Pioneering for You

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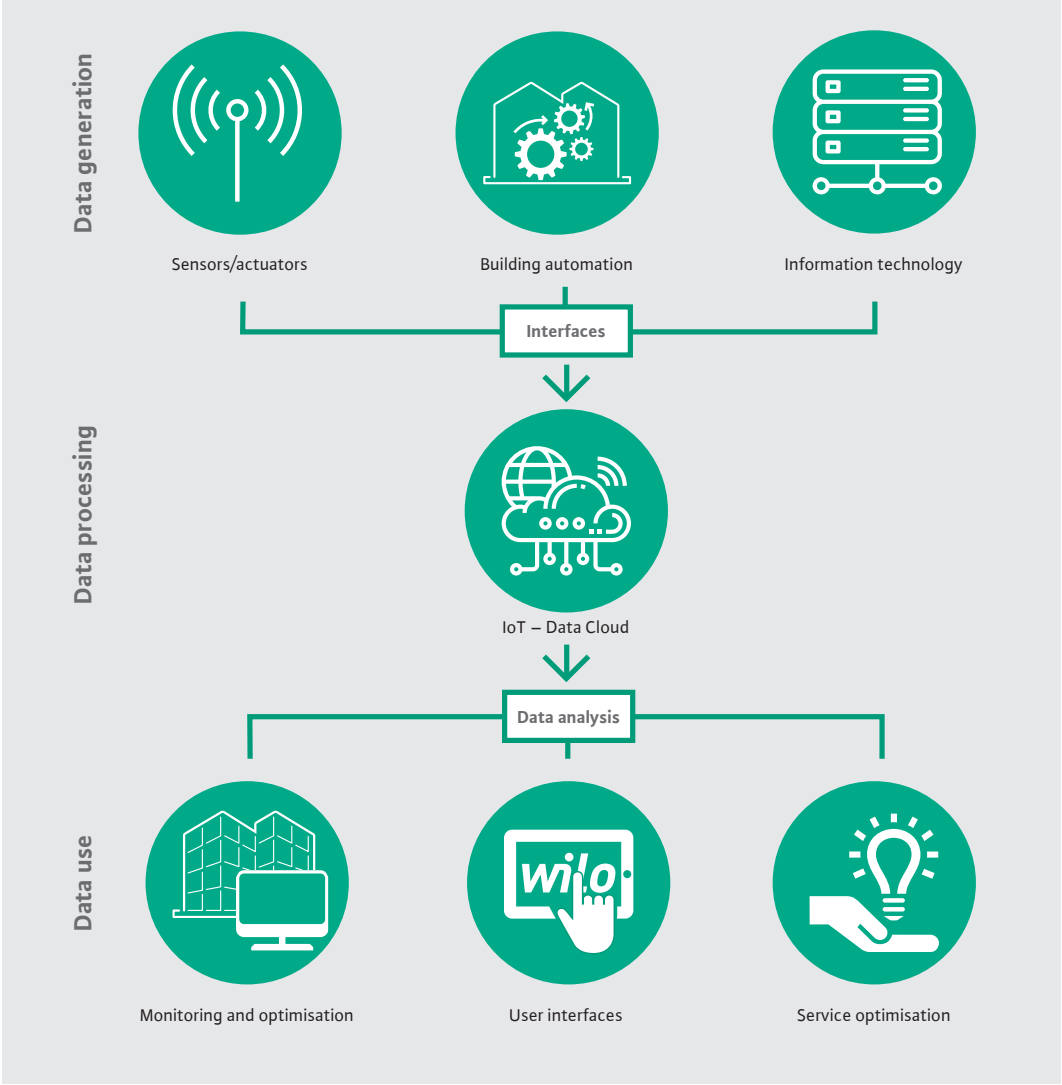
# Digital process reliability for real estate developments with critical infrastructure

**The digital future of construction is defined worldwide as a large framework through integral design and the design methodology Building Information Modelling (BIM). However, the underlying goal of an economically and ecologically holistic view, especially of functional buildings, over the complete life cycle inevitably requires the consistent connectivity of all functional processes taking place in a building with the goal of seamless monitoring.**

**Only in this way is it possible to continuously optimise them as an essential building block of "Building 4.0", particularly in terms of defined process reliability, and to intervene preventively before system-critical failures occur if necessary.**

Despite the significant progress already achieved, particularly through the miniaturisation of sensors and actuators, the vision of the networked building that is seamless in terms of digital concept and cross-processing in the sense of a smart building[1] (and therefore clearly distinguished from the Smart Home approaches geared more towards domestic property)[2] is still in its infancy.

