



# Totex: Embedding Whole Life Costing in the Water Industry

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# 1 Introduction

In the management of water and wastewater assets, embedding Whole Life Costing (WLC) principles in everything from procurement, through day-to-day operation, to plant maintenance is becoming a priority in the quest to optimise process performance while minimising expense.

Such a goal depends on ending the historical separation of capital and operational cost evaluations and instead developing totex (total expenditure) models. In this way, operators no longer work with financial planning models that evaluate the risks and rewards of asset investment in terms of capital expenditure, but on how to get the best value from an asset throughout its operating life.

Critically, while the evaluation of expenditure 'pains and gains' may be modelled on an asset manager's spreadsheet, it is the major impacts of investment decisions on engineering and maintenance outcomes that really sell the totex message.

However, there is still a broad range of interpretation on what totex actually means, and its relevance to day-to-day operating decisions. So, to properly understand the steps needed to achieve the totex prize, it is necessary to identify the targeted asset performance benefits, as well as the barriers that stand in the way of progress.

A supplier of water and wastewater equipment and services, such as Hydro International, can offer a perspective from the supply chain that contributes clarity to a fuller understanding the totex challenge, and what might be needed to achieve it.

## What Can Totex Achieve?

Rather than looking at totex as a financial methodology for asset planning to satisfy the regulator, it is perhaps helpful to see it as the principle that fuels a journey towards optimum operating efficiency and costs. A totex approach presents opportunities to achieve incremental benefits along the way that ultimately deliver better value for the consumer. More integrated management of water and wastewater assets should drive key operating outcomes, which in turn benefit water company customers.

## Key Outcomes of Totex

### Greater innovation

Introducing new processes and practices that achieve better lifetime value, both through technology introduction and more forward-thinking operating and maintenance approaches.

### Operating performance improvements

Focusing on more effective and efficient running of equipment and processes to optimise process performance.

### Operating cost savings

Reducing energy consumption, lowering cost of replacement parts and extended equipment life.

### More effective maintenance

Planning maintenance and pro-active servicing of equipment to reduce labour costs, unexpected breakdowns, costly call-outs and equipment downtime.

## 2 Barriers to Acceptance

The benefits of totex may seem obvious, but in practice, for treatment plant operators all over the world, there can be a 'disconnect' both operationally and culturally between capital expenditure (capex) and operating expenditure (opex) that has been difficult to resolve.

In the UK, the limitations of a regulated water industry have presented particular challenges for delivery of the totex model. Since privatisation of the water utilities in 1989, huge progress has been made through a multi-billion pound investment in the asset base. With a more modernised infrastructure, the attention of the regulator (OFWAT) has shifted to optimising value to the water consumer.

In particular, UK water companies are now incentivised to provide best value to their customers based on outcomes, rather than outputs. As part of this, OFWAT has set out an expectation for water companies to adopt a totex approach, considering capital and operating expenditure in a more holistic way. The intention is to use new totex-based econometric models to assess expenditure programmes outlined in the water company business plans. On top of this, water companies are incentivised to perform efficiently through a number of Outcome Delivery Incentives (ODIs) that offer penalties and rewards (so-called pain/gain) across a number of target key performance indicators.

In practice, the journey to acceptance of totex across the UK water industry has been slowed by cultural and structural inertia, as well as the distractions of other far-reaching changes to the industry, particularly the move to retail competition.

### WaterBriefing AMP6 and Totex Survey

One of the UK's leading websites for water professionals, [WaterBriefing](#), conducted an industry survey to determine to what extent a totex approach is creating a different mindset and prompting the water companies to re-examine current practice. Hydro International was delighted to support the survey and the results were published in Spring 2016.

The respondents represented a broad cross-section of water companies, contractors and equipment suppliers, as well as a good mix of levels of seniority and role. To begin with, almost 90% agreed that there was still a lack of consensus on what totex really means.

The views of respondents reflected a feeling that the UK industry is so far failing to embrace a Whole Life Cost approach, despite agreement that such an approach would encourage innovation which in turn can drive lower operating and energy costs – benefits that can be passed on to the consumer.





Sixty per cent of those surveyed said the water industry was “not ready” for totex, while more than 23% said the industry was “ready but not changed yet.” Only 14.5% of respondents said they believed the industry was already changing. (See fig one).

