



Breakthrough in product development

Reden: innovative, creative, ambitious

Reden (Research Development Netherlands) is an innovative, creative and ambitious engineering consultancy firm which excels in simulation-driven product development. Reden is active in many fields, including industrial equipment, automotive, consumer goods, energy, medical systems, and space systems.

We help our clients to achieve breakthroughs in product development. We give product developers insight based on simulation models. This insight helps them to design new products more quickly and easily, because the products' performance has been made predictable.

Knowledge Rules

Our models yield not only insight in the way a product works, but also new knowledge rules (a knowledge rule is a rule which describes the relation between design parameters and the performance of the product). These knowledge rules can prove very valuable in the design process.

In any organization, a wealth of knowledge rules exist (ranging from tables, formulas, experience, etc.). This accumulated knowledge should be stored securely in such a way that it can be accessed by engineers in an immediately usable form. For this purpose, Reden has developed a virtual engineer: MrReves!

Why MrReves ?

In most companies, there is someone who has encyclopaedic knowledge of the company's products, and to whom everybody turns with questions. This person has years of experience, can combine experimental results done over many years and still knows why design choices were made in the past. Does this sound familiar?



Mr. Reves is the virtual equivalent of this person, a virtual employee who holds all your company's knowledge about your products, and who can supply it in an immediately

usable form to your real employees in both the technical and the commercial department.

How does it work?

The knowledge in your company needs to be translated into knowledge rules as used in Mr. Reves. Reden staff will help you to do this. Numerical modelling is used to add new knowledge rules.

Just one example:

Take a simple product like a valve seal is shown in the diagram below (the part is circular, only half of the valve is drawn).

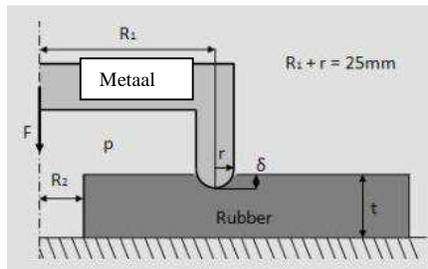


Figure 1; valve seal

A metal ring (radius R1) is pushed by a force (F) onto a flexible (rubber) seat. This closes off a liquid inside the valve with pressure (P). Questions which the designer might have are:
1) which material should I choose to avoid leaks up to a pressure of 8 bar?
2) which is the minimal force F to get adequate sealing up to 8 bar?
3) which values should I choose subsequently for the other design parameters? How much freedom to choose those parameters do I have?

A common method for choosing critical design parameters is the following. The design team examines the above questions and, using knowledge and experience data, decides on a valve configuration which will probably meet the requirements. Testing is used to verify this. If the design fails the test, the process is repeated. The final result works, but it is perhaps a little oversized. Someone may suggest that the development process has taken rather long..

Where does MrReves come in ?

The employees of reason (technical university graduates) make a virtual model of the valve (normally a Finite Element Model). This model calculates the pressure at which a particular valve configuration starts to leak. This configuration is validated in a real test. If the model and the test results match, the model is run with various settings of the design parameters (Design of Experiments). The results of these numerical experiments are

used to formulate knowledge rules. These knowledge rules describe the relation between the design parameters and the performance of the design, and are implemented in Mr. Reves. Other knowledge rules which are used in the company are also fed into Mr. Reves.

An example of how the data in Mr. Reves can be used is the following. Suppose you'd like to know all possible configurations which can handle a pressure of 8 bar. Mr. Reves calculates these using the knowledge rules which have been put in. The result looks like this:

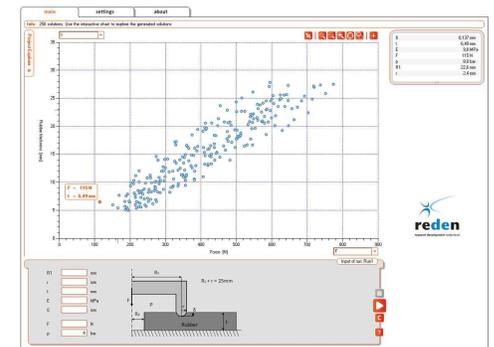


Figure 2; MrReves Demo

Each blue dot represents a working (!) solution, calculated using the knowledge rules. Figure 2 shows the force F on the x-axis and the rubber block thickness t on the y-axis. This makes it possible to select the solution with the lowest F. If the user clicks the leftmost dot, the other design parameters for this solution are displayed automatically (orange box right).

This principle can be applied to the design of almost all products.

What does this bring to you ?

Mr. Reves stores knowledge in a directly usable form. As a result, knowledge is no longer spread over your organization but available in a central system. Knowledge does not disappear when the person who holds it retires.

Mr. Reves shows which solutions are possible (insight in the solution space). This makes it easy to find the optimal solution. Using trial and error, you would need luck or a large number of expensive experiments to find this solution.