

Value Driven Maintenance & Asset Management[®]

Competing with aging assets

"What is actually the added value of maintenance and asset management?" is a frequently heard question in boardrooms the world over. Even though taking care of your assets is often critically important, few managers are able to answer the question convincingly. Especially when they are asked to express the benefits in terms of economic value added or shareholder value - the language increasingly being spoken in boardrooms all over the world.

For this reason Mark Haarman and Guy Delahay developed the Value Driven Maintenance & Asset Management[®] methodology (VDM^{XL}). VDM^{XL} builds a bridge between traditional maintenance philosophies, long term asset replacement strategies and managing by economic added value. Not only does VDM^{XL} simplify the boardroom discussion, it also shows that far from being a cost center, maintenance & asset management can create significant economic value, improving the overall business performance during the lifecycle.

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What is value?

Before you can manage by economic added value, you have to understand what exactly *value* is. Reference to financial literature reveals that *value* is defined as the *sum of all future free cash flows, discounted to today*. This sounds impressive, but what precisely does it mean? Let's start by looking at the first part of the definition. A cash flow is the difference between income and expenditure. This is not the same as the difference be-

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tween revenues and costs, because that's an item that can be greatly influenced by accounting practices. Some companies use highly creative lease, depreciation and reservation

techniques to keep their book profits artificially high (or low!). This does not always contribute to the economic value of the company. Newspapers have been crammed with articles on this subject in the recent past. The second part of the definition stems from the knowledge that the value of a cash flow is related to time. One euro is worth more today than one euro next year. This is because you can deposit a euro at the bank today and use it to generate income over a period of one year. Therefore, we have to adjust future cash flows.

Value of maintenance & asset management

A maintenance manager is likely to say: "This theoretical approach is all very well, but what good is it to me in practice? The value of maintenance comes from delivering *maximum availability* at *minimum cost!*" While this is true in theory, it's little help in the day to day operation. This is because you have to prioritize: do you want to reduce costs or increase uptime? Is a 1% increase of uptime just as valuable as a 1% reduction of costs? And how do you determine the value of safety? What will be the

impact of my choices on the long run? VDM^{XL} provides answers by identifying the value potential of the four value drivers in maintenance & asset management and enabling you to manage by those drivers (see figure 1).

Figure 1 shows what maintenance & asset management is all about. Today's managers are constantly balancing between higher machine availability (asset utilization) and lower maintenance costs (cost control). In doing so, they must take into account the growing body of laws and regulations covering safety, health, environment and quality. On the other hand they need to manage end of life strategies of their aging assets (capital allocation).

For all four value drivers, maintenance & asset management can help to increase a company's economic value. In a market where there is more demand than supply, greater machine availability results in more products, more income and thus higher value. On the other hand, lower maintenance costs produce higher value by avoiding expenditure. When the assets reach their (technical) end of life it becomes obvious that replacement, modernization or lifetime extension of assets becomes

