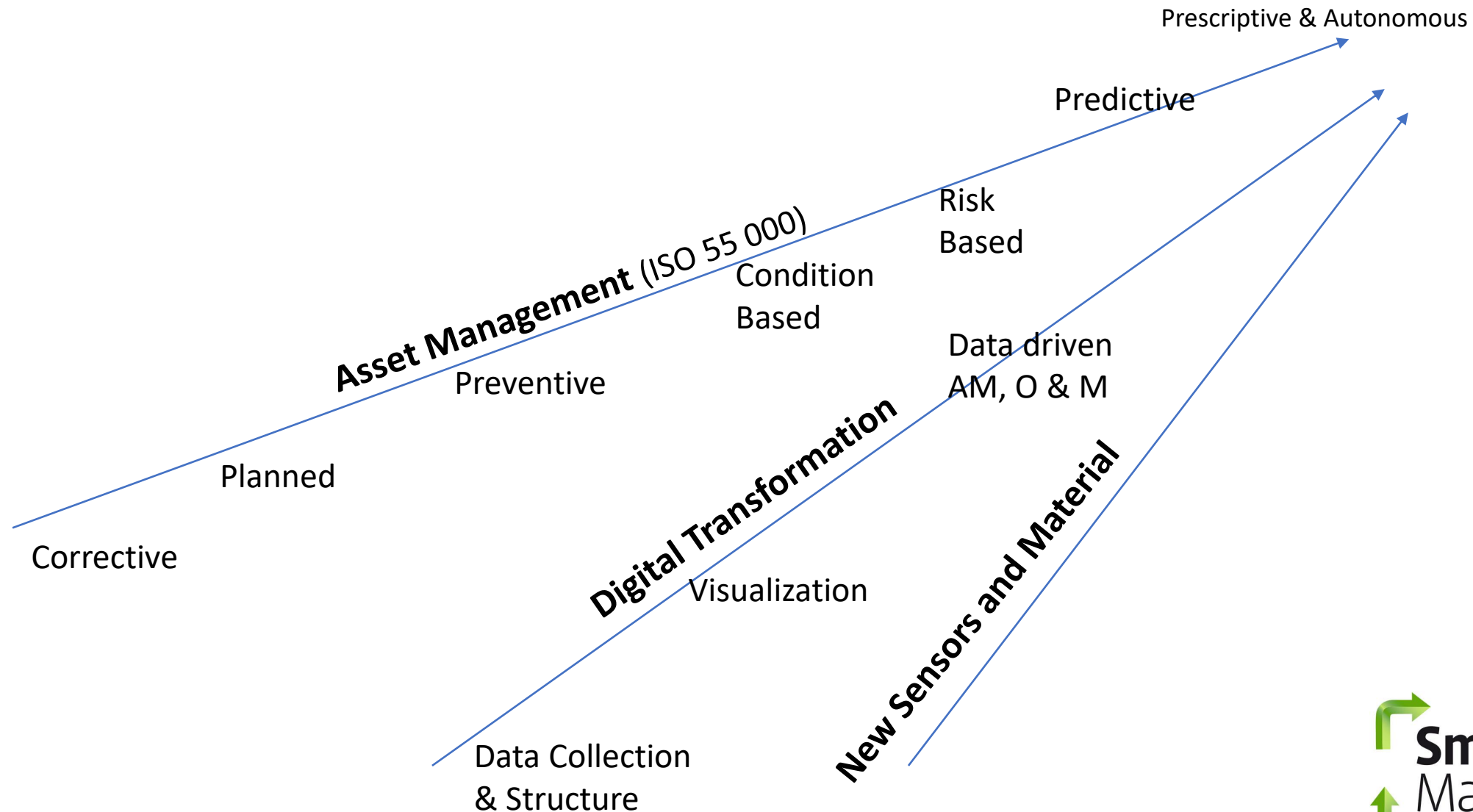
# Impossible Balance

Aging pipes  
More leakage  
More heat loss  
Higher repair costs