## Components of a Smart Building




## The main reasons for this are

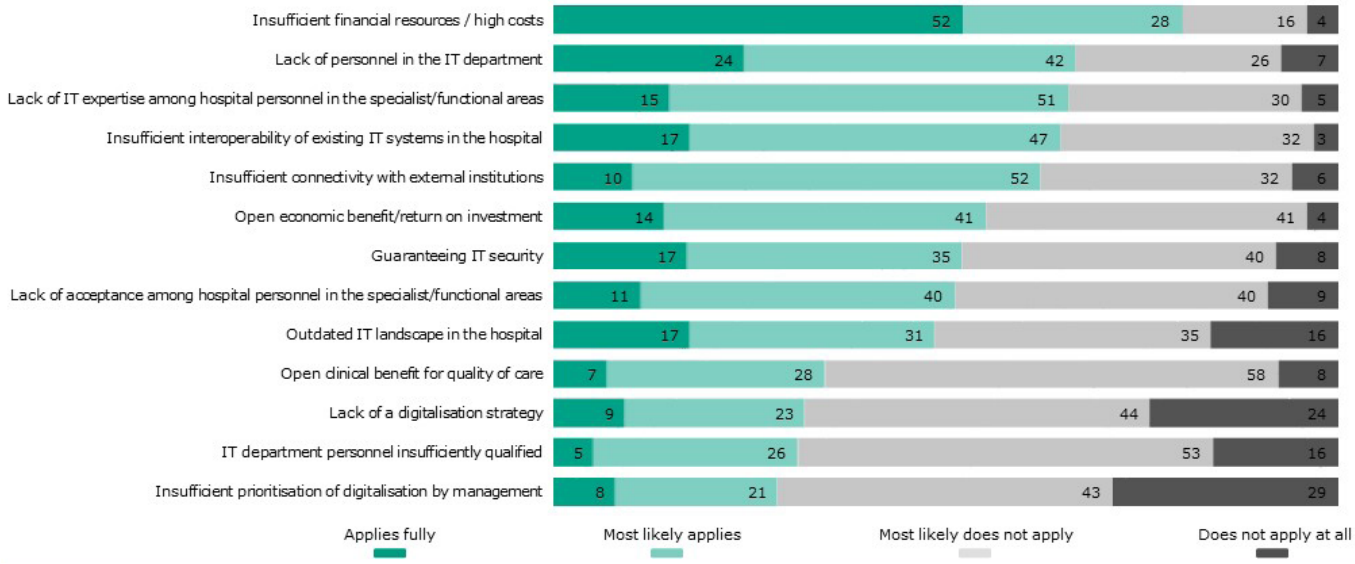
- the inevitable need for connectivity (and therefore interoperability) of the most diverse units and systems over their entire period of use – also when replacing and expanding system components as well as

- the system integration itself, both from a technological point of view (with the particular challenge of retrofitting in existing buildings) as well as taking into account the interests of the user. This includes, most importantly, a measurable value proposition that is, or should be, the basis for every investment decision, every unit extension or expansion for the operators of public-commercial properties.

[1] Smart Building: https://info.thoughtwire.com/smart-building-definitions
[2] Sensor development: The global market for sensors has doubled from US$102 billion 10 years ago to over US$200 billion in 2020. (Source: AMA Verband für Sensorik und Messtechnik e.V.)

An example of this is an investment analysis by the auditing company BDO AG Köln[3] in cooperation with the Deutsches Krankenhausinstitut (German Hospital Institute), here focussing on hospitals as a representative example for all functional buildings. According to this analysis, the operators of these kinds of properties used their investments for the most part (55 per cent) for the new construction and conversion of buildings in the years 2012 to 2014.

## In your view, what are the central problems and challenges in the digitalisation of your hospital? (hospitals in %)




A study carried out by BDO/DK[14] reveals the problems with the digitalisation of hospitals – and, in this way, has also indirectly revealed a central reason as to why the connectivity of technical building equipment can still be expanded, especially in existing buildings. (Graphics / Source: BDO/DKI)

Significantly less, only 29 percent of the money, was invested in medical technology; in principle, therefore, in the core task assigned to the property. However, even less, namely a mere 9 percent, was spent on hardware and software for IT. And if we break down this 9 percent even further, here again the keyword “digitalisation” actually has a clear focus on the “paperless administration” of patients[4]. This includes electronic documentation systems as one of the first steps, followed by electronic patient filing or medication support.