## Do you believe the UK water industry is ready to change to meet Totex objectives?

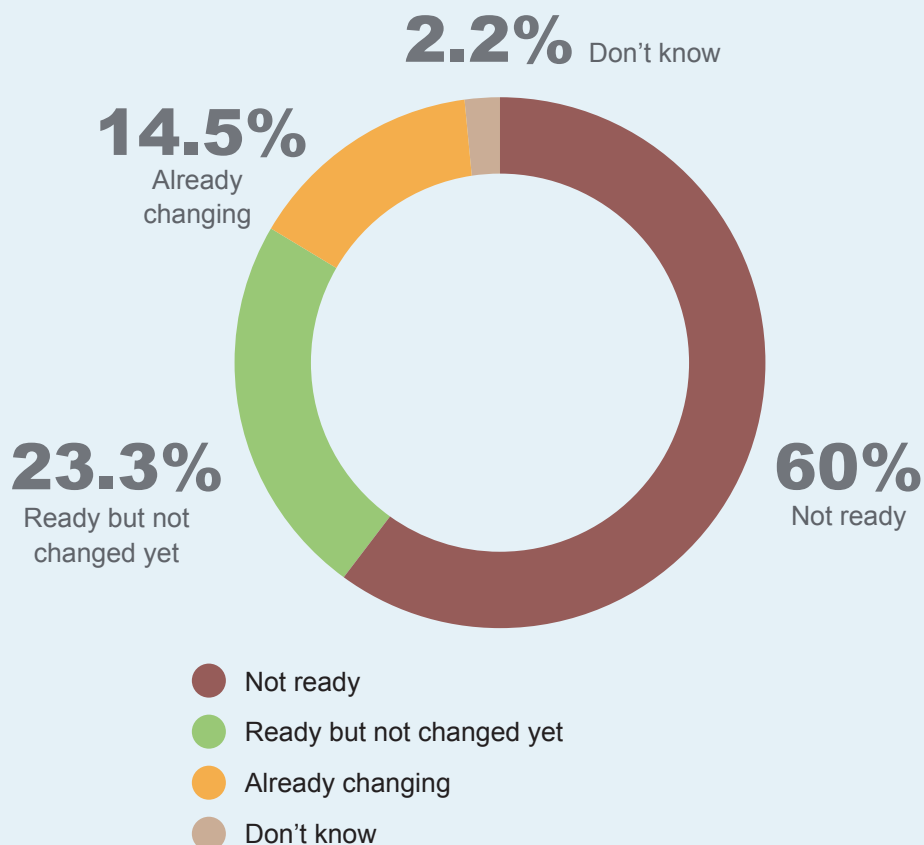


Fig One: (Source WaterBriefing AMP6 and Totex Survey)

Within water companies themselves, the survey respondents believed the level of acceptance of totex principles varied according to the levels of personnel, but was low overall. While senior management showed a greater degree of acceptance, it was a different case at the operational and maintenance level and in middle management, which one commenter described as a “treacle layer” working to outdated systems. However, two thirds of the respondents believed a totex approach would encourage more innovation towards the end of AMP6.

There was a strong correlation in agreement about the obstacles to progress. The following results show the percentage of people who agreed or strongly agreed with suggested barriers to totex acceptance:

- Resistance to change (80.3%)
- Lack of consensus on what totex really means (89.4%)
- Mindset split between capex and opex (95.2%)
- Lack of discussion between budget holders within organizations (83.7%)
- Failure to embrace Whole Life Cost approach (78.8%)

Particularly in the comments made, there was a clear sense of frustration with relation to procurement practices in water companies that was acutely experienced right across the supply chain, both from contractors and equipment suppliers. There were strong indications that a lowest-price-up-front procurement model is perpetuating a capex bias, through what one commenter described as a “race the price to the bottom” tendering process.

# 3 The Example of Grit Removal

A good example to test the totex model is the process of grit removal in wastewater treatment. By removing more, and finer, grit at the inlet works, there are downstream gains in terms of reduced damage to equipment, and less clogging of channels and downstream processes such as aeration, which causes process and energy inefficiencies. The survey took the example of grit removal to explore viewpoints and attitudes to totex in practice.



*A high-performance grit removal system can significantly reduced downstream plant operating costs.  
Hydro International grit removal installation, Bonnybrook, Calgary, Canada*

The results turned out to support a view of this ‘disconnect’ between the opportunities of a totex model and the reality of practice. Nearly all relevant respondents agreed that inadequate grit removal could be reducing overall efficiency of their plant and that grit abrasion impacts on wear, and replacement of parts, treatment capacity and effectiveness of biological treatment.

Yet, at the same time, most people also viewed grit removal as an area of operation where settling for a compromise in the level of protection is accepted. There was a strong indication that water professionals believed upgrading grit removal systems would help to meet totex objectives in AMP6 and beyond.

Both in the UK and elsewhere in the world, particularly the US, the industry standards for grit removal have remained the same for many decades. However, technology now exists that far outperforms these standards that could protect downstream processes, save costs and optimise performance.

