

M3.5 Report on the Key Performance Indicators

WP3. Key Performance Indicators, T3.3

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1 Introduction

Complex façade systems include a large variety of technologies in terms of both single components and whole system assembly. Norms and standards are still not able to provide a unified and comprehensive framework for such complexities, often also due the lack of available product on the market. Nevertheless, the question about “how to characterise a complex façade component or system” is of extremely practical interest, especially in the field of complex fenestration system. In this sector, in fact, innovation is progressing rapidly, and the curtain wall technology has only limited capability to integrate such complex components. As a results, designers, building owners, and public body have to face daily the following problems: (i) “to what extent existing standardised indicators apply to non-standard system” (to comply with regulations) and (ii) “which new/modified indicators should be used to correctly report the façade performance”.

Hence, this report presents synthetically the FACEcamp work done on the topic of the Key Performance Indicators (KPIs) for complex façades. More information can be gathered contacting Eurac Research, Institute for Renewable Energy.

2 Objectives

The work described in this report aimed at mapping and evaluating the (KPIs) for complex façade systems, starting from norms and standard definitions, as well as from the scientific literature. This study has been divided in two parts. Firstly, the mapping of the KPIs available has been completed and make freely available in an open online database (<http://kpidb.eurac.edu>). Secondly, a new set of KPIs for advanced and complex facades has been defined and then applied to a number of relatively similar cases (same purpose, similar level of complexity, different technology) to evaluate the usability of this new set of indicators to assess the performances of dynamic façade systems.

3 Mapping of KPIs

3.1 Methodology

The following text has been extracted with minor changes from the Booklet Building Performance Simulation and Characterisation of Adaptive Facades – Adaptive Facade Network, Fabio Favoino, Roel C.G.M. Loonen, Maxime Doya, Francesco Goia, Chiara Bedon, Francesco Babich (http://tu1403.eu/wp-content/uploads/Vol-3-2_for-web-Open-Access_9789463661119.pdf) as the robust work performed within FACAcamp was used to contributing to this publication.

KPIs are defined as a quantifiable measure used to evaluate the performances of a given thing. Thus, by definition, each KPI has its unit of measurement, a scale, and therefore enables to make a quantitative assessment and comparison of the performances of a certain building or its portion. It is worth highlighting that a KPI is not a feature of a material, such as its density or thermal conductivity, but it usually refers to a system.

The KPI has to be representative for a single specific characteristic of the system under investigation. This peculiarity is very useful when talking about specific technologies, because it helps to easily identify the technology main features and how good the system is performing on that aspect. On the other hand, innovative façade systems and components need new or at least modified KPIs being able to describe their features and their goodness in that.

For such complex system, the traditional façade KPIs are not anymore representative of the actual system performance. New or modified KPIs are needed to characterize the adaptivity of adaptive façade as well as their performance in terms of traditional KPIs.

In order to make the comparison possible, each KPI must be clearly defined so that everyone then calculates it exactly in the same way and using the same units. Thus, a comprehensive repository of

users can also vote the KPIs, add comments, and suggest new KPIs. However, these will not be displayed and accessible to everyone until when the website's administrators approve them.

4 KPI evaluation

This part of the work is synthetically reported in the following paragraphs. The details are freely readable in the publication of Bianco L. et al, Towards New Metrics for the Characterisation of the Dynamic Performance of Adaptive Façade Systems, Journal of Façade Design and Engineering, Vol. 6, Nr 3, 2018 (<https://journals.open.tudelft.nl/jfde/article/view/2564/2854>).

4.1 Methodology

This work focused on the technological group called “adaptive facade”. The work first consisted in the definition of specific performance metrics devised into the four different adaptive façade projects. A description of the adaptive façade system is given, then the definitions and characteristics of all metrics are provided, together with the quantification of the specific metric for the related adaptive façade system. Finally, similarities and differences between the different metrics are contrasted, identifying their main benefits, the specific adaptive technology they refer to, and how they can capture the dynamic effect of the adaptive system.

4.2 Result

Using a combination of experiments and simulations, different indicators for different adaptive opaque façades were identified. The main difference between the presented metrics, and the standard way to evaluate the performance of façades such as U-value, G-value, and so on, is that the presented metrics cannot be calculated directly from physical characteristics of the materials adopted in a typical façade multi-layer system / construction, and do not have an immediate direct physical meaning. Instead, these metrics are derived from either experimental or numerical datasets.

5 Conclusions

Complex façade systems needed a dedicated set of Key Performance Indicators to be characterised becoming comparable, and the work conducted within FACEcamp enabled to move some step forward. However, there is still a relevant gap between technologies' complexity and reference methodologies and related KPIs. FACEcamp KPIs database (<http://kpidb.eurac.edu/>) is the main step, reached with project, towards the creation of an agreed methodological framework able to support the comparison of different complex façade technologies.

FACEcamp partners

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	<p>IDM IDM Suedtirol - Alto Adige</p>	<p>Partner</p>
	<p>UIBK Universität Innsbruck, Arbeitsbereich Energieeffizientes Bauen</p>	<p>Partner</p>
 <p><i>Jalousien. Markisen. Rollläden.</i></p>	<p>HELLA HELLA Sonnen- und Wetterschutztechnik GmbH</p>	<p>Partner</p>
	<p>BB, Bartenbach GmbH</p>	<p>Partner</p>
	<p>gA, Glassadvisor Srl</p>	<p>Partner</p>
	<p>F&R, FRENER & REIFER Srl</p>	<p>Partner</p>

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