Since at the same time, according to the study, “the financial resources for comprehensive digitalisation are lacking” and there is a “shortage of qualified IT personnel ”, it cannot be assumed in the long term that there is structural improvement in the digital connectivity of technical processes in hospitals (such as the secure supply of heat/cold or drinking water, but also media such as gases or compressed air).

[3] Investitionsfähigkeit der deutschen Krankenhäuser (Investment capability of German hospitals); BDO Wirtschaftsprüfungsgesellschaft (Auditing company); 2015; www.bdo.de
[4] Das digitale Krankenhaus (The digital hospital); BDO Wirtschaftsprüfungsgesellschaft (Auditing company); 2019; www.bdo.de


The uninterrupted supply of heat/cold and drinking water is of existential importance for hospitals. (Photo: Martin)

This is all the more critical since, on the one hand, about 6 percent of hospitals by definition belong to the so-called critical infrastructure in healthcare (KRITIS)[5].

This means that they must function without interruption in terms of acute care in the event of a disaster. On the other hand, regardless of a hospital's classification, even comparatively minor disruptions in in-house technical processes generally lead to significant difficulties in patient care everywhere. Two typical examples of potential disruption risks with far-reaching consequences specifically are the supply of heat/cold to operating theatres or an interruption in the drinking water supply that comes with corresponding hygiene risks. In the case of disruptions to the supply of heat/cold to operating theatres, even slight changes in the temperature of the air in the room during an operation can lead to serious complications for patients, such as wound healing problems, if the temperature in the operating theatre falls below 21°C for adults or 24°C for children[6].

In the case of interruptions to the drinking water supply, immunocompromised persons are at high risk of becoming infected with Legionella pneumophila if interruptions in operation lead to stagnation and therefore to the risk of significant multiplication of these bacteria. This so-called legionellosis is a type of pneumonia caused by legionella growth in stagnant and/or incorrectly tempered drinking water[7].

This can have fatal consequences.

However, it is precisely such comparatively standardised process risks as the uninterrupted supply of heat/cold or hot/cold drinking water (PWH, PWH-C, PWC and PWC-C) that could and can be largely eliminated in advance. This can be done via digital connectivity of the building services in accordance with the generally recognised latest technology, even in the case of retrofitting, without major investment expenditure.

The prerequisite for this is that in the (replacement) procurement of pumps for the systems that carry the media, for example, not only are correspondingly connective products used, but their potential "swarm intelligence" is simultaneously flanked by a coordinated service package. This includes, among other things, support during commissioning, remote monitoring or more extensive services aimed at the process reliability of the overall system.

An example of this is the Wilo-Smart Connect concept, with which network-capable products such as the Wilo-Stratos MAXO pump and retrofit modules for existing systems are brought together via the Wilo-Assistant app to safeguard technical processes and are intelligently integrated with the broader goal of predictive maintenance.

**Wilo-Smart Connect**

[5] Der Marburger Bund; Aug. 2019; www.marburger-bund.de
[6] Deutsch. Ärzteblatt Int; 2015
[7] see also: www.rki.de; Infektionsschutz, RKI-Ratgeber, keyword: Legionellose

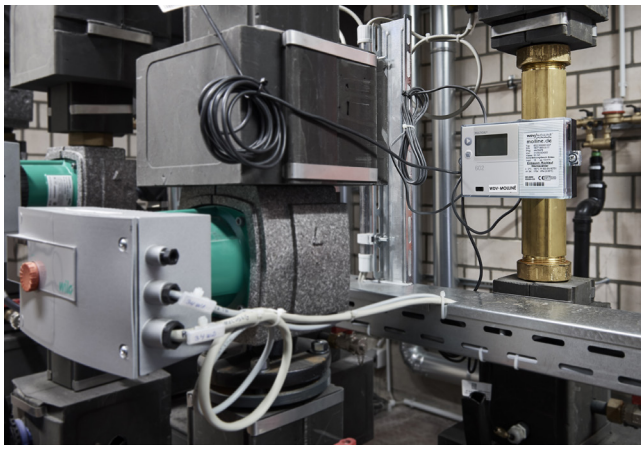
## The challenge

Driven by increased demands for functionality, safety and comfort, as well as the subsequent major expansion of regulations, the complexity of technical building equipment has increased massively in recent years. In addition to the electrotechnical equipment, this applies in particular to the central “lifelines” of each property, especially the piping networks for hot/cold drinking water as well as for the supply of heat and cold or air conditioning. What these supply networks have in common is that in general they

- have to function without interruption 24/7,
- are continuously being expanded and supplemented, especially in the existing stock and
- their functionalities depend without exception on pumps or pump systems.