Only those operators prepared to go beyond the standards, embrace innovation and evaluate an investment in advanced grit removal in terms of a totex model will reap the benefits.



*Collected grit following grit removal*



## 4 Repairing the Capex and Opex ‘Disconnect’

Finding solutions that can repair the ‘disconnect’ between capex and opex, as well as between operators’ intention and the reality, ought to be a priority for any forward-thinking water and wastewater operator, or indeed for the industry as a whole.

In the UK, the strictures of regulation, and particular of the five-year Asset Management Planning (AMP) cycle present additional challenges. Although there have been attempts to smooth the investment cycles, progress has been slow and the industry is frequently chided for its inertia and risk-averse culture.

In particular, the cycle arguably provides a built-in ‘feast and famine’ mechanism for contractors to keep pushing for lowest capex, no matter whether this produces the best whole life cost-to-performance benefits. Recent media reports have suggested that the move to ODIs and totex may also have been a distraction from addressing ‘boom and bust’. Surely, if totex is about balancing the best risks and rewards across the whole life of assets, it should help to smooth UK investment cycles?

To find the best solutions, the water industry could look to other parts of industry and the public sector to find best practice solutions for Whole Life Costing and collaborative supply chain management.

So what are the areas of focus to achieve the incremental steps needed to make totex culture and practice becomes the norm? My suggested top ten is based on a UK perspective, but nevertheless should have some resonance in other countries with similar operating challenges.



Wastewater grit sampling underway with Hydro International’s HeadCell pilot unit.

## Top ten steps to Totex

<b>1. Innovation</b>	Innovation can target the totex outcomes that can be delivered through supply chain partnership. We need to encourage operators to be willing to be first; willing to try out new technologies and processes to gain advantage.
<b>2. Industry Standards</b>	Industry design standards for the equipment that runs key processes must be able to respond quickly to reflect what the newest and best technologies can achieve. We should be nimbler in updating standards to reflect best practice and review any that have not changed for many years.
<b>3. Procurement</b>	More 'joined-up' procurement practices, in the UK water industry particularly, are needed to facilitate a totex investment in equipment and related maintenance and services, based on the predicted whole-life process performance. This requires a better communication that crosses traditional water company demarcations. It will also require cross-industry consultation.
<b>4. Best value costing models</b>	Adopting effective procurement cost models that consider best value, rather than lowest cost, is a relatively straightforward and incremental "quick win" that does not necessarily require major organisational change.
<b>5. Innovative contracting</b>	Choosing best value should also be the basis for more innovative contract arrangements between suppliers, contractors and even operators that could share the risks and rewards of the through-life operation of equipment or systems.
<b>6. Supply chain collaboration</b>	Manufacturers and service suppliers offer expert equipment and operating knowledge. Finding new and more collaborative ways of working between the supply chain, contractors and water companies could promote a more integrated approach to whole-life water asset management. Models such as the BS11000 certification, as used in other contracting sectors, could help to promote best practice.
<b>7. Building Information Modelling (BIM)</b>	Wider adoption of BIM supports a holistic view of the management of water assets and processes. BIM could help to integrate regulatory submissions, water company asset planning and supply chain collaboration. It is now a well-proven approach and widely adopted in other areas of public sector infrastructure development. Sharing data via BIM models of water assets would support decisions for best through-life process performance, efficiency and operating savings.
<b>8. Data</b>	With improvements in communication and sensing technologies, the water industry will use instrumentation and software more widely to collect data and provide evidence to justify totex investments based on Whole Life Cost impacts.
<b>9. Equipment standardisation</b>	Greater standardization in the way equipment is specified, packaged and tendered is a sure-fire way of achieving efficiencies. This is true for individual water companies, as well as across the industry. Not only would this encourage an infrastructure based on best practice, such standardization could also remove the costly inefficiencies of repeated framework negotiations for equipment suppliers.
<b>10. Cyclicity</b>	Doing more to tackle the artificial market conditions generated by cyclicity in the UK would support better totex outcomes, because there will be less pressure to isolate investment into five year periods. Smoothing out boom and bust cycles will take away in-built incentives for contractors to push for lowest price over best value.

