SAWEA Workshop

Metering Systems Advancements - a Technology Review

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elster

Elster Group

Profile

- large investments being made in technology, people and infrastructure
- at the forefront of developing the next generation of data intelligence technology for metering
- largest metering company in the World
  - water, electricity and gas
- market leader in the Middle East

Elster at a glance

- over 8,500 staff
- operations in 38 countries
- 200 million meters installed in the last ten years
- US$2 billion turnover

Agenda for today

- Market Drivers
  - Global trends
  - Regional issues
- Advanced Metering Vision
- Realising the Vision
  - Existing Technology
  - Emerging Technology
- Summary

Global Trends
Water Demand

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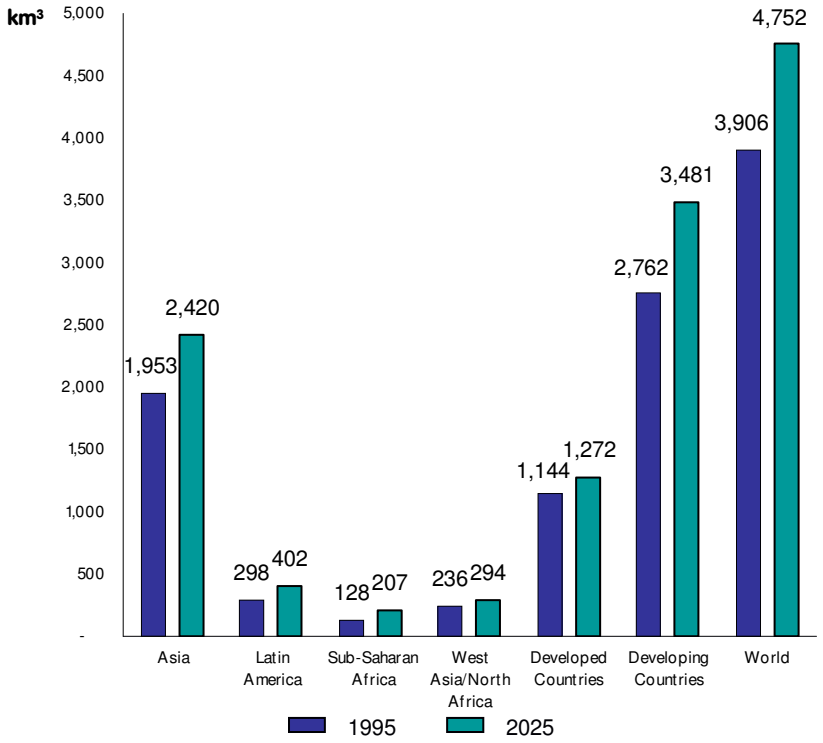
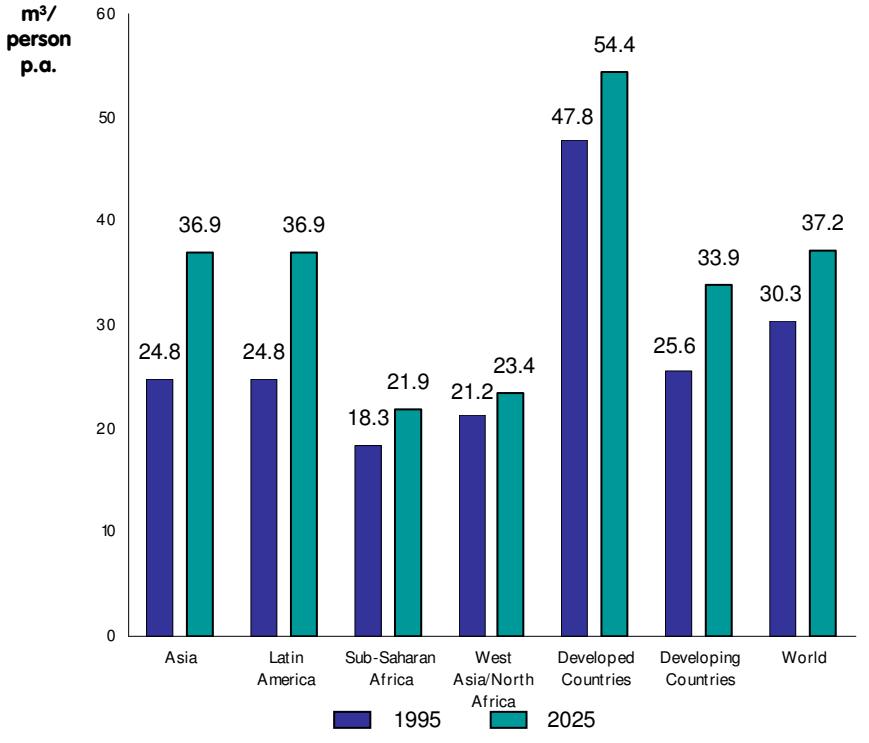
total water extraction[1]