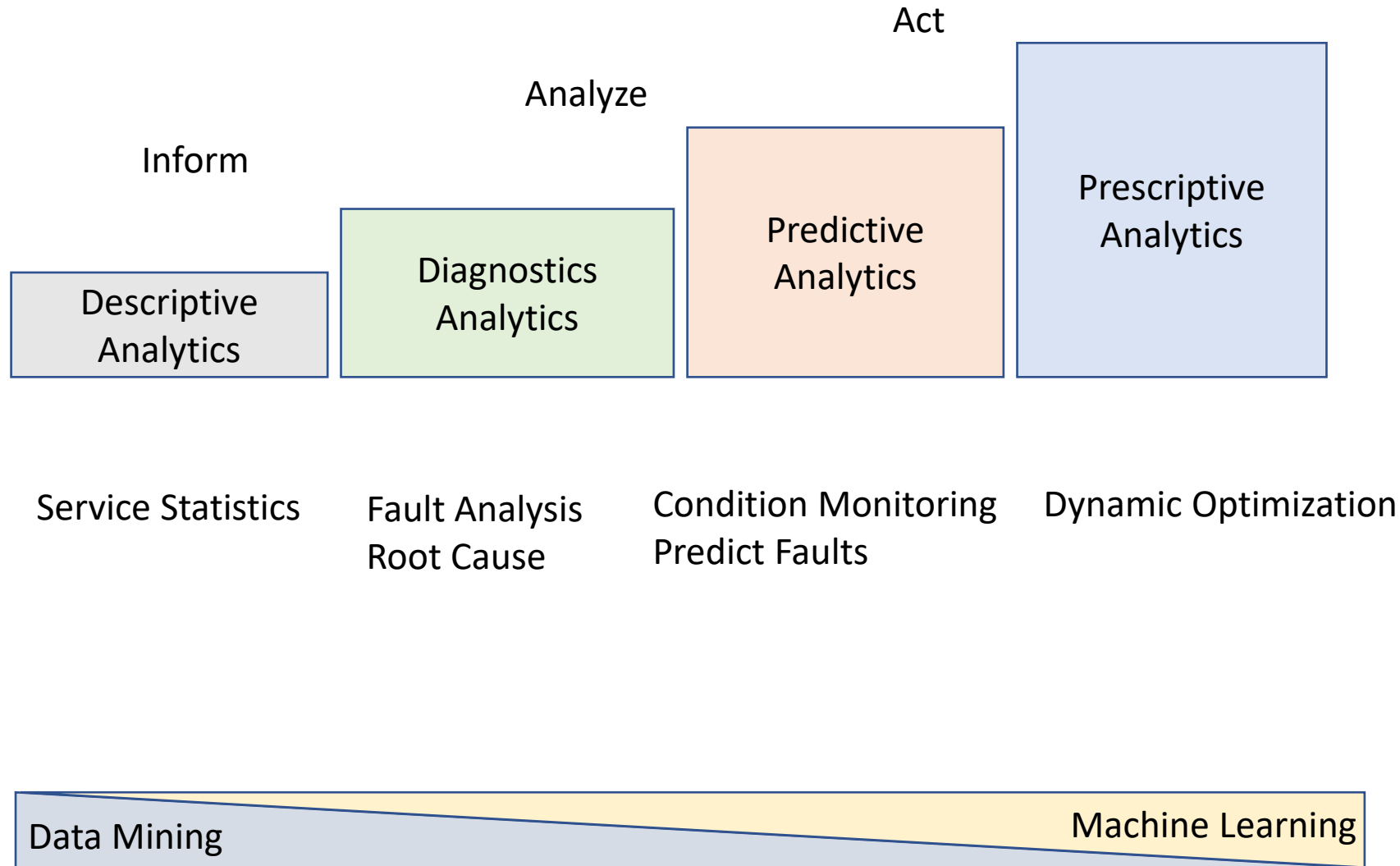
Very expensive to  
replace old pipes  
Negative impact  
on third parties by  
leakages

