

SPECIFIČNOSTI PRI OCENJIVANJU TEHNOLOŠKIH KVALITETA MAZIVA ZA DUBOKO IZVLAČENJE

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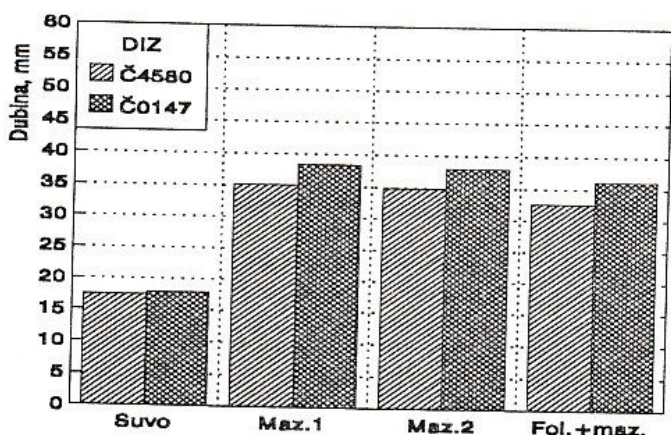
Pravilan izbor maziva u obradi metala deformisanjem, posebno pri obradi dubokim izvlačenjem, podrazumeva da se uloga i značaj podmazivanja razmatra ravnopravno sa značajem ostalih elemenata obradnog sistema. Pri izboru maziva i zone podmazivanja se moraju ispuniti sledeći zahtevi:

- obezbeđenje željenog otpora trenja u svim zonama otpreska (upravljanje tečenjem metala),
- smanjenje kontakta metala po metalu u kritičnim zonama, odvođenje toplote i smanjenje habanja alata,
- dobijanje željenog kvaliteta površine otpreska.

Ovome treba dodati i osobine maziva koje se odnose na način nanošenja i lakoću uklanjanja, usklađenost sa procesom naknadne obrade, zaštitu od korozije pri uskladištenju otpresaka i sl.

Poznato je da kod delova komplikovane geometrije u različitim zonama mogu postojati vrlo različite sheme oblikovanja: čisto duboko izvlačenje (ČDI), razvlačenje (RAZ), savijanje sa zatezanjem i sl. U tribološkim istraživanjima, ove oblasti se opisuju posebnim modelima /1/.

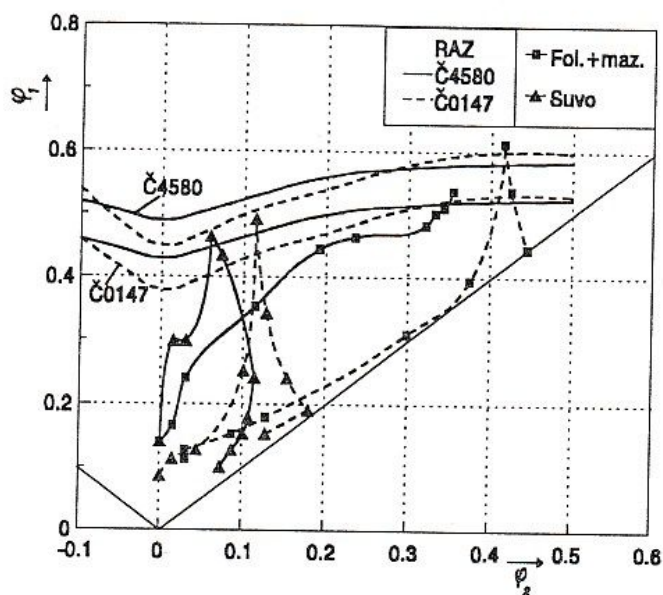
Rezultati tribo-ispitivanja, koja se u jednom delu odnose i na ocenu tehnoloških svojstava maziva za duboko izvlačenje, mogu se u osnovi podeliti u tri grupe. Prva grupa obuhvata fizičke pokazatelje (sila i koeficijent trenja, parametri hrapavosti i sl.), druga makropokazatelje pri obradi (sila i dubina izvlačenja i sl.), i treća parametre ostvarenih naponsko-deformacionih



Sl.1. Granične dubine pri ispitivanju DIZ

polja (distribucija deformacija, prikazi u dijagramu granične deformabilnosti-DGD). Parametri treće grupe su najpotpuniji, ali je i njihovo određivanje najsloženije /2/.

Na sl.1 prikazane su ostvarene dubine pri razaranju kod ispitivanja DIZ kvadratnih komada za različite kontaktne uslove. Prema sl.2, na osnovu rezultata ispitivanja RAZ kod nerđajućeg čeličnog lima, koji se inače teško podmazuje, ostvareni su izuzetni efekti korišćenjem čvrstih maziva (kombinacija folije-polietilena i maziva). Distribucije deformacija u DGD pokazuju suštinski uticaj podmazivanja pri opisanoj shemi, kada dubinu razaranja određuje veličina tangencijalne deformacije u mernom preseku.