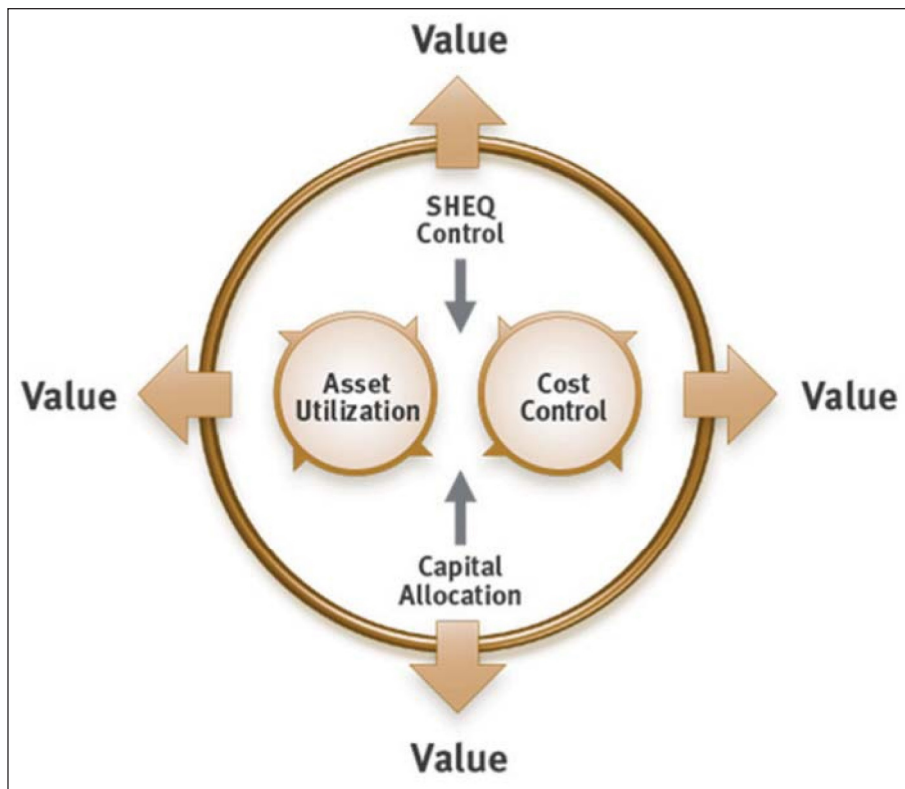


Figure 1: Maintenance & Asset Management value drivers

dominant in the discussions and that large investments for uptime improvement are no longer beneficial during the remaining lifetime.

Similarly, the safety, health, environment and quality (SHEQ) compliancy affects value. SHEQ accidents tend to necessitate substantial expenditure, with resulting negative cash flows. Damage caused to personnel, environment and image, for example, will increase expenditure. An even greater danger is loss of the license to operate because of inability to comply with SHEQ legislation. No license to operate means no production and no income.

Value potential

Maintenance & asset managers must show where there is potential for value within their organization and should focus on the value driver with the highest value potential. VDM^{XL} provides calculation models and industry specific benchmarks to determine the dominant value driver within the maintenance & asset management organization (see boxes 1 and 2). Note that the result of the calculation of value will differ markedly depending on the industry involved. For example, in the West

European chemical industry is suffering from aging plants. The value potential here lies mainly in modernization and lifetime extension of the existing assets. So managing Capital

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Allocation becomes dominant. In most pharmaceutical companies, the situation is the other way round. Demand for medicines continues to grow but the technical availability of the production process is relatively low. This matter is obviously receiving attention. The SHEQ compliancy here is becoming more and more important with the growing role of the American FDA (Food & Drug Administration) in the global pharmaceutical industry.

Value and time

The next example shows that value depends not only on the

industry concerned, but also on time. Around 2007 the automotive industry was one of the first industries that experienced the financial crisis. The demand for cars declined dramatically and automotive companies needed to change their strategy quickly, from top floor to shop floor, including maintenance.

Volvo Cars, the Swedish car manufacturer with plants in Sweden and Belgium, after years of focusing on Asset Utilization as their dominant value driver, suddenly found Cost Control became the number one. As their TPM based maintenance strategy was only aiming at plant uptime, Volvo Cars implemented VDM^{XL} to optimize the maintenance costs. Three years later, in 2010 the maintenance manager from Torslanda, Volvo's largest manufacturing site, announced that he had been able to reduce the maintenance budget by 50%, without jeopardizing uptime or safety of the plant. The lower cost levels helped Volvo cars to survive the financial crisis and to be ready for the future. They knew that as soon as the demand for cars grows again, they need to adjust the maintenance strategy, focusing on Asset Utilization again as they do now. And so the dominant value driver - and thus the maintenance strategy - changes over time as a result of the market situation.