***Pumps are an essential part of maintaining the function of the “lifelines” in buildings.***

The number of pumps installed in a hospital varies, of course, depending on the size of and equipment in the hospital. However, typically, in addition to glandless and glanded pumps of various performance capacities in heating, plumbing and air-conditioning systems, there are usually various separating stations, pressure-boosting systems, pump systems for firefighting water and, if necessary, for rainwater utilisation and (when it comes to sewage) not least lifting units and pump chamber systems.



In new systems, the connectivity of pump systems for energy monitoring, for example, is becoming more and more standardised in functional buildings. That being said, it fails just as often because there is no BMS or it is not really open for the individual installation systems. (Photo: Martin)

In properties without building management systems (BMS), these pump systems must be regularly checked, maintained and, if necessary, re-parameterised on site. But even in existing buildings with BMS, the remote reading/parameterisation is often incomplete, as older pump systems are not connected to the network for various reasons, or only with a limited scope of performance (keyword: potential-free output).

As well as the personnel (and therefore cost-intensive) effort associated with manual control and maintenance work, such a comparatively insecure, sometimes even non-transparent maintenance system due to lack of documentation, represents a latent liability risk for the system operators: If problems arise as a result of a pump failure, the operators must always be able to provide complete proof that they have fulfilled their obligations. This also includes regular inspections and maintenance. If this is not possible, there is a risk of claims for damages.

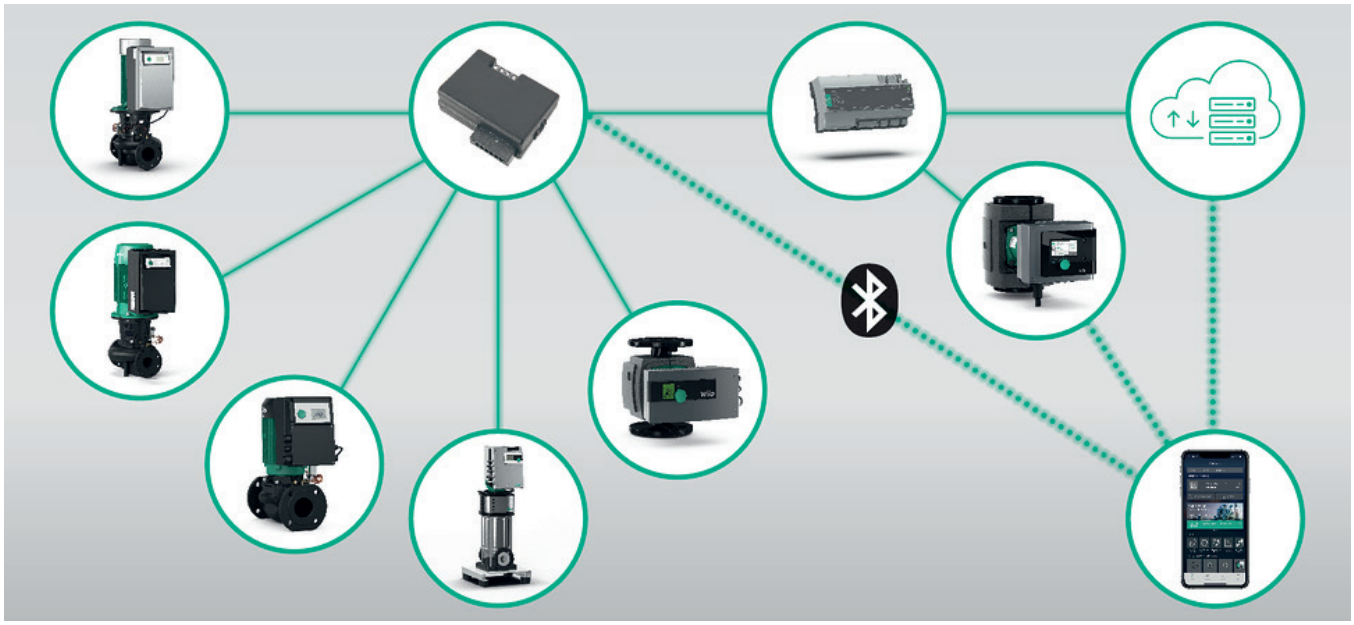
**Critical: lack of information...**
**... in buildings without BMS or without networked pump systems:**

