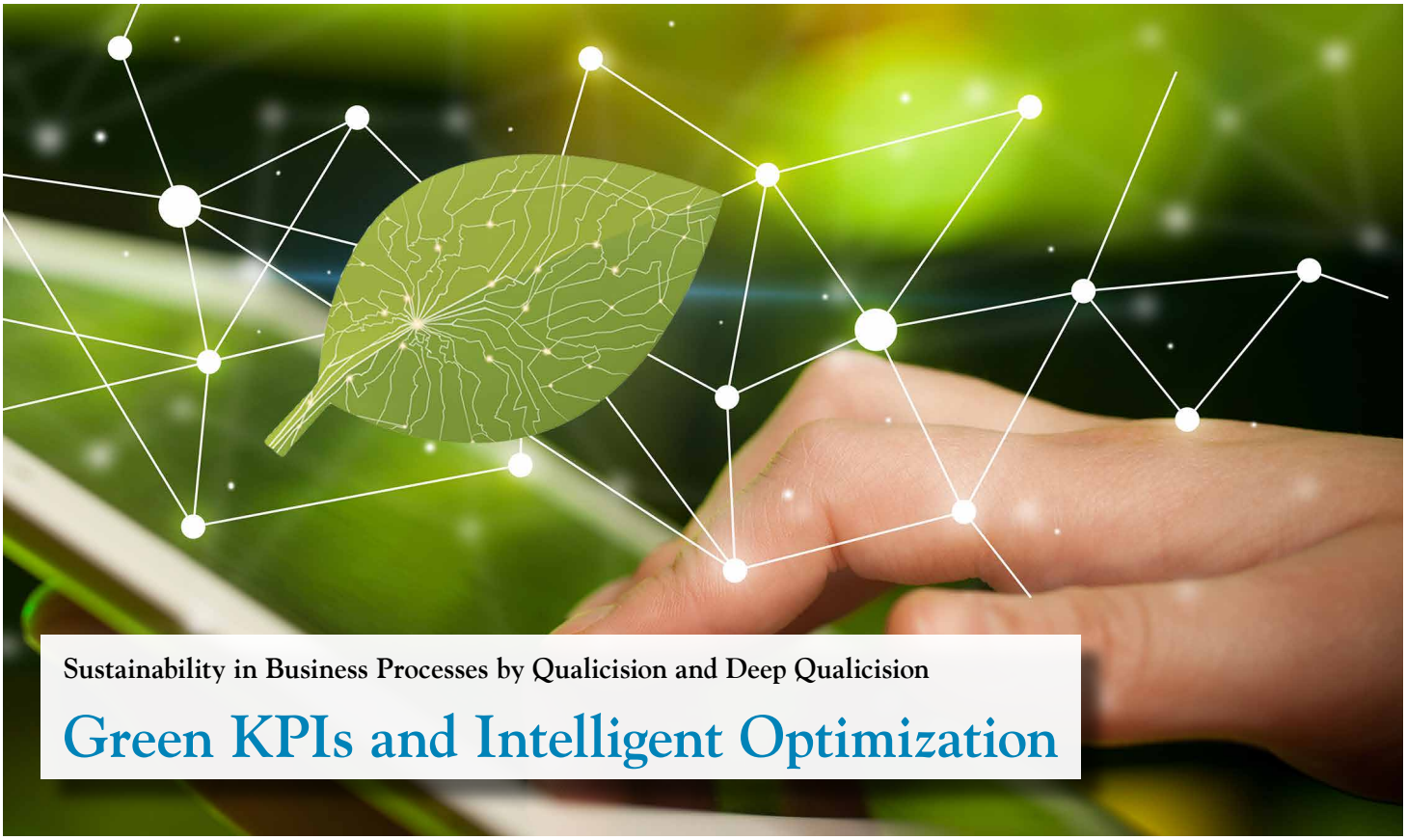


Sustainability in Business Processes by Qualicision and Deep Qualicision

Green KPIs and Intelligent Optimization

Conserving resources in business processes has a huge impact on improving their sustainability. With Qualicision-based optimizations, traditional process goals can be mapped onto or traced back to sustainability goals by using KPIs. In this way, Green KPIs can be integrated into Qualicision optimizations. Green Qualicision emerges.