Value and competences

Once the dominant value driver and its value potential has been identified, the maintenance & asset management function must be organized accordingly. Which competences (see figure 2.) are, and are not, important? Take the example of a plant in a market situation where most value is currently achievable by controlling costs. So the right-hand value

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VDM^{XL} formulas

The definition that *value is equal to the sum of all future cash flows, discounted to today* is translatable into the following formula:

$$PV = \sum \{CF_t / (1+r)^t\}$$

Where: PV = value (present value)
 CF_t = future free cash flow in year t (cash flow)
 r = discount rate

To calculate the value of maintenance & asset management, this formula can be applied in the following way:

$$PV_{M\&AM} = \sum_{t=0}^n \{(CF_{AU,t} + CF_{CC,t} + CF_{RA,t} + CF_{SHE,t}) / (1+r)^t\}$$

Where: PV_{M&AM} = value of maintenance & asset management
 CF_{AU,t} = future free cash flow in year t from asset utilization
 CF_{CC,t} = future free cash flow in year t from cost control
 CF_{RA,t} = future free cash flow in year t from resource allocation
 CF_{SHE,t} = future free cash flow in year t from SHE
 t = the years between now and the expected remaining lifetime
 n = expected remaining lifetime in years
 r = discount rate

circle must be configured from *asset cost budgeting to cost analysis*. The opposite applies to the pharmaceutical industry. There, the left-hand value circle must be organized from *asset*

performance planning to loss analysis. Interestingly, both value circles include the competences of *asset portfolio management, reliability engineering, planning & scheduling and job execution*.

These competences are the link between the four value drivers (including SHEQ Control and Capital Projects) and thus form the heart of VDM^{XL}. On the outside of the model you