# Know-how - Emerging and Converging



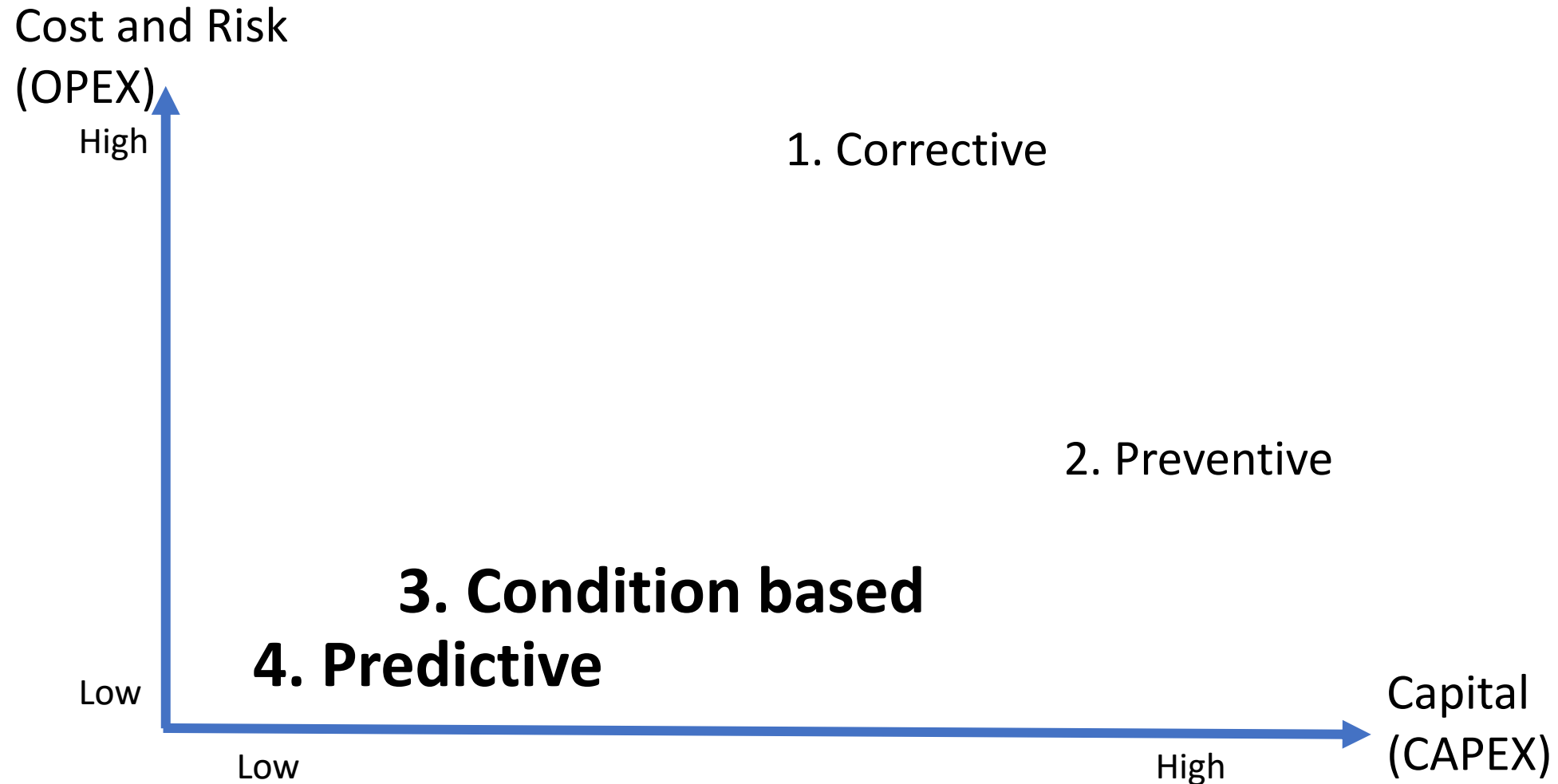