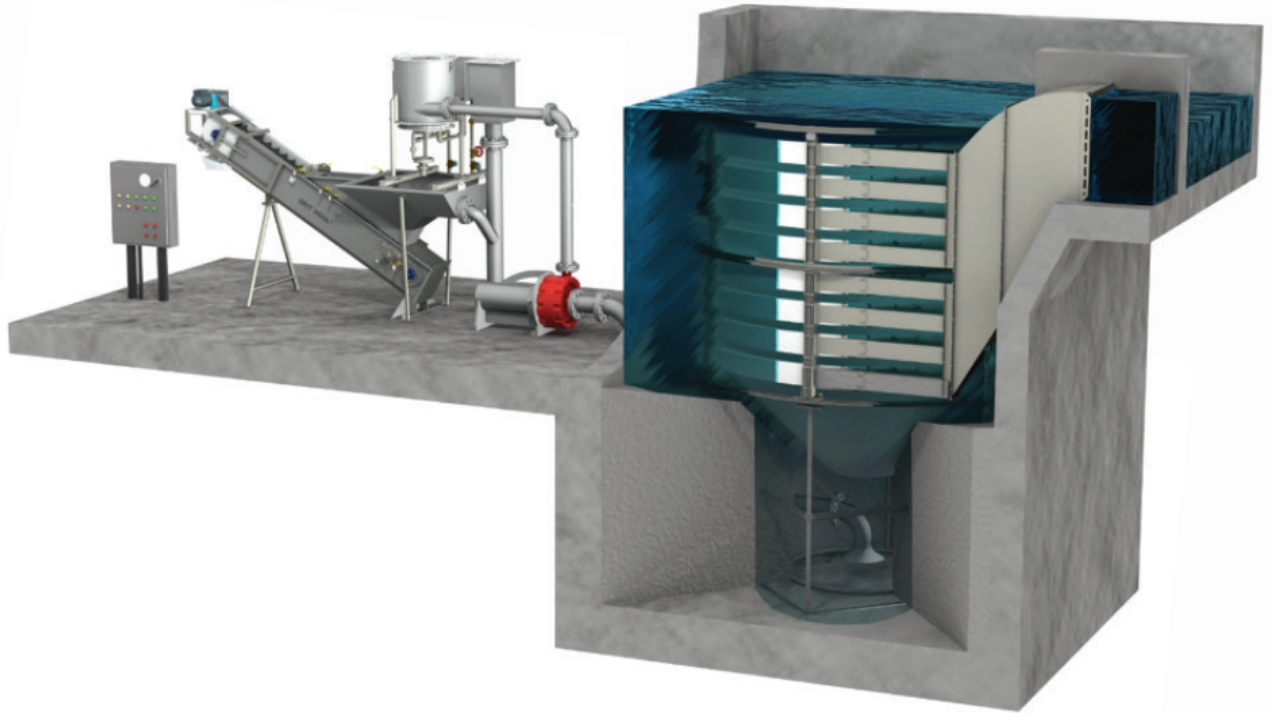


## Green shoots of change

Seeing totex as an incremental journey, rather than a distant prize, may help progress. Returning to the example of grit removal offers some evidence of the 'green shoots' of change.

Several UK water companies are now working with Hydro International to undertake sampling studies across the UK, which are already showing promising results. We are also conducting pilot trials of our [HeadCell®](#) advanced grit management system at selected wastewater treatment sites in England and Scotland and hope to set up a full operating trial soon.

To help operators from all over the world to evaluate the operating and maintenance savings that can be achieved with improved grit removal, Hydro International has developed a unique online resource. The [Cost of Grit Calculator](#) uses real operating plant data to help asset managers and engineers assess the financial impact of grit on downstream processes.



## More work to be done

The results and conclusions of the WaterBriefing survey are, perhaps, not surprising. However the very strong sense of agreement and consensus is striking, as is the clear sense of frustration felt by other equipment suppliers, and also by contractors across the water sector supply chain. The survey reveals a real sense of yearning among water company staff for a greater openness to innovation, rather than waiting for someone else to make the first move.

As the UK water industry moves towards AMP6 and the introduction of retail competition, even greater disruption, reorganization and preoccupation can be expected. Nonetheless, ensuring best practice models for whole life asset management, procurement and supply chain collaboration should be essential to achieving the desired efficiencies and minimizing costs for the consumer.

So what are the next steps? In the UK, the answers may not all be clear to see today.

Collaboration is needed between professional and trade groups to find answers, and at Hydro International we are keen to see a specific industry initiative with an agreed agenda to tackle at least some of these issues. I believe engaging the supply chain in developing the answers is critical.

A cross-industry working group, or possibly the continuation of the Cyclical Working Group, have been suggested as possible options for drawing up a roadmap that can accelerate change.

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Hydro International is a global leader in sustainable technologies for the control and treatment of stormwater and wastewater. For more than 30 years, Hydro has been at the forefront of water industry innovation and product development. From housing developments and municipal sewage works to paper mills and public highways, thousands of Hydro products are operating in countries all over the world. With strong bases in both the United States and the United Kingdom, and a network of partners and agents, Hydro is strategically placed to deliver winning technological solutions to customers wherever they are in the world.