Source: International Food Policy Research Institute (2002)

per capita domestic water demand[2]



Source: International Food Policy Research Institute (2002)

Trend: Increasing industrialisation and growing world population

(1) Water extraction defined as water removed from surface and groundwater used for human needs
(2) Water demand equals aggregate of irrigation and non-irrigation demand

Global Trends
Water Scarcity

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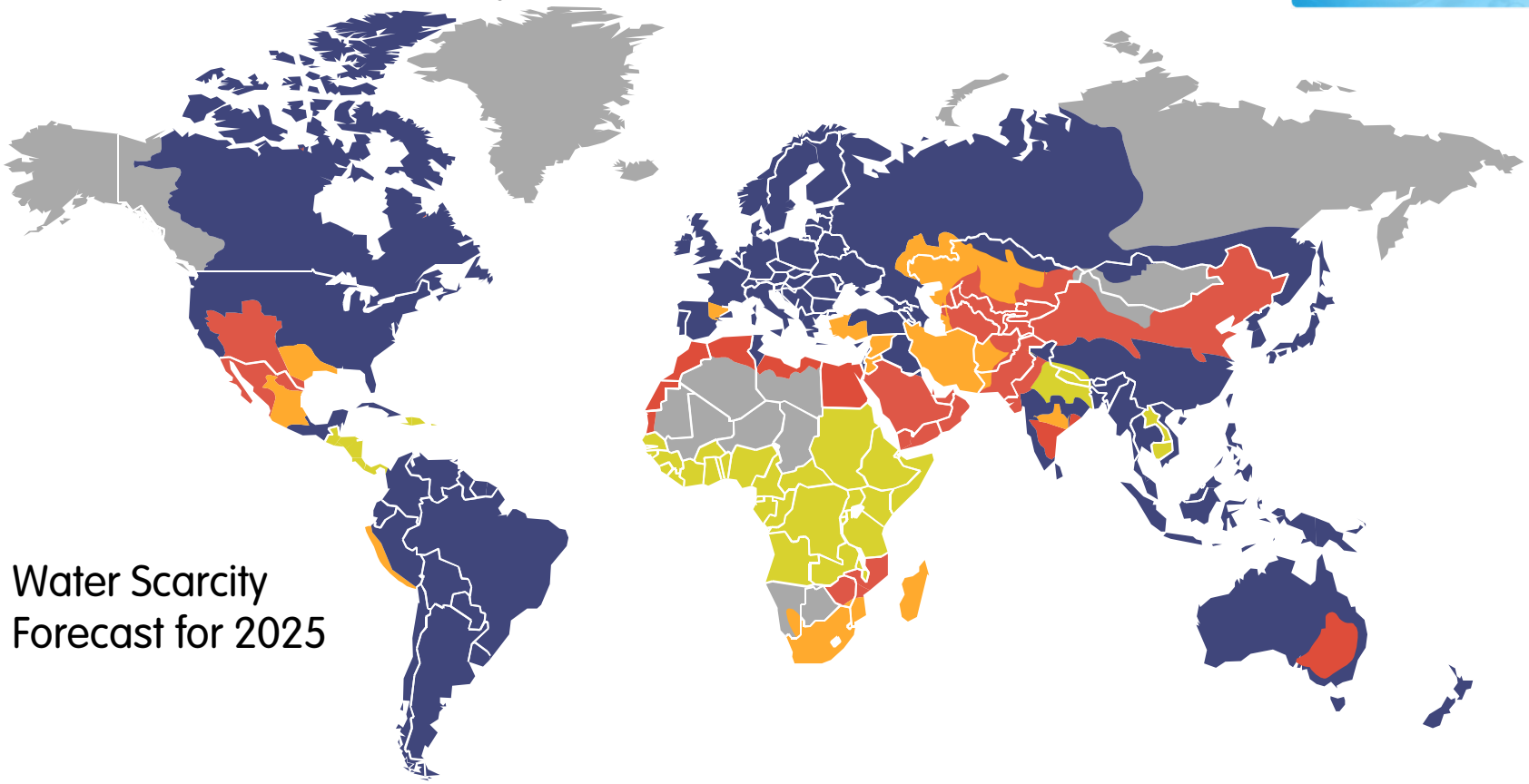


