KUNST NETZ WERK STOFF

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„Measuring, collecting and preserving!!!“

ZiMaTec GmbH and SLS Kunststoffverarbeitungs GmbH & Co KG create new ways for cost-effective revision of undefined tool contours with intelligent measuring systems

The Project

Another unloved case the other day... The extrusion die is worn out, and due to the age no reliable design data available. Drawings and tools have unfortunately been produced years ago and many of the adjustments made are only partially recorded, or on paper, or even not at all. Sometimes existing data records are simply faulty or unusable. Tools often come directly to us via our customers, so that SLS does not have any design data at all. We ask ourselves what to do, because without the exact construction data a cost-effective rework or repair is almost impossible and leads to an expensive construction of a new extrusion tool.

How could modern measurement technology help us here? This is exactly the question we from SLS asked our good friend and measurement technology specialist Uwe Martin from ZiMaTec GmbH. He didn't have to think long and spontaneously invited us to his measuring laboratory in Weilerbach to discuss the project. Because "Can't do it - Doesn't exist", neither for ZiMaTec GmbH nor for SLS.
And so, on the same day we started this special future project with our defective extrusion tool and a lot of optimism with Mr. Martin, where we first had to learn a lot about the prerequisites and the measurement technology to be used.

Measurement technology

The employees of ZiMaTec know our problem, because in modern production plants many different problems occur, that have to be solved. More and more digital data sets are becoming the backbone of information here. Be it for the dimensional definition of components or even tools, or for the exact and complex geometric description of the surface. Also spare parts (not available for a long time) can lead to problems for a smooth project flow.

And this is exactly where the special service that brings ZiMaTec GmbH into play. Paired with excellent practical knowledge regarding the production of components and tools, as well as the best knowledge of various materials and the necessary design know-how, we go to work together with Mr. Martin.

He explains to us that using a highly modern, very precise and high-resolution scanner based on strip light projection (GOM ATOS Triple Scan), it is possible to capture the surfaces of tools and components made of a wide variety of materials in order to virtually describe the geometries captured. We are curious, because we don´t have any experience in 3D measuring technology. So, while we are busy dismantling the tool, the measuring laboratory is being prepared.

The preparation

The measurement of an extrusion die with its many corners, edges and undercuts is not unproblematic. But without any doubt about the success of the measurement, we now proceed to sample preparation (our tool). This must be meticulously prepared, because the smallest deviations can falsify the result and later lead to a faulty spare part. Measuring points are applied to determine the exact geometry. For us laymen hardly imaginable that one can already install errors here, but when looking at the possible measuring accuracies of the system then still quite logically understand. Depending on requirements, the measurement data can be generated with an accuracy of up to 1/100mm and form the basis for all subsequent steps in production.

The measurement begins

Now we will begin with the preparation of the sample, the so-called photogrammetric calibration. This forms the basis for the subsequent and highly accurate measurement with the scanner. The scanner is in use and projects a stripe pattern onto the components to be detected. We can see this from a laser matrix, which together with the attached measuring points is now visible on our tool and, according to Mr Martin, represents the grid for the measuring robot to determine the exact distance.

Again and again, the scanner is readjusted in the next hours and aligned so that no spot of the tool remains unmeasured. Otherwise, the entire result would be nullified. Also, all individual parts of the extrusion tool are prepared and measured by Mr. Martin after disassembly, bit by bit, just as professionally. It is explained to us that the size of the component plays a rather subordinate role in its measurement, since it can later assemble the captured individual parts with high precision using photogrammetric individual measurements in order to maintain the required tolerances to within 1/100mm.

