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Asset management in urban drainage

Gestion patrimoniale de systèmes d'assainissement

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RESUME

Les décisions liées à la gestion du patrimoine en assainissement sont basées sur l'optimisation du coût et prennent en compte les besoins du client, les buts du maître d'ouvrage, la valeur créée pour les actionnaires ainsi que la législation en vigueur. Des objectifs clairs sont nécessaires afin d'atteindre un processus de gestion du patrimoine structuré et focalisé.

CESD a implémenté une gestion du patrimoine par le haut en 2004 dans le but de se rendre compte des économies possibles de la manière la plus efficace. Cela a résulté deux ans après par un changement de la stratégie d'entretien et de réinvestissement pour certains types de biens. Les nouvelles stratégies ont eu pour conséquence des économies importantes tant du point de vue commercial que social.

Cependant, il est nécessaire de prêter une attention supplémentaire envers la gestion des données ainsi que la gestion du patrimoine par le bas afin d'améliorer la validité et la précision des décisions à court terme.

ABSTRACT

Asset Management decisions are based on life-cycle cost optimization and has to take the Asset Management framework such as customer needs, owner or corporate goals, shareholder value generation, regulation and legislation into consideration. Clear Asset Management objectives are needed for a structured and focused Asset Management process.

CESD implemented a top-down Asset Management approach in 2004 in order to realize a cost saving potential in the most effective way. As a result of 2 years of experience the maintenance and reinvestment strategy has been changed for certain assets or asset classes. The changed strategies demonstrate substantial cost savings from a business as well as a social point of view.

However more attention must be paid toward Data Management and bottom-up Asset Management in order to improve the validity and accuracy of short-term decisions.

KEYWORDS

Asset Management, framework, life cycle costing, management cycle.

1 INTRODUCTION

A substantial cost saving potential is identified in the Danish Water Sector in general. Customers and owners are seeking more value for money from infrastructure expenditures. Future regulation will most likely focus on fixed tariffs and decreased cost levels causing a demand for efficiency and effectiveness.

As the largest utility in Denmark with more than 500,000 customers Copenhagen Energy, Sewerage Division (CESD) holds an aging infrastructure portfolio of tangible assets (pipe network, buildings, pumping stations etc.) at an estimated replacement value of 20 billion DKK. Investment, operational and maintenance costs run into more than 300 million DKK annually, which accounts for a large percentage of the total CESD budget.

The question is how CESD can realize the substantial cost saving potential in the most effective way in order to deliver an optimized service with fewer resources? In this light CESD has implemented Asset Management to provide a framework for managing assets in a better way.

2 AIM

The aim of this paper is to present the CESD set-up and experience with top-down Asset Management.

3 DEFINING ASSET MANAGEMENT

Asset Management provides a methodology for continuous optimization of the operation, maintenance and renewal of assets. Review of literature, papers etc. indicates that there is no clear definition of Asset Management. In the financial sector Asset Management is seen as "getting the best possible return from investments". US Department of Transportation has the following working definition of Asset Management:

"...a systematic process of maintaining, upgrading, and operating physical assets cost-effectively. It combines engineering principles with sound business practices and economic theory, and it provides a framework for handling both short- and long-range planning." (US Department of Transportation, 1999).

Another example of a general definition of Asset Management when applied to tangible asset is:

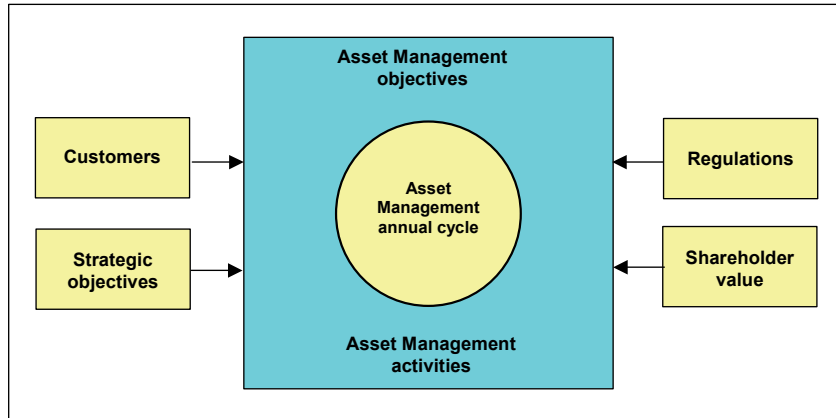
"The set of disciplines, methods, procedures & tools to optimise the Whole Life Business Impact of costs, performance and risk exposures (associated with the availability, efficiency, quality, longevity and regulatory/safety/environmental compliance) of the company's physical assets." (Woodhouse, 2001).