Source: International Water Management Institute

Trend: Water scarcity to increase substantially in next twenty years

(1) Little or no water scarcity: Abundant water resources relative to use: less than 25% of water from rivers is withdrawn for human purposes
(2) Physical water scarcity: More than 75% of the river flows are allocated to agriculture, industries or domestic purposes (accounting for recycling of return flows). This definition of scarcity—relating water availability to water demand—implies that dry areas are not necessarily water-scarce. For example, Mauritania is dry but not physically water-scarce because demand is low
(3) Economic water scarcity: Water resources are abundant relative to water use, with less than 25% of water from rivers withdrawn for human purposes, but malnutrition exists. These areas could benefit by development of additional blue and green water, but human and financial capacity are limiting
(4) Approaching physical water scarcity: More than 60% of river flows are allocated. These basins will experience physical water scarcity in the near future

Global Trends
Supply/Demand Mismatch

Water Infrastructure Management and Sophisticated Metering Technology	• Need substantial global investment: Ageing water infrastructure in the developed world New infrastructure in emerging economies • Need sophisticated infrastructure management (eg. leakage detection) and metering technology → **Replacement of direct read meters with more sophisticated AMR / AMI meters / systems**	**Expansion of Supply**
Reduction of Demand through Metering and more Accurate Measurement	• Need clearer incentives for consumers and suppliers to increase the accuracy of measurement • Need effective methods to drive down consumption eg. water tariff schemes • Need metering technology to implement schemes • Need a reduction of non-revenue water (NRW) → **Global increase in meter penetration**	**Control/ Reduction of Demand**

Trend: The supply/demand mismatch requires innovative metering

Global Trends
Regulations

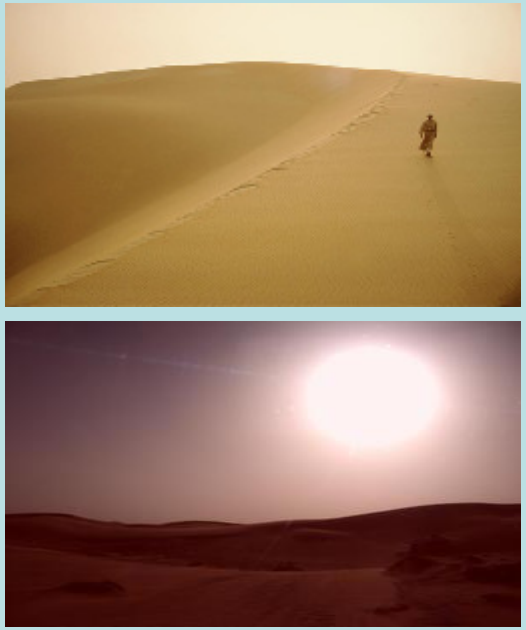
Water - Focus for Regulation	Regulatory Influence	Impact on Meter Regulation
Water conservation initiatives	**Supra-National Organisations/ Initiatives** • COOMET, ENLF, APLMF, ISO, IMF, WB, OECD	Increase in mandatory use of water meters
More consumption data for consumers	**National Initiatives** • Cornerstones Paper - Integrated Climate and Energy	Higher frequency reads AMR/AMI deployment
Hygiene/ health considerations	**EU Directives/ Legislation** • 2000/60/EC Water Framework • 2004/22/EC Measuring Instrum. • 2002/91/EC Energy Perform. • 1996/92/EC Energy Deregul. **National Law** • E.g., MID in German "Eichordnun" (Verification Directive)	Replacement cycles to ensure meter accuracy
Improvement/ growth of infra-structure		Increased accuracy and standardisation
Meter accuracy to protect consumers	**EU Communications/ Initiatives** • "the challenge of water scarcity and draughts in EU"	Rules on production materials used