# Opening for AI and Machine Learning

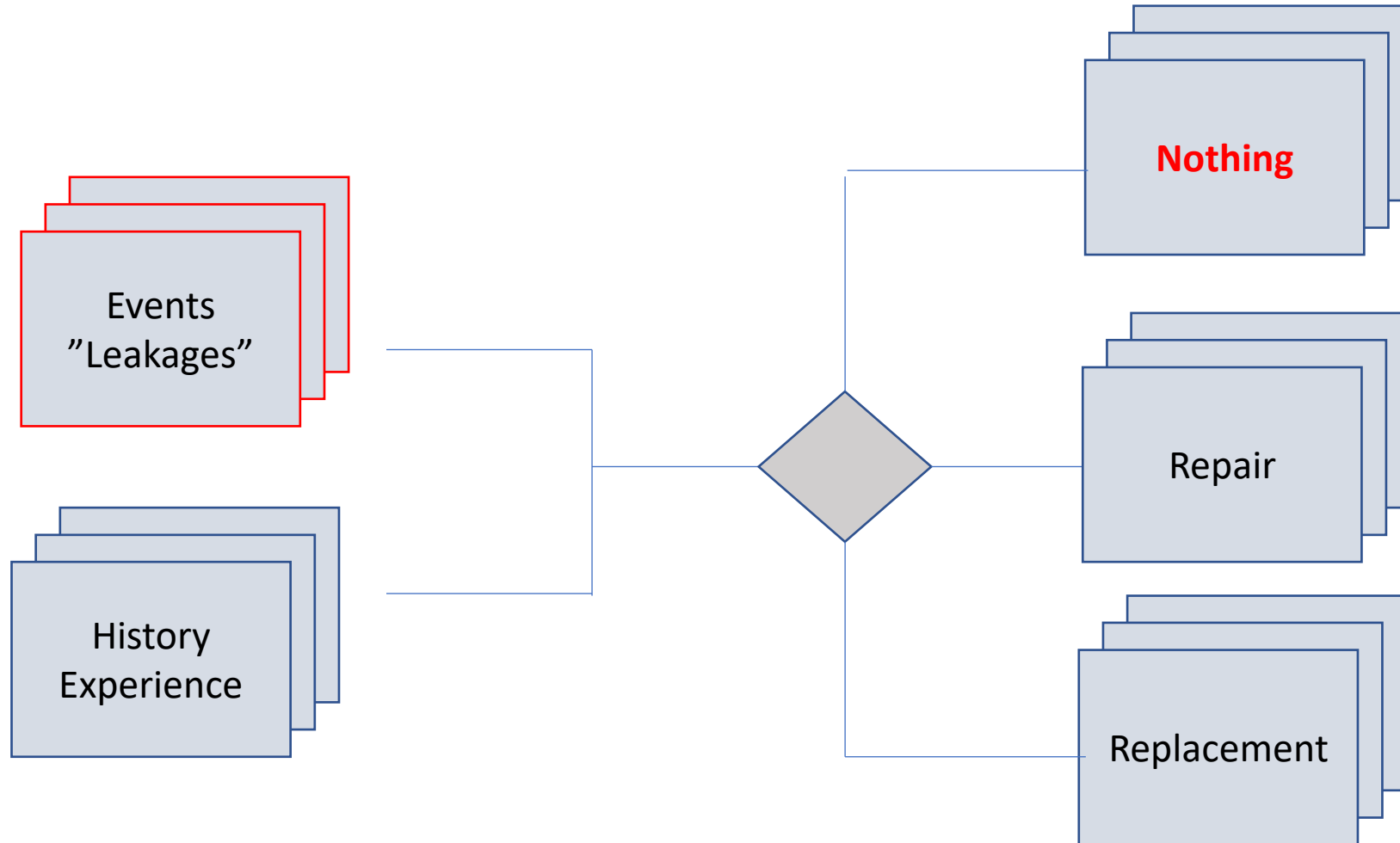