To CESD, the "centre of gravity" of Asset Management can be expressed by the following keywords:

- Taking a **life-cycle approach** Asset Management covers all stages from planning to final disposal and replacement. Thus Asset Management improves investment decisions for new assets and maximizes the value and usefulness of existing assets. No matter if it is a single asset or a group of assets, all stages must be taken into account.
- Asset Management is **holistic** as it integrates all kinds of costs (investment, operational, maintenance, social, risk) and effects of the whole lifecycle.
- Asset Management is a **systematic** approach as it optimizes the life-cycle value of physical assets using a certain methodology, structure and well-planned business processes. Thus Asset Management is a **cost-effective management strategy** for the long-term.
- Asset Management is **dynamic and iterative** as it includes the performance monitoring, feedback and continuous improvement of the management of assets.
- Supporting the decision-making process by providing forecasts of the long-term costs of ownership, Asset Management contribute to an improved and more **sustainable resource allocation**.

4 ASSET MANAGEMENT FRAMEWORK

The figure below gives an overview of the Asset Management framework CESD is facing.

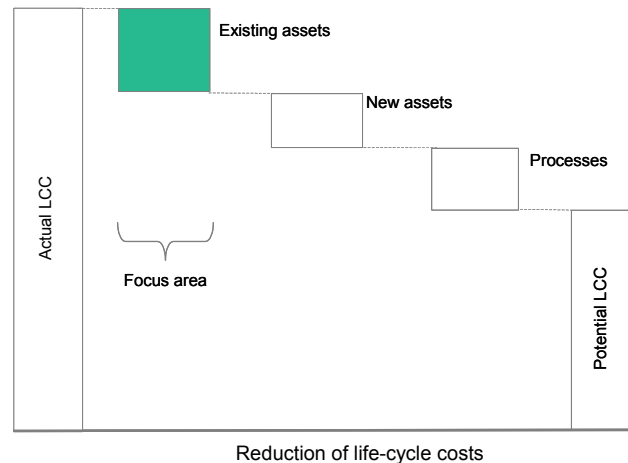


Asset Management framework

Asset Management decisions based on life-cycle cost optimization has to take the following into consideration:

- Customer needs, priorities and willingness-to-pay.
- Strategic objectives such as owner or corporate business goals.
- Shareholder value generation and competitiveness by providing the defined level of service at the minimum costs.

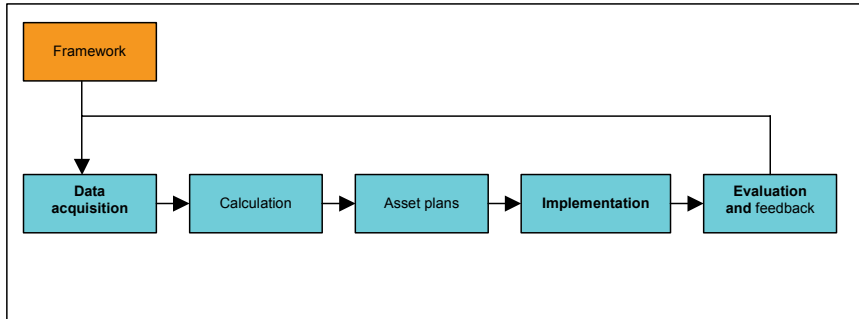
- The delivery must comply with all kinds of regulation, including environmental and health regulation and must not impact the agreed customer service level.
- Clear Asset Management objectives are needed for a structured and well-planned process. The first and crucial task in establishing an Asset Management regime is to make the objectives clear to everyone as there are many interests to satisfy, and some of them are naturally conflicting. The Asset Management objectives should minimise the inherent clashes and provide an agreed basis for focus and resource priorities.
- All CESD Asset Management activities can be related to three main areas:
 1. The optimization of existing assets based on a life-cycle cost approach balancing reinvestment costs and increasing running costs and risks (including social costs),
 2. CESD improves investment decisions for new assets by the introduction of Professional Project Management. This includes feasibility studies in the planning phase in order to identify and invest in assets with the lowest lifecycle costs that meet your objectives.
 3. Processes are optimized by among other things the implementation and use of LEAN.



The figure shows that an Asset Management objective (focusing on minimizing life-cycle costs to a potential level) can be reached by activities related to the three areas. The focus area of the next chapter is the CESD optimization of existing assets using a top-down approach.

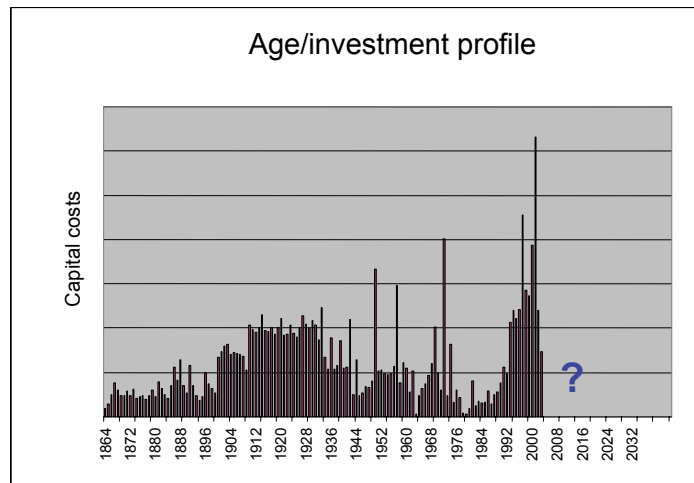
5 ASSET MANAGEMENT ANNUAL CYCLE

In general, management of asset follow a management cycle (Harlow, 2001). The Asset Management annual cycle for the optimization of the management of existing assets in CESD is illustrated below.