Trend: Increased focus on investment in metering technology

Regional Drivers

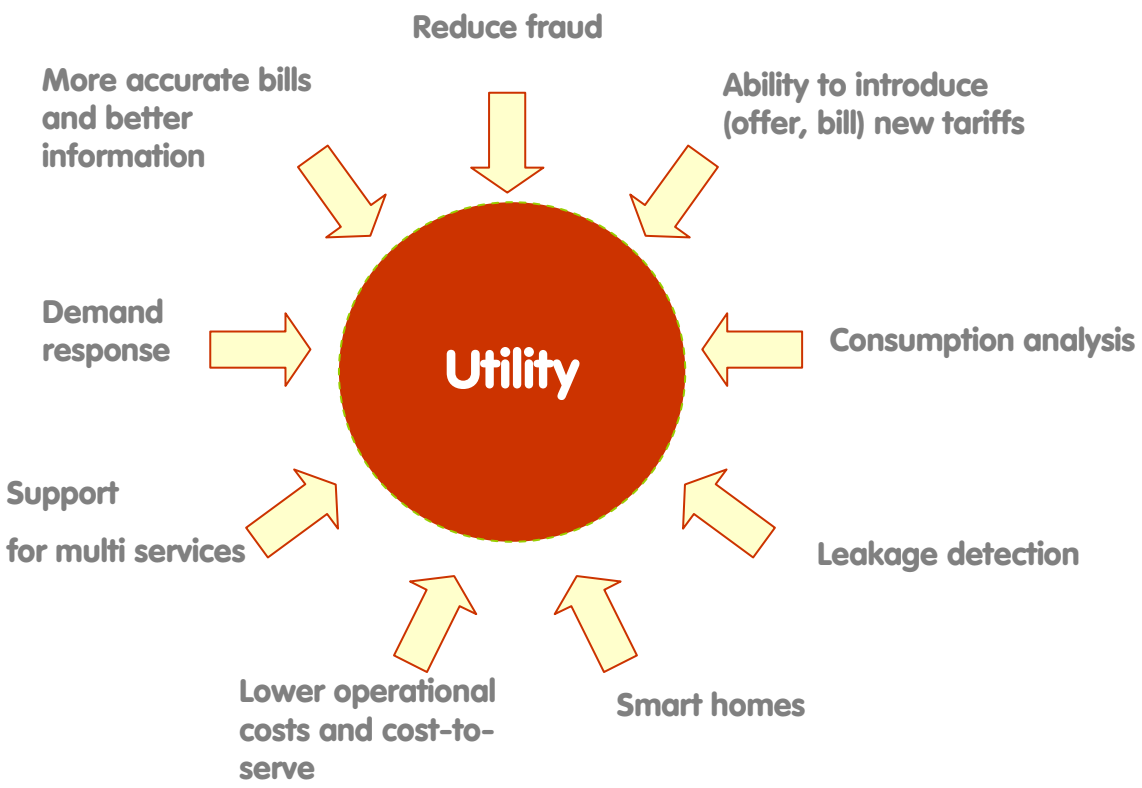
Impact of the environment

- Water quality
  - Intermittent supplies causing air enclosures
  - High levels of entrained sand/grit
- Temperature
  - High diurnal temperature range
  - High UV effects
- Flow profiles
  - Frequent high flows
  - Risk of water hammer



Meter technologies for this region require robustness

Regional Drivers
Demand for Improved services



To meet these needs utilities require intelligent metering solutions that provide valuable data