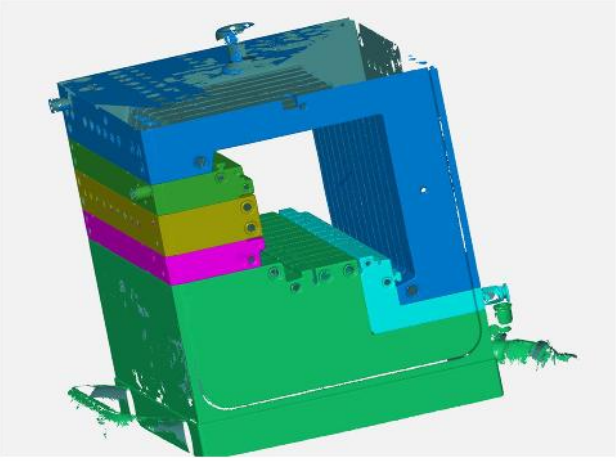
And indeed, every detail displayed by the measuring program on the connected monitor makes us more and more amazed at this trend-setting technology. Green contours, blue contours, separating edges, undercuts, connections, recesses, with each measurement, more details come to light and the puzzle gradually joins together and we can slowly look forward to the end of the measurement.

The possibilities

If everything went well, ZiMaTec can now prepare the data for the most diverse demands. For example, they can be used for quality determination (target/actual comparison in false color display; measurement data against existing CAD data) and for CAD data generation (reverse engineering; CAD data generation from STL data).

The scan data can also provide information about wear, warpage, shrinkage, sink marks, but also about upcoming tool failure or quality information about the running time of other production components. Virtual assemblies to determine the function of individual components in complex interactions are also possible, as is verification of the entire production process. We at SLS are pleased with the wide range of possibilities that this measuring system offers us. Even if this was not the reason for the current survey, we still have completely new findings and advantages for future projects. This is the end of an eventful day for us, and we are on our way home.

But in our minds, we still have this one crucial question: "Do the data we collect really meet our requirements? Because so far, it's all been theory. Only the still pending evaluation can bring us certainty.



Evaluation and preparation

The data analysis and preparation of the CAD data important for SLS begins directly the next morning. All measuring points must now be read into the CAD system and checked. Some points are replaced and others are added. From this, the contours of the individual components, as well as of the entire component, are then assembled and connected piece by piece in painstaking precision work. Then again everything is checked for completeness and the measurement protocol is made. All this according to our specifications on three different cross-section levels, so that we can better allocate the wear limits. In addition to the 2-D data, a three- dimensional model with all important design data for the production of new spare parts is created. And this data package will be in our email inbox a few days later? We are curious.

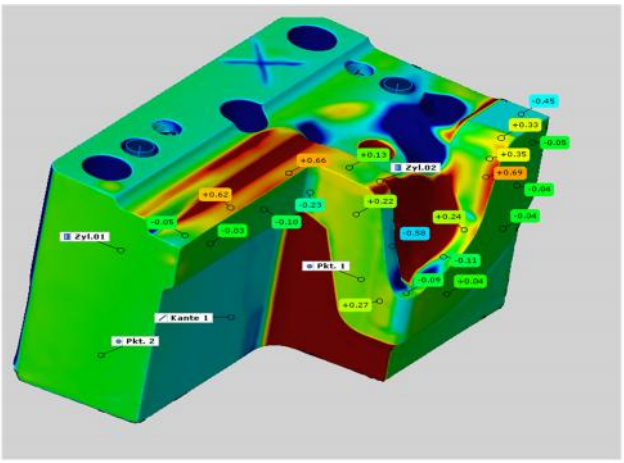
Data transfer and spare part production

The tension rises as we open the files transmitted by Mr Martin. A post-processing of the scan data/results after only a few days is really a great service of ZiMaTec GmbH.

And in fact, the effort was worth it! Everything went well and Mr Martin didn't promise too much. The transmitted data can be used directly. Of course, we immediately start with the G-Code creation in our CAD/CAM system so that the spare parts can be created promptly. We have already prepared the required materials and can start machining the same day on our milling centre and spark erosion machine. After another two days, the parts are then fully machined, reassembled on the extrusion die and ready to go.

The subsequent sampling looks promising at first glance. And in fact, the final result and functional test of the profile made from it turns out to be optimal after extensive quality testing by our QA. The effort was worth it. The cooperation with ZiMaTec presents itself as absolutely right way and will be continued with other projects. Then we will start again:

Flapl – „Measurement technology the 2th“.



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