- higher operating costs due to the time-consuming manual testing/parameterisation of the pumps
- cost-intensive fault recording due to exclusively on-site operations
- lack of transparency/inadequate documentation of operating parameters
- predictive maintenance is not possible, as there is no direct information on changed operating parameters/system status
- poor monitoring/achievement of calculated energy savings

## The solution approach

In light of the chronic underfunding and the associated investment weakness as well as the limited digital resources of German hospitals (as described), the connectivity of the functional processes in such complex technical building equipment systems “top down”, i.e. radiating from a central BMS to the individual installation components, for example for heating/cooling or drinking water, seems rather unrealistic.

By contrast, approaches such as the Wilo-Smart Connect system developed by Wilo for new and existing systems, which can also be retrofitted, are much more practical and are tried and tested, as it allows the simultaneous integration of existing pumps in addition to the integrated pump intelligence of the current pump generation. This is why it is a low-threshold investment incentive to successively build up the connectivity of the local pump world.



The Wilo approach to the connectivity of the lifelines in a functional building is holistic: With Wilo-Smart Connect, both new and existing pumps are integrated; decentralised communication is possible locally via Bluetooth as well as via Gateway using the Wilo-Smart Cloud.

When it comes to the hardware, Wilo-Smart Connect is based on only two pillars although these are crucial: a current pump generation such as the Wilo-Stratos MAXO series and retrofit modules for retrofitting electronic Wilo pumps in existing buildings.

With their integrated intelligence, the current pump generations, such as the Wilo-Stratos MAXO, are a central component in the practical connectivity of pump systems.

Wilo-Stratos MAXO

The “Wilo-Stratos MAXO” is designed as a high-efficiency pump for commercial HVAC and drinking water applications. In addition to the usual equipment features, which are aimed in particular at user-friendliness, it comes with the following as standard, among other things,

- various options for integration into the building management system,
- intelligent control functions such as Dynamic Adapt plus, Multi-Flow Adaptation, T-const. and ΔT-const. as well as
- all necessary communication interfaces (e.g. Bluetooth) for connection to mobile end devices, including direct pump networking for multi-pump control via the Wilo-Net.


Retrofit modules are used as an interface for retro-fitting existing pump systems.

The retrofit modules for retrofitting electronic Wilo pumps in existing buildings, such as the Wilo-Stratos GIGA series, are compact interfaces that are simply attached to the existing pump and, in this way, make the pump just as capable of communicating with the same “network” as the Wilo-Stratos MAXO already is at the factory.

This limitation of Wilo-Smart Connect in terms of the hardware to basically only two core elements brings the following advantages for operators, facility management and contracted installers

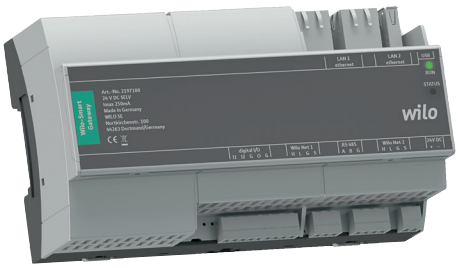
- an option of successive conversion and upgrading of the pump equipment,
- financing that can also be extended over longer investment periods and
- a step-by-step and therefore more manageable entry into networked pump system control

When it comes to the software, and therefore also in terms of control technology, Wilo-Smart Connect brings together the intelligent pumps in the free, easy-to-use

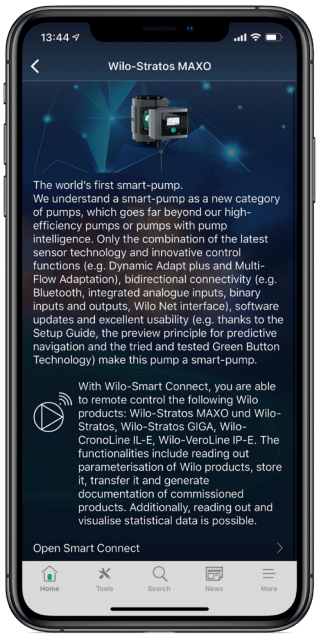
**Wilo-Assistant app.** Bidirectional communication takes place either locally via Bluetooth (between the pump and smartphone/tablet with the Wilo-Assistant app) or continuously via the

**Wilo-Smart Gateway for up to twenty pumps.**

The system data continuously supplied via Gateway can always be called up from the Wilo-Smart Cloud using any end device, for example for system analysis.