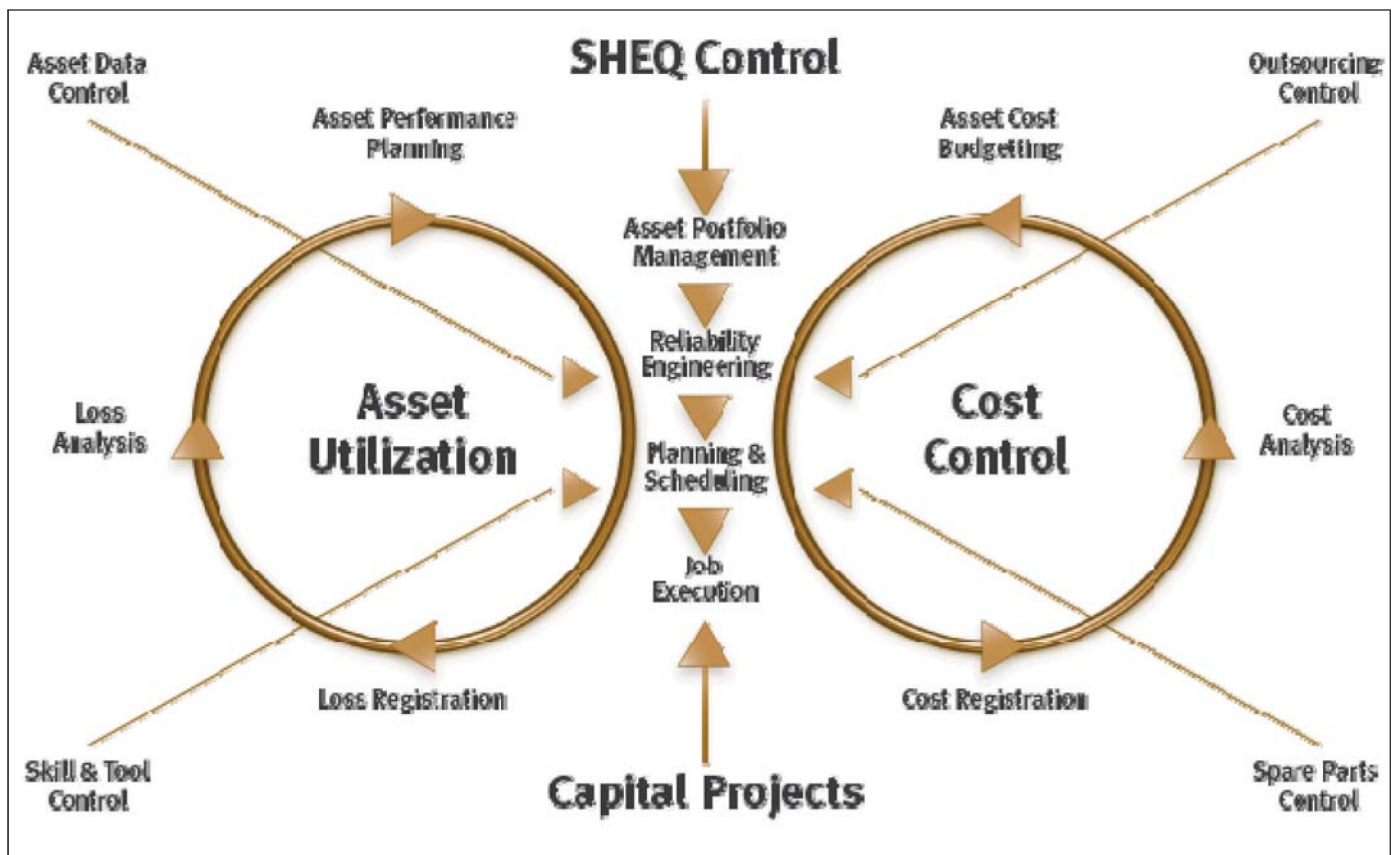


Figure 2: Maintenance & Asset Management core competences

Example of asset aging impact on value potential

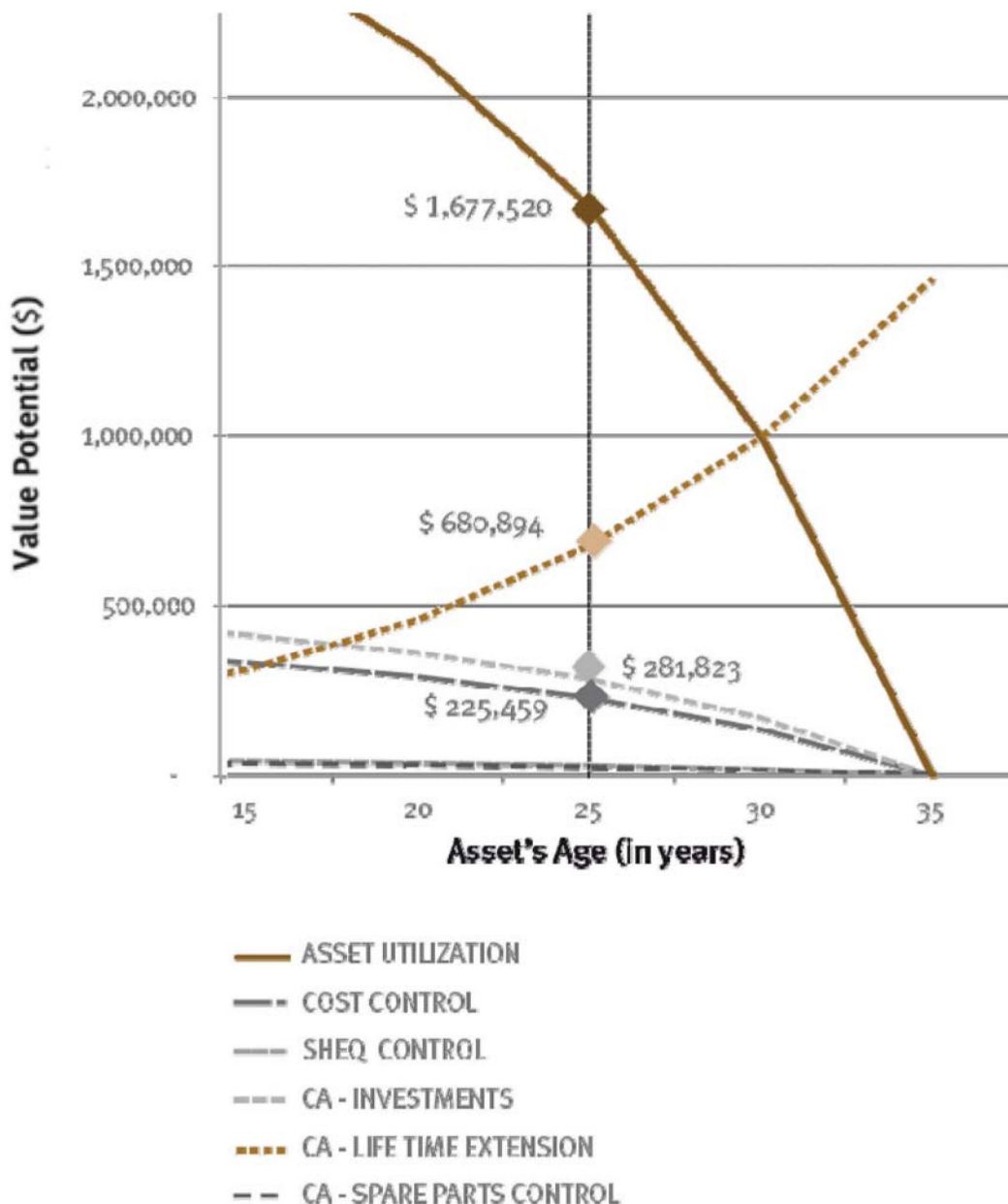
The annual turnover of a pharmaceutical plant is \$80 million with a 25% gross margin realized by 80% technical availability. Total asset replacement value (ARV) of the plant is \$84 million, annual maintenance costs are \$3.2 million (4% of the ARV) and approximately \$6.7 million worth of spare parts on stock.