To begin with, all process improvements that contribute to the reduction or the consistent and even use of resources without unnecessary stress peaks are green. Suitable use cases can always be defined if the underlying business processes require multiple resources whose modes of action must be coordinated. For example, when organizing and carrying out maintenance processes for electrical transmission networks, appropriate optimization potential can be achieved by suitable optimization of deployment.

The advantage of Qualicision as an optimization logic for software-driven business processes lies in the possibilities of linking technical and operational KPIs (key performance indicators). With Qualicision, technical restrictions can be efficiently linked to any number of other KPIs. These include those that represent the sustainability of the processes. These can be both indirect green KPIs aimed at conserving resources, and KPIs that are directly mapped to the relation between original KPIs such as utilization, throughput or adherence to delivery dates, as well as sustainability KPIs such as energy efficiency. The following use cases, which have already been implemented or are in preparation, show which sustainability effects can be achieved by a suitable Qualicision-based optimization.

Sustainability effects in the maintenance of electrical networks

The maintenance of a power grid in the network area of a federal state is usually in the hands of several hundred maintenance teams which have to carry out more than one hundred thousand maintenance operations per year. Optimally coordinated, the operations carried out every day allow substantial CO_2 savings. Assuming that in such a business process about 500 maintenance vehicles are on the road, covering every day a distance of about 50 km, each year a total distance of 50*500*220 km, that is 5.5 million km is travelled. This corresponds to a total distance of more than 137 times around the earth. At a defensive estimate of approx. 100 grams per kilo-

meter (following the ADAC[1]), the resulting CO_2 emissions correspond to approx. 550 tons per year.

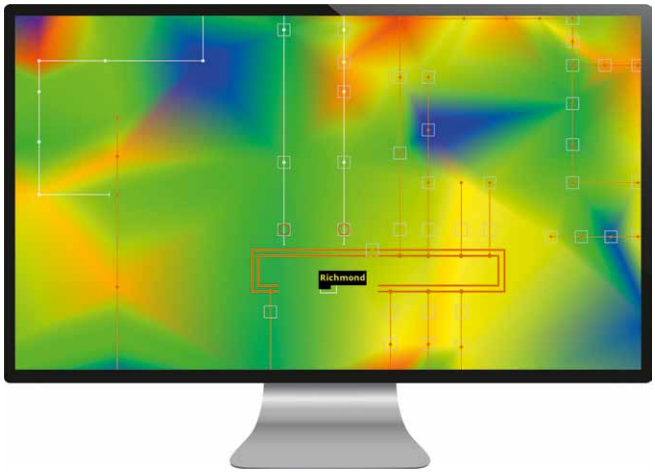
By means of a suitable Qualicision-based optimization as part of the software tool PSIcommand, the business process described above could be improved in such a way that the same workload could be managed with a 15 percent reduction in the use of resources. If this is translated into kilometers traveled and the resulting CO_2 emissions, a saving of about 80 tons of CO_2 emissions per year is achieved, which corresponds to about 655 flights on the Munich-Berlin route (approx. 122 kg of CO_2 per passenger and flight[2]) or approximately four flights of an Airbus A320[3]. If this is then extrapolated to all German federal states, intelligent optimization of maintenance processes in this present business process alone results in potential savings in CO_2 emissions comparable to around 64 medium-haul flights.

Sustainability effects by Qualicision-based sequencing

Comparable or even stronger effects can be derived from optimizing production processes. For example, estimates suggest that the production of a mid-range vehicle is connected with between 3 and 5.3 tons[4] of CO_2 emissions. If, making a cautious assumption, we take half that number and assume that a factory produces about 500000 vehicles per year, we can expect a total of around one million tons of CO_2 in one year.