From Siemens

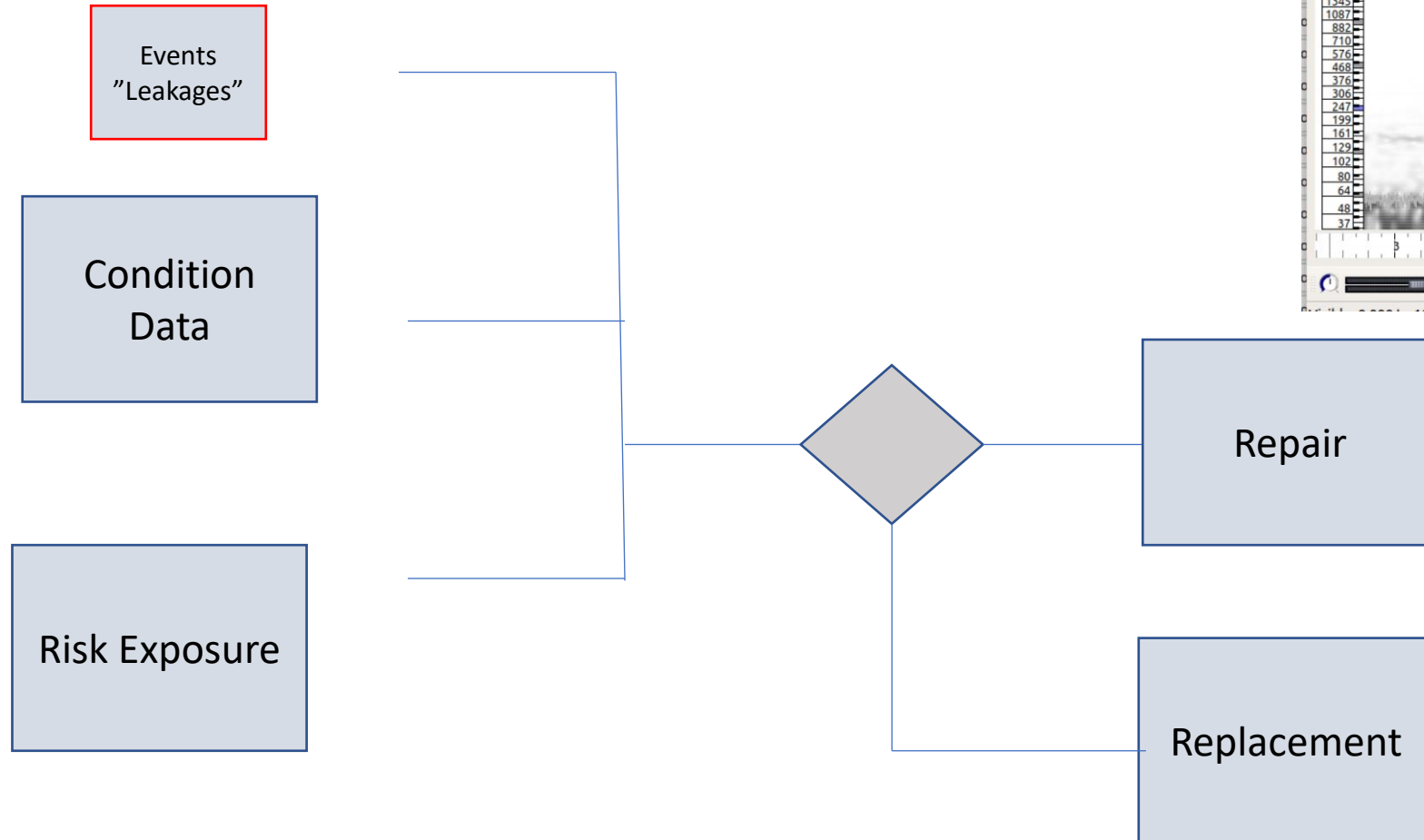
# Pipe Maintenance Methods