Sl.2. Raspodela deformacija u DGD

Literatura

- /1/ M.Stefanovic, S.Aleksandrovic, Complex approach to tribo-modelling in deep drawing of thin sheets, Balkantrib '96, Thessaloniki, 1996., Proceedings, 214-221 pp.
- /2/ M.Stefanović, S.Aleksandrović, M.Samardžić, Značaj deformacione analize pri ocenjivanju kvaliteta maziva za duboko izvlačenje, XXVI SPMJ, Budva, 1966., Zbornik radova, 91-96.

SPECIFIC QUALITIES IN EVALUATION OF TECHNOLOGICAL PROPERTIES OF LUBRICANTS FOR DEEP-DRAWING

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The right selection of lubricants in metal-forming, especially by deep-drawing, implicitly means that the role and importance of lubrication should be regarded as equal as the importance of other elements of the forming system. In selecting lubricants and zones of lubrication, the following demands must be fulfilled:

- the existence of desirable friction resistance in all working-piece zones (control of metal-flowing),
- reduction of metal to metal contact in critical zones, leading away of heat and reduction of tool-wear,
- obtaining the desirable quality of the working-piece surface.

These demands should be completed with lubricant characteristics regarding the manner of application and easiness of cleaning, coordination with the following process of forming, corrosion protection while stocking working-pieces and so on.

It is well known that with parts of complex geometry very different schemes of forming could exist in different zones: pure deep-drawing (PDD), stretching (STR), bending with tension etc. In tribological researches these areas are described by special models /1/.

The results of tribo-researches which are partly connected with the evaluation of technological qualities of lubricants for deep-drawing, can be basically divided into three groups. The first group includes the physical indicators (force and friction coefficient, asperities parameters etc.), the second group includes macro-indicators in forming (force and drawing depth etc) and the third one includes the parameters of realized strain-stress fields (deformation distribution and position in

forming limit diagram-FLD). The third group parameters are the most complete, but the defining of them is the most complex /2/.

The figure 1 shows the realized depth of fracture in investigating PDD square pieces for different contact conditions. The figure 2 shows how, according to the results of the stretching investigation STR of stainless steel, which is difficult to lubricate, exceptional effects have been realized by using solid lubricants (combination of the polyethylene foil and lubricant). Deformation distributions in FLD show the basic influence of lubrication according to the scheme, when the depth of fracture is defined by the size of tangential deformation in measuring section.

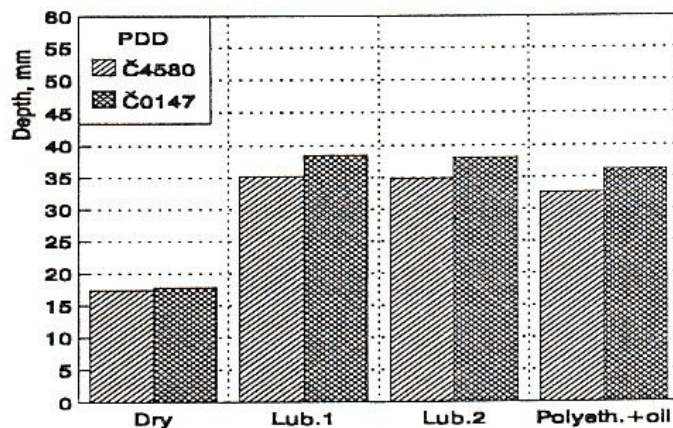


Figure 1. Limit depths in the investigation of stretching

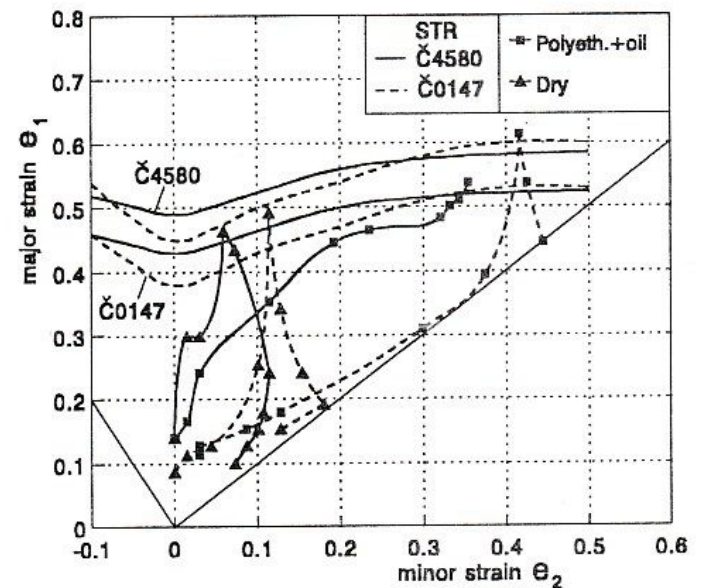


Figure 2. Deformation distribution in FLD

References:

- /1/ M. Stefanovic, S. Aleksandrovic, Complex approach to tribo-modelling in deep drawing of thin sheets, Balkantrib '96, Thessaloniki, 1996, Proceedings, 214-221 pp.
- /2/ M. Stefanović, S. Aleksandrović, M. Samardžić, Importance of strain analysis in evaluation of lubricants for deep drawing, XXVI SPMJ, Budva, 1996., Proceedings 91-96 pp.