In terms of calculating assembly sequences, Qualicision-based optimizations have been able to achieve potentials which, depending on the initial situation, have led to an improvement of 10 to 20 percent. After introducing this optimization, it was therefore possible to work more sustainably with an average of 15 percent resource conservation.

If we assume, for the sake of simplicity, that assembly only accounts for about 2.5 percent[5] of the CO_2 emissions, then 25 percent of one percent of 1000000 tons, i.e. 2500 tons, of CO_2 reduction per factory in the first year of using the optimization can likewise be assumed. Two thousand five hundred tons correspond to almost 20500 less flights on the Munich-Berlin route, according to the figures mentioned above. This is already a surprisingly high number, given that it corresponds to approximately 122 fully booked flights of an Airbus A320. But, if you extrapolate this potential to all factories equipped with Qualicision optimizations, the figures are truly impressive. Accordingly, it can be estimated that Qualicision algorithms already contribute significantly to reducing CO_2 emissions, representing a considerable share of the PSI Group's Green Software.



Representation of a "heat map" in the PSIsaso module of the PSI network control system.

Sustainable network management by PSIsaso with Qualicision [6]

Decision Support is particularly associated with new sustainable energies and the corresponding increase in decentralized energy production. For example, we can see the growing importance of the usually static separation points in the network. In the "Decision Support" module, a dynamic optimization of the separation points is implemented. This enables a significantly better utilization of the entire medium and low-voltage network while complying with the prescribed voltage bands. The goal of this optimization is to avoid additional grid expansion projects. Here too, the conservation of resources plays a decisive role. Sustainability for sustainability is the credo. Since the system is designed to use Qualicision to incorporate additional operational and economic KPIs into decision support, the inclusion of green KPIs that can reflect sustainability aspects is on the agenda.

Holistic depot and charge management for e-bus fleets [7]

Emission-free local passenger transport is an important sustainability goal for modern mobility concepts in municipalities and cities. Electric buses are becoming increasingly important. At the same time, the changeover to e-mobility also has a significant impact on depot processes. In addition to the new requirements for qualification of employees and on technology for service and maintenance, dispatching systems also need to be adapted. This is because, if future public transport

The PSIebus software solution integrates all e-mobility tasks into one system.

operations are to be sustainable—but still no less reliable—new factors such as limited battery range, charging infrastructure on bus routes and in the depot, numbers of passengers, outside temperature and connection capacity will be decisive.

These factors are incorporated into the PSIebus optimization goal system as Green Qualicision KPIs. This system offers transport companies a holistic software solution that combines knowledge about public transport processes with those of energy supply. The system combines the depot management module PSIeDMS, which is already equipped with Qualicision, with the charge management system PSIsmartcharging (soon also powered by Deep Qualicision AI, i.e. learning functionalities) and thus takes into account the necessary sustainability factors and original dependencies. In doing so, all vehicles, whether in the depot or on the road, are optimized for sustainability in terms of efficient control, charging and dispatching.

Green Qualicision KPIs

The use cases described above already improve the sustainability of the optimized business processes. The given figures are intended to illustrate a possible order of magnitude of the effects of optimization on the different aspects of sustainability. At this point, it is not a question of deducing precise series of numbers. But it is clear that even original economic KPIs contribute to sustainability. Because Qualicision optimizations are open to the integration of a wide range of types of KPIs, further developments should explicitly integrate sustainability KPIs. These can certainly be described as green KPIs which will be included in the KPI portfolio of existing optimizations in a leading position.

For example, the program includes "energy balancing", with a working group established specifically for this topic having been set up within the PSI Community Industrial Intelligence (CII). This group is concerned with a holistic harmonization, based on energy KPIs, of the use of existing PSI software tools for optimizing business processes, in particular by defining green sustainability KPIs. These KPIs then serve as decision support and AI tools by modeling with Qualicision and Deep Qualicision to control business processes directly from a sustainability perspective. There is a lot to do.

Sources:
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[2]www.utopia.de
[3]www.lufthansagroup.com
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