## The uses:




The pumps can be put into operation, read out and re-parameterised directly on site using a smartphone or tablet with the Wilo-Assistant app or remotely from the facility management office or the specialist installers commissioned with the service without additional equipment (such as a dongle, GSM module or similar). This is because the securely transmitted data is always bundled centrally in the Wilo-Smart Cloud, so that regardless of the communication channel and device (smartphone, tablet or desktop), the latest information on the operating states, parameters and statistical data of the respective pump system is always available whenever it is accessed.

This means that neither complex technical retrofitting is necessary nor are there any follow-up costs for mobile phone contracts, for example, in order to comprehensively monitor the pump systems for heating and plumbing as well as cooling and air conditioning, even in large systems.

## Intuitive to use: the Wilo-Assistant app

On top of this, there is the intuitive, menu-guided setup of the pump systems via Bluetooth, which makes Wilo-Smart Connect so practical, especially for specialist installers and facility management personnel: Anyone on site at the system with a smartphone and authorised via the Wilo-Assistant app has full access to the system data and its parameterisation. On the other hand, each time someone accesses the Wilo-Smart Cloud this requires access rights to be granted by the operator, which can also be tiered. This not only provides a high level of data security, but also prevents unauthorised intervention in the respective processes through the defined responsibilities.

## The user benefit

The description of the hardware and software approach used by Wilo-Smart Connect to create networked building services already makes clear the measurable functional and economic practical benefits that fundamentally distinguish Wilo’s Smart Building concept, even from a purely technical installation point of view, from those approaches in which the focus is on a BMS, regardless of how it is designed.

Wilo-Smart Connect for the connectivity of the technical building equipment for function maintenance is consistently conceived from the point of view of user benefit, i.e. from that of the operator or the facility manager or specialist installer responsible for operational reliability.

However, the decisive factor was and is not so much the pump expertise accumulated at Wilo over almost 150 years, but the consistent implementation of a measurable customer benefit for operators, facility managers and specialist installers under the overriding objective of

- digital process reliability for real estate developments with critical infrastructure.

The customer benefit of the Wilo-Smart Connect system is therefore measured in terms of

- the simplicity of development, installation and connectivity, right through to faster commissioning of multi-pump systems by reverting to the data of existing configurations,
- the simple handling of the entire data management and analysis through the uniform look and feel, regardless of the type of end device,
- the simple creation and storage of commissioning protocols including complete documentation,
- the maximum operational reliability for pumps and pump systems through the seamless reading, monitoring and analysis of operating states,
- the comprehensive and easy-to-understand operating analysis using statistics imaging,
- the verifiable savings through remote access to the entire system instead of time-consuming on-site inspections, and not least in terms of
- the future-proofing of the entire system through centrally controlled updates.

Predictive maintenance and perfectly prepared service calls are among the decisive advantages of Wilo-Smart Connect in practice.

The benefit of "enhanced comfort through building automation", which is always mentioned in the context of smart buildings and even more frequently in the context of Smart Homes, takes on a whole new dimension in this way.

This is because "enhanced comfort" here automatically includes not only process reliability, the remote reading of aggregate states or the definition of new system parameters via a smartphone, but also additional aspects such as the

- automatic notification in the event of malfunctions,
- anticipatory provision of spare parts without a prior visit to the site in the event of a malfunction or the
- efficiency-increasing updating of system data

which in turn have the same effect on the process reliability of the system as on its economic operation.

**Summary**

With Wilo-Smart Connect, building automation, the Smart Building, no longer docks only to "possibilities", to "potentials" or to "negligible additional functions" around living and operating real estate. Rather, Wilo-Smart Connect protects the original, (super) vital building functionalities in a targeted manner on precisely those wear products that are required 24/7 without interruption in primary and secondary processes and for which a malfunction has a direct, significant impact on building operation.

In this way, the simple basic structure of the Wilo solution is almost a prototype for the basic requirements that operators, facility managers and installers, as well as specialist consultants, place on a networked house today: operationally reliable, intuitively understandable and can be created with few components at marketable conditions, even in existing buildings – but at the same time future-proof and open to the integration of further applications in the future.

This means that, at the same time, the smart building approach pursued by Wilo is an answer to the central objection that automation of functional buildings can only be economically represented via systematised objects, i.e. standardisation and the associated economies of scale.

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