The *Surface Inspection Pad* (SIP) for non-destructive and in-process surface analysis of components

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If components are to be surface treated, the cleanliness of the surfaces plays an inherently important role. Thus, checking the surface cleanliness is essential. In principle, expensive inline or online analysis devices can be integrated into the process lines for this purpose. However, small and medium-sized enterprises (SMEs) do not have the financial resources for this. Furthermore, the component geometry or size often does not allow for an inline/online analysis. In such cases, the components to be examined must be removed from the process and given to an analysis institute. Since the components for the surface analysis, which is usually carried out in an ultra-high vacuum system with a small vaccum lock, must be cut into suitable pieces and thus destroyed, they cannot be returned to the process afterwards. If the analysis of large quantities is necessary, this is consequently accompanied by an enormous financial loss. For this reason, we have developed an innovative solution: the *Surface Inspection Pad* (SIP). The SIP allows the surface cleanliness to be checked without having to remove the corresponding components from the process or destroy them. The principle is based on transferring the surface contamination to the SIP with subsequent analysis of the SIP surface instead of the component surface. Suitable materials were identified, and the first prototypes were built and successfully used. Contamination can be transferred in a variety of ways, such as rinsing, wiping, or stamping. Using the highly sensitive ToF-SIMS analysis, even the smallest amounts of contamination can be clearly detected.

An extension of the SIP to other areas of application is also possible. Tribological applications are of particular importance here. With the help of SIPs, the cleanliness of lubricating oils or tribological test benches can be checked, for example after an oil change. For this purpose, the test stand is rinsed with an ideally unalloyed oil and a scratch mark is created on a SIP using a scratch test method (e.g., pin-on-disc). Here, the characteristic surface-active property of additives is exploited, whereby these can be enriched and clearly detected even with very small concentrations. This allows the detection of additive contamination in oils well into the sub-ppm range.