

SURFACE ROUGHNESS MEASURING OF INACCESSIBLE SURFACES

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Abstract: Guaranteed surface roughness is required because of functional demand for active surfaces of machine parts. Such as for example: clamping surfaces of tools, thread flanks of guide screws and others. Therefore we are finding out the roughness magnitude during production process. If these surfaces are inaccessible for profilprojector roughness measuring the off print method can be used. The using of appropriate material of the offprint will determine the best correlation of measured results of the offprint roughness and real surface roughness magnitude. Our contribution contains methods for offprint reading and comparison of results for different materials.

Keywords: surface, roughness, offprint

1 INTRODUCTION

Surface roughness measurement of machine parts belongs among measurements, which has essential contribution on correct parts function in industrial practice.

During measuring of large machine parts which are untransportable for a control and also during measuring of surface machine parts which can not be measured by sensor arm, for example: holes, threads, groves and others. Is possible to measure indirectly using plastic offprint.

Offprint materials have to fulfil following requirements for example: simple, quick and everywhere-possible realisations of preparation. They must be sufficiently strength, hard and proof against to damaging by diamond reading point head of profilometer. They should be go easily apart from machine part surface without record damaging.

2 EXPERIMENTAL RESEARCH AND RESULTS

There was carried out experimental research with some materials to confirm suitability of mentioned method by offprint and measuring of machined surface offprint. Technical dentacryl, Veropal 004 and colloid amyacetat were used for off preparation. Arithmetical mean deviation of the profile Ra was measured as a parameter of surface roughness.

By the turning machined four samples were measured using the offprint method for offprint roughness comparison with roughness of measured surface. Ra measurement of offprints and also samples was carried out using induction profilometer SOMET and electromagnetic profilometer PC-2. Final measured values were found out as arithmetical mean values of ten repeated measurements. (Table 1, Table 2)

Table 1. Values measured by induction profilometer SOMET

Sample	Sample case Ra [μm]	Technical dentacryl Ra [μm]	Veropal 004 Ra [μm]	Colloid amyacetat Ra [μm]
1	10,170	9,800	9,960	9,290
2	5,950	5,100	5,500	4,730
3	2,052	1,825	1,935	1,720
4	1,476	1,330	1,374	1,116

Ra measured values of samples are deviated from their offprints about given value and therefore we established – coefficient of match k_z (1) as ratio of arithmetical mean roughness value of samples surface Ra_s and arithmetical mean roughness value of offprint Ra_o . (Table 3, Table 4)

Table 2. Values measured by electromagnetic profilometer PC-2

Sample	Sample case Ra [μm]	Technical dentacryl Ra [μm]	Veropal 004 Ra [μm]	Colloid amylacetat Ra [μm]
1	8,720	7,710	8,260	9,910
2	5,520	5,600	5,510	6,280
3	2,730	2,420	2,730	3,255
4	1,635	1,880	1,760	1,970

To determine the coefficient is possible, by preparing offprint of roughness standards of different technologies of machining and subsequently by measuring of given surface standards and their offprints. The coefficient can be exploited for indirect practical measuring when Ra measured on offprint will be multiplied by coefficient found out for related machining technology.

$$k_z = \frac{Ra_s}{Ra_0} \quad [-] \quad (1)$$

Table 3. Coefficient of mach for induction profilometer SOMET

Sample	Technical dentacryl k_z	Veropal 004 k_z	Colloid amylacetat k_z
1	1,038	1,021	1,095
2	1,167	1,082	1,258
3	1,124	1,061	1,193
4	1,189	1,074	1,323

Table 4. Coefficient of mach for electromagnetic profilometer PC-2

Sample	Technical dentacryl k_z	Veropal 004 k_z	Colloid amylacetat k_z
1	1,133	1,056	0,881
2	0,986	1,004	0,879
3	1,128	1,000	0,839
4	0,869	0,929	0,829

3 CONCLUSION

In case of Ra roughness measurement of inaccessible surface for example: internal holes, threads using classic methods, is very effective to create surface offprints which can be measured with demanded roughness parameters.

Measuring was carried out using induction profilometer SOMET and electromagnetic profilometer PC-2. The controlling of machine parts produced by turning shows that the nearest to real value was measured offprints roughness prepared using Veropal 004. There is problem with preparing of cast mixture and therefore Veropal 004 is the most suitable for control centre. Using and preparing of technical dentacryl and colloid amylacetat cast mixture is easier.