Market Drivers
Summary

- Increasing industrialisation and populations leading to greater water scarcity
- Water conservation is high on the political agendas
- Increasing prices and infrastructure investment
- Supply/demand mismatch requires innovation
- Increased focus on investment in **advanced metering technology**

New technology is driving development of intelligent metering services that will enable utility businesses to shape strategic decisions about efficient water use

Advanced Metering Technology
A Vision for the Future

Flexible

Distributed

Intelligent

Water Metering

- Flexible
  - easy to install
  - upgradeable
- Distributed
  - networked
  - intelligence local to the meter
- Intelligent
  - gives valuable information to the utility and consumer
  - improved service levels

"..advanced networks that will incorporate water metering and leak detection systems for water conservation…"

Mohammad Al-Othman

SAEWA Conference Chairman

Advanced Metering Technology
Meters are already evolving…

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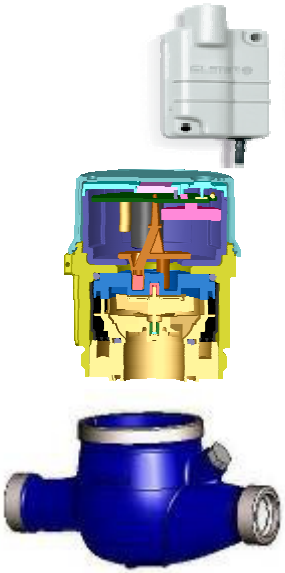
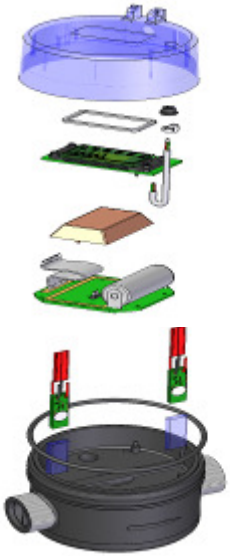
Mechanical 'dumb' meter

Mechanical with external AMR



Hybrid meter with integrated AMR

Electronic meter with integrated AMR



Advanced Metering Technology
…but what's the right choice?

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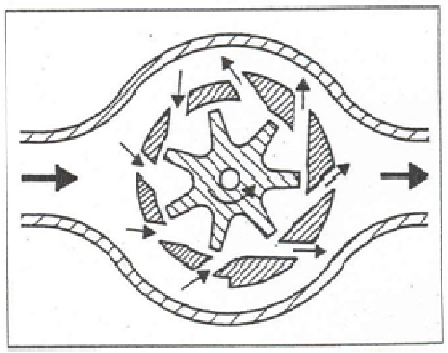
- are mechanical meters old technology?
  - close to extinction?
- are electronic meters ready to take over the world?
- how are metering technologies evolving to realise the vision?

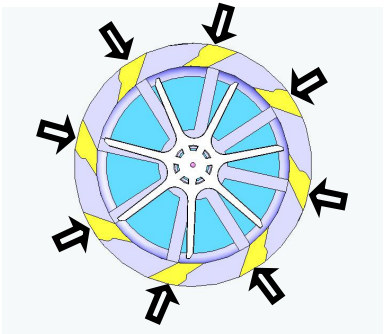
Realising the Vision
The "Traditional" Approach



- Multi-Jet Meter
  - Mechanical impellor is driven by water flow via multiple inlet ports
  - Impellor rotation is transferred to the register via magnetic coupling
  - Gearbox is used to drive the odometer and dials
  - Stable Class C performance
  - Grit tolerant
  - Proven technology

Realising the Vision

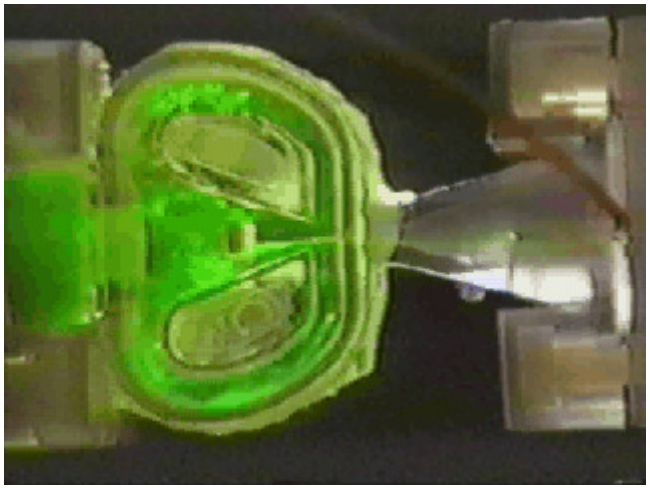
The "New Kids on the Block-1"



