

# BEARINGS



## NEW TOPIC: ANALYSIS AND SIMULATION OF THE RING ROLLING PROCESS

Welcome to the second issue of ORS Newsletter. In this issue, we would like to present to you a new R&D project and some of the preliminary results.

Following the purchase of the hot forging press in 1996, ring rolling machines were purchased in 1997 and 1998. In this way, the bearing rings produced at the hot forging press are cold-formed at the ring rolling machines, to obtain the required shape and dimensions.

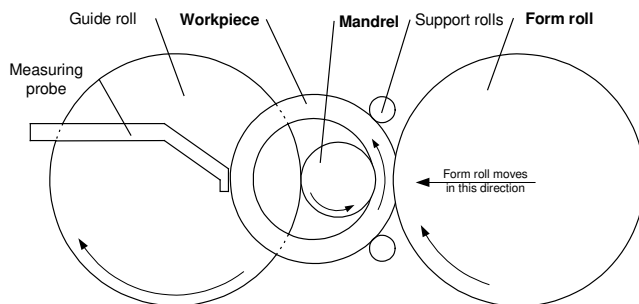


Figure 1. -Ring rolling process

In this process, the rings are plain-rolled i.e. there is no profile (raceway or seal groove) on the rolled rings. However, according to the information available in literature, profile-rolled rings prolong the fatigue life of bearings. In addition to this, profiled ring rolling reduces the amount of scrap material.

Taking into consideration the above stated facts, an R&D group consisting of 7 engineers

and 7 technicians was formed in 2001. This group started a project with the aim of studying and improving the process of ring rolling. This project is supported by TUBITAK (Science and Research Council of Turkey), and work performed is being done in cooperation with Mechanical Engineering Department of METU (Middle East Technical University).

Using the SuperForm Finite Element Analysis software (from MSC.Software), work on process simulation has started. Data related to the ring rolling machine, rolling dies, process parameters and the material used in the production has been determined and given as input to the software.

Studies of the process with help of simulations are in progress. Some of the results we have obtained so far, are given below:

- With help of the Finite Element Method: by studying the material flow and distribution of loads on the rolling dies, optimization of the rolling die design
- Rolling of the raceway and seal groove - Profiled Ring Rolling
- Determination of the residual stress distribution introduced in bearing rings at the end of the ring rolling process

- Minimization of the process time and accordingly, increase in the efficiency of the process
- By rolling of the raceway and seal groove, decrease in the amount of scrap material, and subsequently increase in the efficiency of the following turning operations
- Profiled ring rolling-bearing fatigue life relation and study of its causes (in progress)
- Testing of different materials and surface coatings for the ring rolling dies

Figures shown below and on the right are some of the results of the simulations done so far.

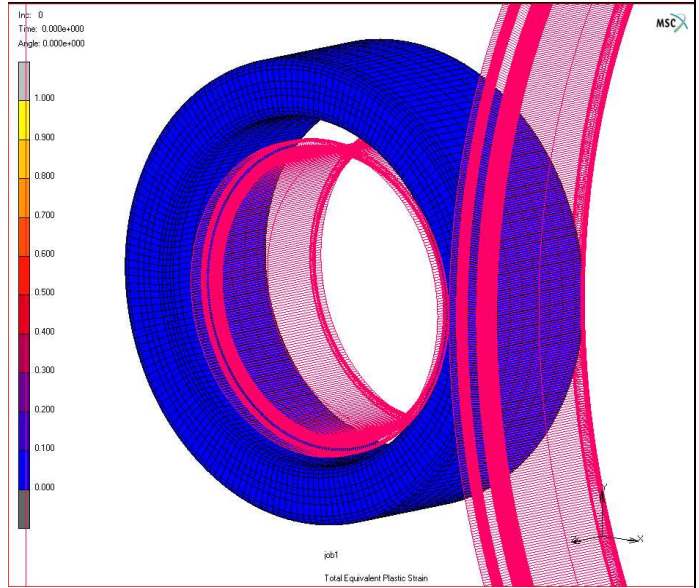


Figure 2. - A sample FE analysis

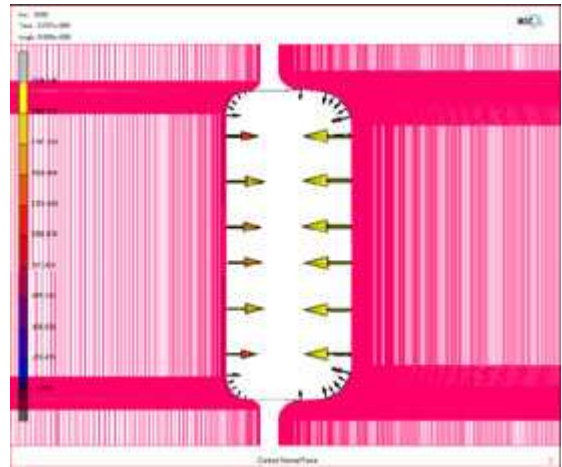
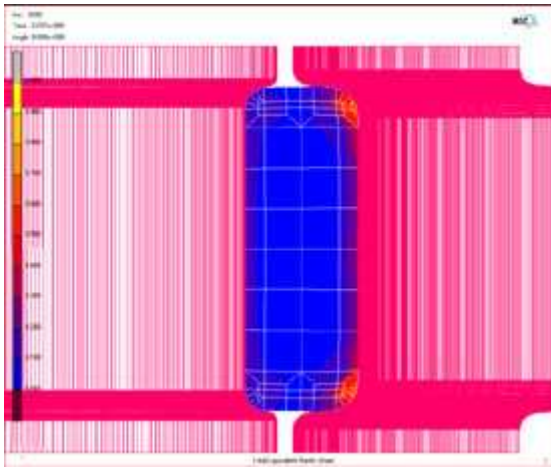


Figure 3. -Results obtained by 3-D analyses: total equivalent plastic strain formed in the ring cross-section (left) and load distribution on the rolling dies (right)

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### Head Office:

Eskişehir Yolu No. 294,  
06800 Lodumlu,  
Ankara/TÜRKİYE  
Fax: (+90-312) 284 62 53  
Tel: (+90-312) 289 89 00  
E-mail: [salesors@ors.com.tr](mailto:salesors@ors.com.tr)

### Factory:

Ankara Polatlı Karayolu 65.km  
06901 Polatlı  
Ankara/TÜRKİYE  
Fax: (+90-312) 648 00 21  
Tel: (+90-312) 648 00 10 (PBX)  
E-mail: [plant@ors.com.tr](mailto:plant@ors.com.tr)

[www.ors.com.tr](http://www.ors.com.tr)  
[www.orsbearings.com](http://www.orsbearings.com)