

Summary Report

Energetically Inspection Based On Mobile Monitoring Systems

Complete Title:

Enhancement of standards for energetically inspection of buildings by development of analysis methods as to identification improvements in efficiency on basis of measured data by mobile monitoring systems

Reason / Initial Position

Low rates of new construction and refurbishment define the present rate of implementation and opening up for potential improvements in efficiency. Frequently, compelling measures are solely realised without integration into an all-embracing strategy of refurbishment. Thus, existing opportunities in view of relevant need for optimisation of energy performance stay unexploited and often miss their economic benefit. In consequence, realisation of goals aspired to climate change policy is stagnant.

In contrast, energetically inspections of systems provide significant contribution to create transparency concerning energy saving measures and to counteract realisation holdup (→ s. Fig. 1).

Scope of the research project

In the scope of energetically inspection methods for identification of optimisation potential due to system operating processes still do not exist. But, a significant percentage of improvement in efficiency merely can be utilised by considering the operating process. Hence, the research project aims at developing methods for inspection and analysis to turn monitoring data to account. For existing standards, containing solely checklists and evaluation of static nominal parameters, no allowance is made for these aspects up to now. Furthermore, the interaction of supply systems with consumers regarding boundary conditions as climate impact and processes of utilisation and operation has to be implied in efficiency evaluation (→ s. Fig. 2).

The initially compiled overview of the state of related technology educed the requisite of development of a basic approach for structured analysis of monitoring data and evaluation in order to derive opportunities of improvements in efficiency especially at complex system setup.

In the matter of hardware conception of the mobile monitoring system a suitable framework was extracted, engineered and configured. A comparison to existing energetically inspection of boilers, air handling units and chillers determined the coverage and adequacy of the system developed. Based on the hardware, compatible software for anal-

ysis of metering data sets was implemented for application. Thereon development of methods for specific data display and analysis conducted within this research project is based.

The application of the mobile monitoring system in pilot projects (→ s. Fig. 3) and the successively enhancement of methods of analysis and data display facing project specific tasks as well as further development and gaining hands-on experience represent the main part of the research project. The systems inspected comprise boilers, air handling units, hot water systems and terminal units for room conditioning. In connection with the system inspection, specific criteria for single components and whole systems were developed as to identify abnormality and inefficiency based on energy performance indicators. The results generated incorporate into standardised reports of inspection (→ s. Fig. 4).

Efficient management of extensive meter data and the generation of adequate data visualisation as well as calculations of indicators based upon meter data sets for analysis (→ s. Fig. 5 & Fig.6) compose fundamental methods. Together, these represent the core of development. Thus, operation process oriented performance indicators of HVAC-systems mainly are the feature of differentiation contrasting existing methods.

The realisation of improvements in efficiency identified, provide energy savings about 15% (s. Fig 1), which is confirmed from experience in pilot projects. Foremost, energetically inspection delivers maximum benefit not only by exclusively energy optimisation but also by means of ensuring functionality and longer lifetime by correction of parameter in synergetic combination with additional service. These are inventory control and consultancy for strategy of refurbishment with prioritisation of measures and technical options.

Advice for case-related selection of the method of energetically inspection results from possible fields of application compiled. Depending on system extend, project specific task, intended use of results and future changes with respect to operation and maintenance of the existing systems, the method of inspection should be determined.

Conclusion

Results from energetically inspection of HVAC-systems deliver basic data, brief information on the energetic state and on improvement measures. Description of optimisation actions is asked without planning or detailed scrutiny of efficiency and economy. So, on the way to energetically optimisation, inspection represents only the first step. Yet, other steps have to follow. Mobile temporary monitoring enables to consider more closely further steps to refurbishment with its possibilities available.

The methods developed within the research project contribute to a broader view including the operating process. Beyond legal directives on systems requiring inspection and above the regular extend of checking, due to rising energy costs and increasing demand for consultancy on energetically refurbishment, application of inspection based on mobile monitoring systems can be appraised optimistically.

Keydata

Short title:	Energetically Inspection Based On Mobile Monitoring Systems
Project manager:	Dr.-Ing. Benjamin Freiherr von Wolf-Zdekauer
Total budget:	105.384 €
Share confederacy subsidy :	68.750 €
Project span:	07/2012 – 09/2013 (prolong. 6 Mon.)

FIGURES:

Fig. 1: File	Bild 1 Vorgehensweise Energetische Sanierung.png
Legend:	Economy of usual steps of refurbishment measures contrasting energetically inspection applying mobile monitoring systems
Fig. 2: File	Bild 2 Vorgehensweise Energetische Inspektion Monitoring.png
Legend:	Principle outline of proceeding of energetically inspection applying mobile monitoring systems
Fig. 3: File	Bild 3 Aufbau Messkoffer Pilotprojekt.jpg
Legend:	Metering kit with cable based sensors installed in a HVAC room of a pilot project
Fig. 4: File	Bild 4 Datenblatt Messobjekt Energetische Inspektion.png
Legend:	Data sheet „measured building“ for energetically inspection as cover sheet of the analysis report
Fig. 5: File	Bild 5 24h-Profil Systemtemperatur-Spreizung.png
Legend:	Overview diagram of meter sluices containing system temperatures such as supply flow and bracing illustrated as 24h-profile from isometric perspective
Fig. 6: File	Bild 6 Carpet-Plot.png
Legend:	Carpet-plot of system temperatures of district heat supply plotted on an incremental area of daytime an weekdays