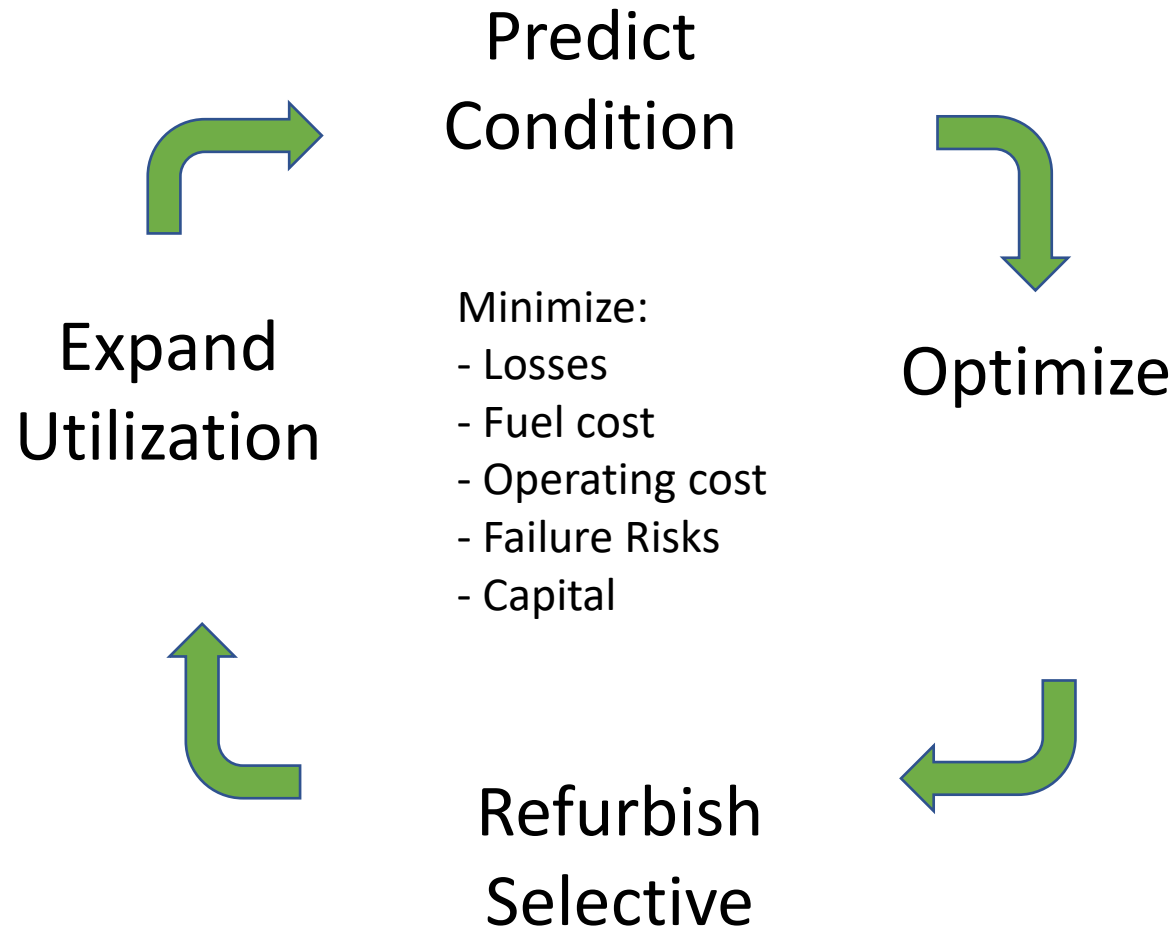
# Pipe Maintenance Methods - Traditional