- Hybrid Meter
  - Mechanical flow sensor combined with electronic register
  - MultiJet hydraulic detect the volume → proven robust technology
  - Stable Class C performance
  - Grit / air tolerant measurement
  - High flow resistant
  - Radio transmission integrated
  - Logging functionality optional

Realising the Vision

The "New Kids on the Block-2"

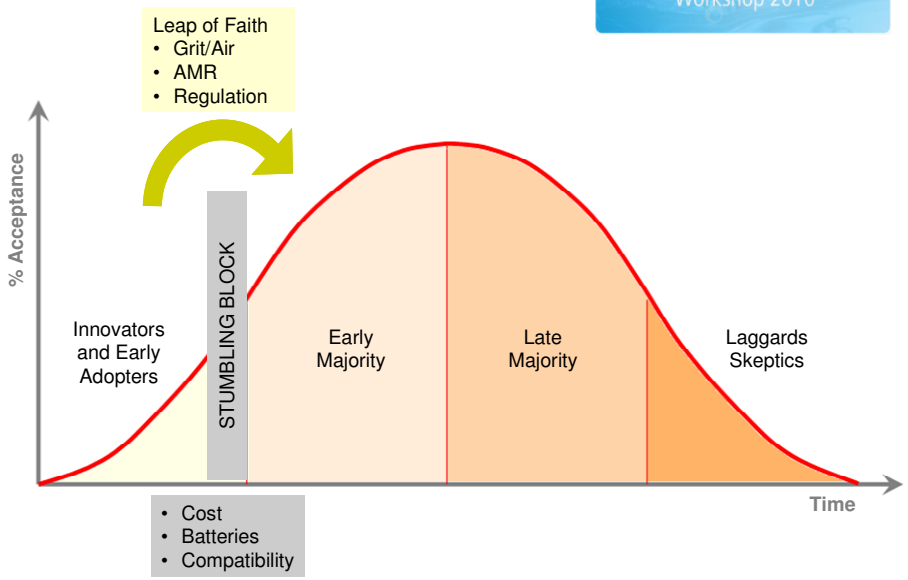


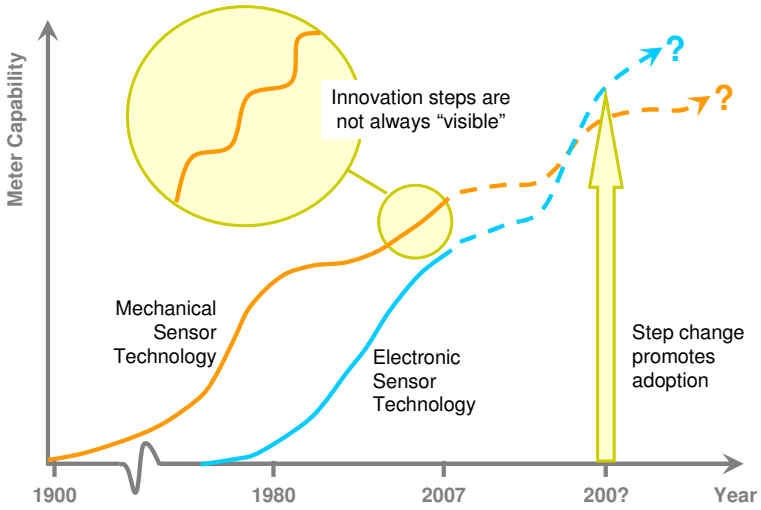
- Fluidic Oscillator
  - Water flow is split in the flow tube and is diverted back on itself
  - This creates oscillation, and this is proportional to velocity
  - Electromagnetic sensors detect the oscillations and infer a volume
  - Grit / air tolerant measurement
  - High flow resistant