The plant is already 25 years old and is expected to last another 10 years, based on the current modification investments of \$4.2 million per year. A recently completed SHEQ risk assessment identified a safety risk with a probability of 0.5% and consequential reputation losses of \$20 million on one hand and a quality risk with a probability of 0.1% and reputation loss of \$300 million on the other hand.

The company uses an 8% discount rate, while the interest on long-term is 5%. For the current situation this results in the following incremental value potential for:

- Asset Utilization: \$1,677,520 per 1% improvement of technical availability
- Cost Control: \$225,459 per 1% reduction of maintenance costs
- SHEQ Control: \$26,840 per 1% risk reduction
- Capital Allocation: \$680,894 per 1% lifetime extension (e.g. 0.35 years additional lifetime)

As the present value is calculated on the basis of the plant's remaining lifetime the value drivers Asset Utilization and Cost Control will generate less free cash flows because of fewer remaining years. The value of lifetime extension (Capital Allocation) increases and becomes dominant because the timing of these measures comes increasingly closer and the potential value is discounted over fewer years.



find the competences related to the four resources: spare part control (spare parts), outsourcing control (services from contractors), skill & tool control (internal work force) and asset data control (drawings, manuals, asset condition data, et cetera).

Value and best practices

Now we know which competences need to be improved, we need to determine how. For this purpose VDM^{XL} puts forward hundreds of best practices that were collected from the leading maintenance & asset management organizations in different industries. All these best practices have been assigned to competences in the VDM^{XL} model, so that you know which best practices to use in which situation. Total Productive Maintenance (TPM) enjoys a reputation mainly as the best practice for registering, analyzing and improving production

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losses (Asset Utilization). For managing the long term risks long turn asset planning (LTAP) and strategic asset management plans (SAMP) are recently developed best practices. Using these best practices, a technical department can quickly become a professional maintenance & asset management organization that adds value to the overall business performance. In VDM^{XL} terminology, this is called the Winning Maintenance & Asset management Strategy.

Valuable?

Is VDM^{XL} valuable? Hundreds of maintenance organizations around the world and across industries think it is. Managing by value is not just a must, it is the only way to discover the true significance of maintenance & asset management. VDM^{XL} makes maintenance more than a cost center because it contributes in various ways to a company's economic prosperity and in a sustainable way by taking into account the whole asset lifecycle. In fact, VDM^{XL} confirms what we already thought, but now we have the proof!

References:

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2. Mats Ahlstedt, "VDM Bingo För Volvo", Underhall, Sweden, 12 March 2010
3. Investor information on www.bp.co.uk