# Pipe Maintenance Methods - Predictive



# Smart Asset Management - Distribution





# Some Examples

# Predict Conditions

## Acoustic Sensors & Algorithms

Detect and locate corrosion and thermal wear at steel pipes before pipe burst

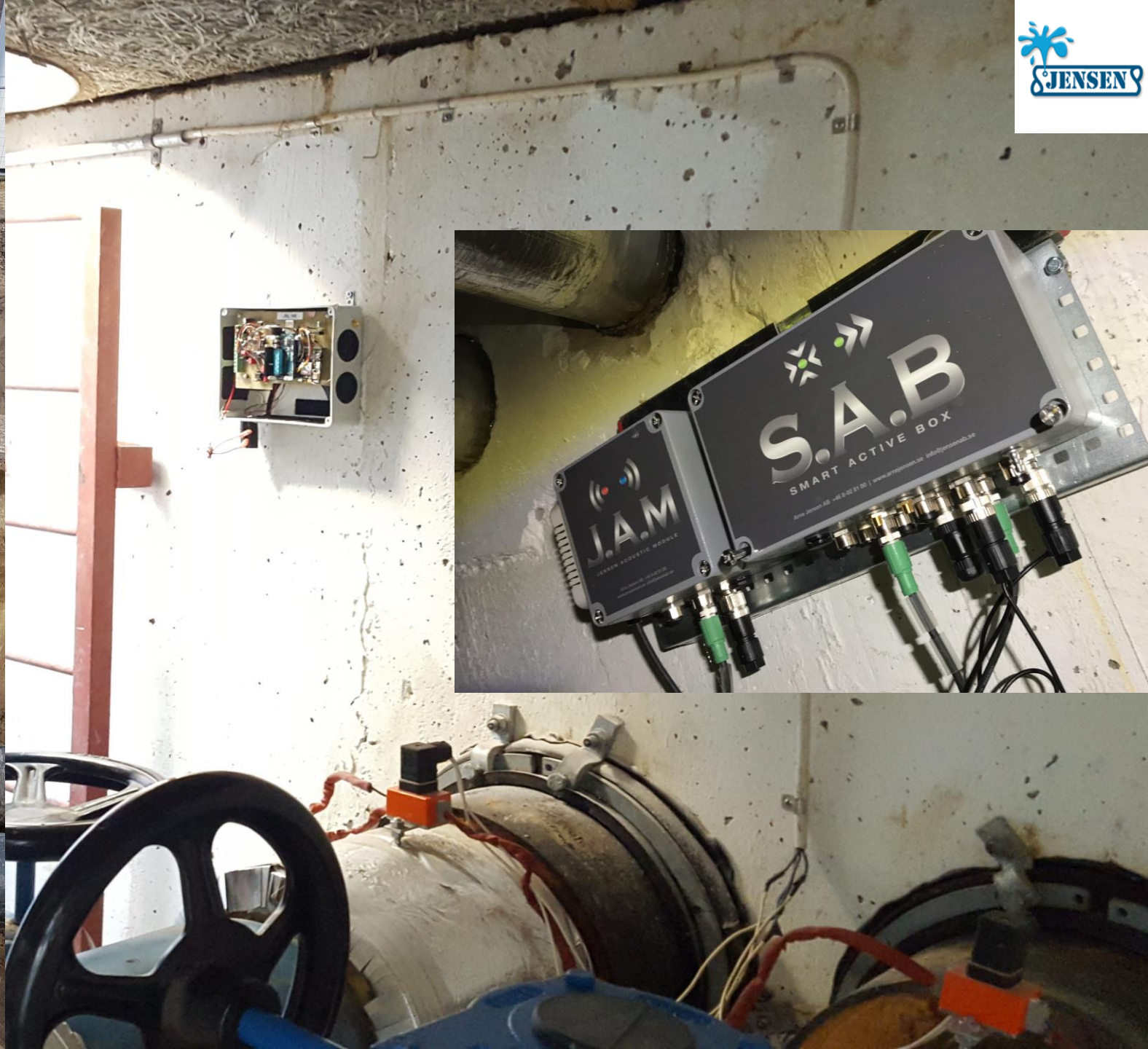
Benefits: Reduce hot water losses and risk of accidents. Utilize full life time of the pipes. Lower reinvestment need.

Detect and locate weak customer connections, causing high return temp.

Benefits: Enabling reduction av system temperatures, reduces losses.