Deviation of characteristic curves of roughness of those plastic materials from axis of match are smaller than scatter of measurement that is, both plastic materials are suitable for workshop practise and sufficiently exact. (Figure 1, Figure 2)

Values measured using profilometer SOMET are different from those measured by profilometer PC-2, due to different profilometer properties. From the point of sharpness, profilometer SOMET appears as a more suitable. However the main aim of this contribution was concerned to the methodology of indirect method of surface roughness measuring not to exactness of results.

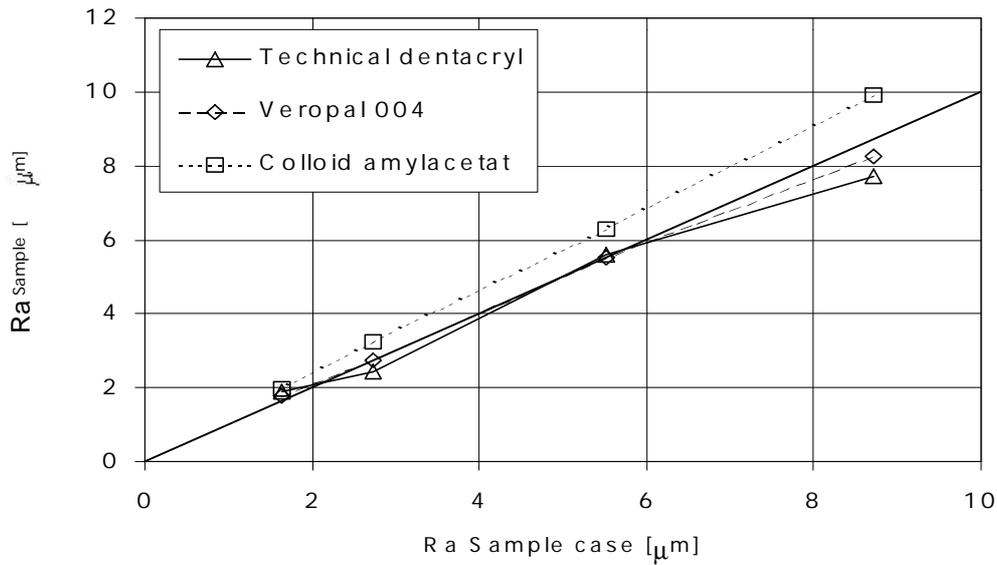


Figure 1. Relationship of Ra_s real surface and arithmetical mean roughness Ra_o of offprint measured by induction profilometer SOMET

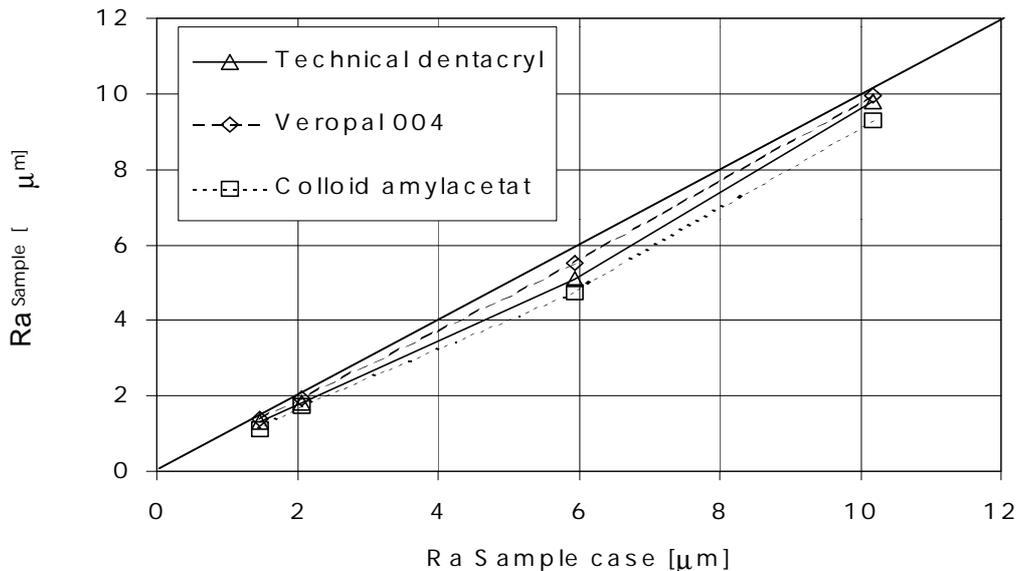


Figure 2. Relationship of Ra_s real surface and arithmetical mean roughness Ra_o of offprint measured by electromagnetic profilometer PC-2

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