Realising the Vision
Technology Acceptance

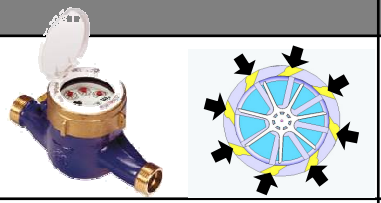
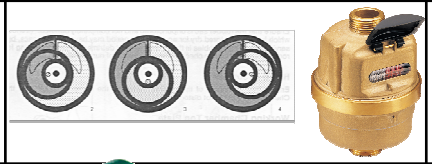
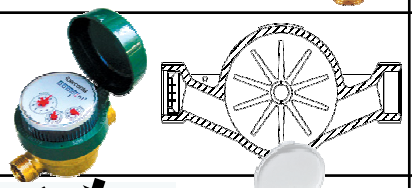
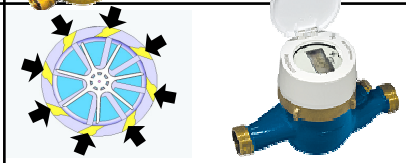
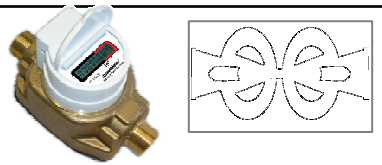
- early adopters of electronic sensors
  - take risks to be seen to lead
  - have a specific need the new technology addresses
- there are few needs that only electronic sensors can address

- mechanical sensors have been subject to constant development
- utilise cutting edge technology
- communication systems and advanced "intelligent" features are common across technologies
- innovative step needed for full adoption of electronic sensors



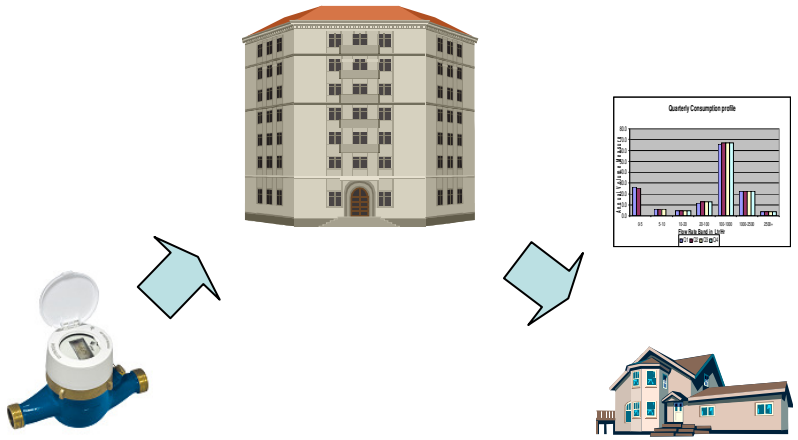


Realising the Vision
The Bigger Picture

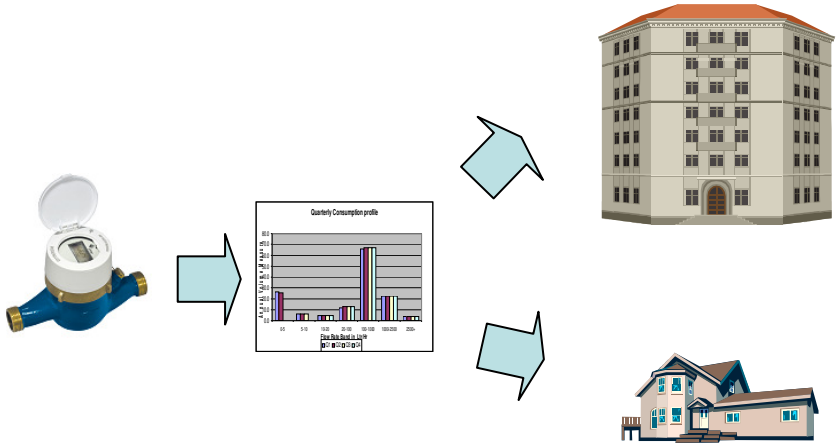
Sensor Type	*Typical Product / Measuring Principle*	*Air / Grit Tolerance*	*High Temperatures*	*High flows / Water Hammer*	*Low Flow Performance*	*Relative Cost*
Multi-Jet		✓✓✓	✓✓	✓✓	✓✓	Low-Med
Piston		✓	✓✓	✓	✓✓✓	Low
Single Jet		✓✓	✓✓	✓	✓	Low
Hybrid		✓✓✓✓	✓✓	✓✓	✓✓	Med-High
Electronic		✓✓✓✓	✓✓	✓✓	✓✓	High