# Selective Refurbishment

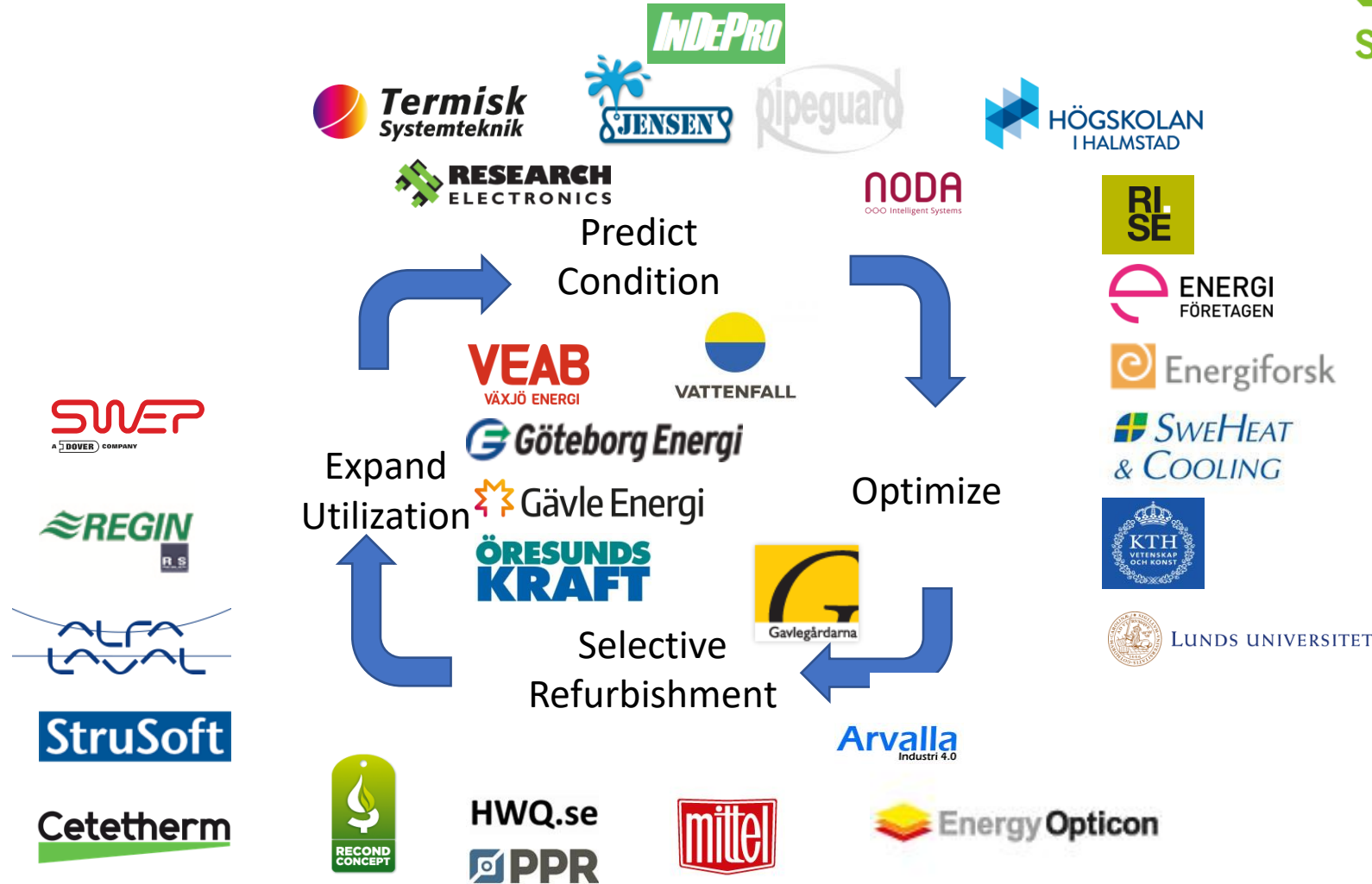
Relining of pipes and on-line repair of joints

Carbon fiber relining and electro welded joints

Benefits: Immediate risk reduction, no excavation (80% non value adding)



Challenges Driven  
Innovation



**Smart Asset  
Management**  
District Heating & Cooling Distribution Network