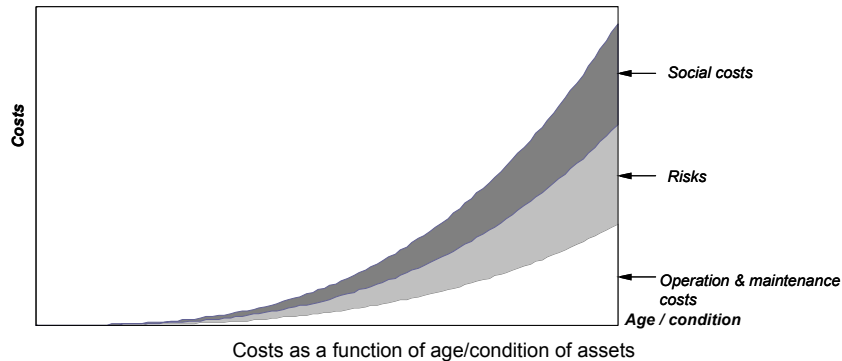
Asset Management annual cycle

CESD implemented a top-down Asset Management calculation model in 2004. The model is capable of extrapolating future costs for asset classes that each contains many similar assets. The CESD tangible assets were divided into 27 asset classes. Age and investment profiles were established for each asset class. An example is given below:



Investment profile for an asset class

The extrapolation of costs is based on the assumption that costs increase with age (or worsening condition) of an asset – finally reaching a level that makes a reinvestment required.



As indicated before Asset Management covers all stages (planning, design, installation, operation, maintenance and replacement). Life-cycle costing means that all type of costs incurred in the different stages of the assets life must be identified in order to obtain the best possible basis for economic lifetime calculations or estimates.

The model calculates optimal economic life-cycle for each asset class. Theoretical the optimal time for reinvestment is when the marginal annual costs of the existing asset reaches the level of the average annual costs (annuity) of the potential new asset. Replacement of assets neither too early nor too late will minimize the total costs expected in the future expressed as net present value (NPV).

The data acquisition phase covers:

- Approximation of the reinvestment cost for replacement of the asset. This include planning, design and construction.
- Operation and maintenance costs extracted from the business accounting system and attributed to the asset classes. Operation costs cover insurance, energy, facilities management, cleaning and security, while maintenance costs are repair, component replacement and refurbishment.
- Social costs and risks identified or estimated. From a business optimization point of view all these costs should not be included.

The systematic collection of key data and the application analytical tools or model is the basis of a comprehensive Asset Management (GAO, 2004).

The earlier mentioned top-down calculation model is applied to organize and analyze data and to transfer the input to output such as economic lifetime and recommended level of reinvestment, operation and maintenance for asset classes. The output of the calculation model must be interpreted and eventually adjusted before serving as input for the planning and budgeting.

The asset plan is based on the identified asset class cost and investment requirements. The existing condition of asset groups is described and areas of concern are identified. The asset plan must develop an overview and prioritise investment and other cost decisions. Eventually resources are allocated and activities are carried out at asset class or individual asset level.

An evaluation and feedback phase is needed to evaluate the present Asset Management performance and to improve future decisions in a proper way. If there are no true measurements in the audit phase, there can be no control process and thus no continuous improvement. In fact, the monitoring and report of the actual performance of asset groups is a continuous process. Based on the results of our

measurement, the asset plans are updated, which may involve re-allocation of resources.

6 RESULTS AND CONCLUSIONS

One of the main results based on 2 years of experience with top-down Asset Management is that CESD has gained an improved knowledge about the tangible assets at an aggregated asset class level. This includes number, size, age profile, life-cycle cost and value of the assets.

The applied lifetimes for assets are in general quite similar to the calculated economic lifetimes. However the maintenance and reinvestment strategy for certain asset classes has been changed as a result of the top-down Asset Management results. These changes are based on business cost calculations and social cost concerns. Thus Asset Management ties costs and use of limited resources more directly to shareholder value and agreed customer service levels. The changed maintenance and reinvestment strategies demonstrate substantial cost saving from a business as well as a social point of view.

Asset Management very much rely on reliable life-cycle cost data and assumptions. Given the volume and quality of data to be processed more attention must be paid toward Data Management in order to improve the validity and accuracy of the top-down calculations.

The present top-down approach is primarily applicable for long-term strategic planning and budgeting. Bottom-up Asset Management focusing on specific assets or asset classes should be applied in order to improve the short-term decisions and day-to-day practices. In addition the results and findings of the bottom-up Asset Management will serve as input to the top-down model.

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