Realising the Vision
Distributed or Centralised intelligence ?

- **Centralised Intelligence**
  - Intelligence is in the utility systems
  - Requires frequent reads
    - power hungry
  - Information is controlled by the utility, they send this to users



- **Distributed Intelligence**
  - Intelligence is in the meter
  - Information is passed directly to end users & utility eg
    - Flow profile
    - Leak / Burst
    - Tarriff
  - Low power consumption



Realising the Vision
Intelligent Registers

Integrated communications

- Lowest cost AMR

Alarms

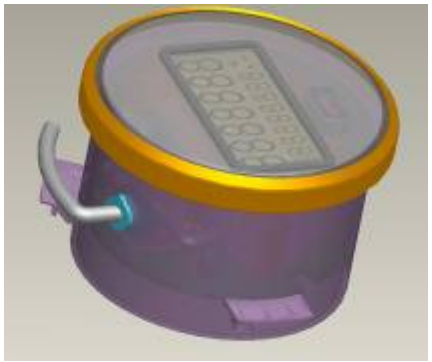
- Battery, Leak, Burst, Tamper

Advanced Features

- Peak flow, Reverse flow, Datalogging, Periodic readings, Tariffs
- Air detection

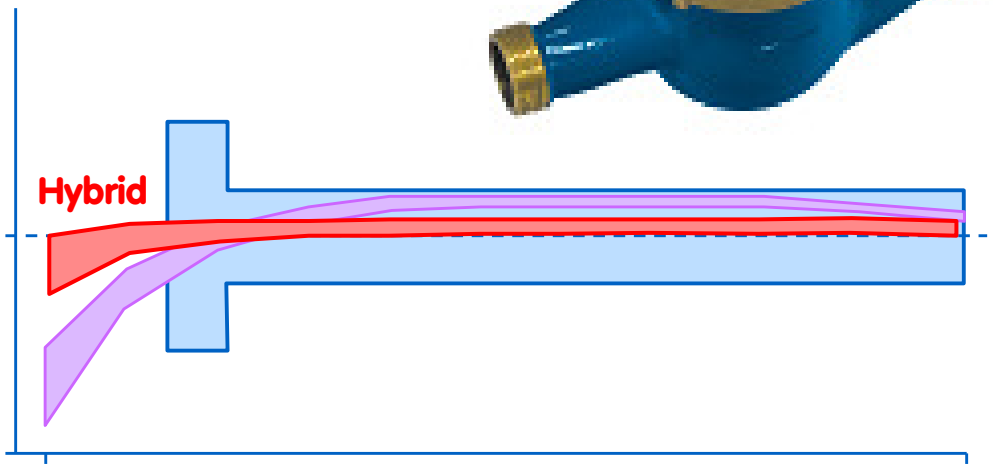
Distributed Intelligence

- Communication direct to the customer
  - Event alarms
  - Tariff indicator
- Low power system



Realising the Vision
Hybrids; an interim step?

- Proven sensor performance combined with advanced electronic registers
- Electronic registers
  - Distributed intelligence
  - Consumer interaction
  - Performance linearisation
  - Air detection
- Integrated AMR
- Improved performance



Realising the Vision
Summary

- Mechanical meters still provide a good cost / benefit ratio
  - but as AMR grows, this advantage is declining
- AMR systems improve the business case for advanced electronic & hybrid meters
- But evaluate the meter technology choice carefully
  - Proven technology v New innovation
  - Long term durability v Initial performance
  - Price v lifetime cost

Thank you for your attention

elster