# AUTOLISP & DCL METHOD FOR AUTOMATIC TECHNOLOGICAL DESIGN

Conf.ec.dr.ing. Adrian Mihai GOANTA[1],
Asist. Ing. Catalin RĂDULESCU[2],
Conf.dr.ing.Niculai HAUK[1]
[1]"Universitatea "Dunarea de Jos" din Galati
[2]Universitatea "POLITEHNICA"  Bucuresti

## ABSTRACT:

*The work has as purpose to present the general principles of working with the technological processors in designing the casting technologies and to put into evidence the advantages of this designing method. As examples, the graphic interface for introducing data and its structure of type DCL, specific for these processors are described as follows..*

## 1. Introduction

The language *Dialog Control Language* (DCL) is used in order to add to the AutoLISP Programs dialog boxes defined by the user. The description of these boxes in the programs performed "by request" represents a working tool that is very accessible and convenient for the beneficiary, but it especially represents a plus of professionalism for the programmer. As it was first designed, AUTOCAD is an opened system, this feature making possible the access to the mechanism of building the dialog boxes. The language, characterized by a very simple syntax, is composed of blocks of two types: for control and for organization.

## 2. General principles concerning the automatic design with technological processors

The performance of systems for automatic technologic design supposes the achievement of the following steps:
- the design of the system scheme;
- the establishment of the family of pieces;
- the design of the piece – code (the representative piece or the piece of highest complexity in the family);
- the design of the geometric processor as system of introducing the geometric data;
- the design of technologic processors ("proTEHNOLOGIC" and "proFEA").

Concerning the piece code, it must be a real or fictive piece, having as property to express all the constructive and technological features of the pieces in the family. At the basis of the conception of all geometric processors are the following general principles:
- the processors are conceived on families of pieces starting from the piece – code (the representative or of highest complexity in the family);
- graphic interface efficient, attractive and comfortable;
- automatic quotation at the level - piece of execution and cast blank;
- getting the graphic results in colors specific to the casting technology;
- the graphic results are grouped on different layers, but in a single file in order to get in the same working session the execution drawing but also the drawing of cast piece;
- getting the three-dimensional samples for the finite piece, blank and cores;
- getting automatically all the graphic results.

At the basis of the conception of all technologic processors accomplished by the author are the following general principles:
- the processors are conceived on families of pieces starting from the piece – code;
- the technologic processors are conceived as a continuation of the geometric processors;
- efficient, attractive and comfortable graphic interface;
- automatic quotation at the level – technologic design;
- getting the graphic results in colors specific to the casting technology;
- the graphic results are grouped on different layers, but in a single file in order to get in

the same working session the execution drawing but also the drawing of assembled piece;
- getting three-dimensional samples for casting network, whistlers, feeding head, casting mould parts and casting frames;
- getting the technological drawing and of

assembled shape for the family of pieces for which they were conceived;
- getting automatically all the graphic results.
The block scheme of a working session with the technological processors is described in the figure 1.
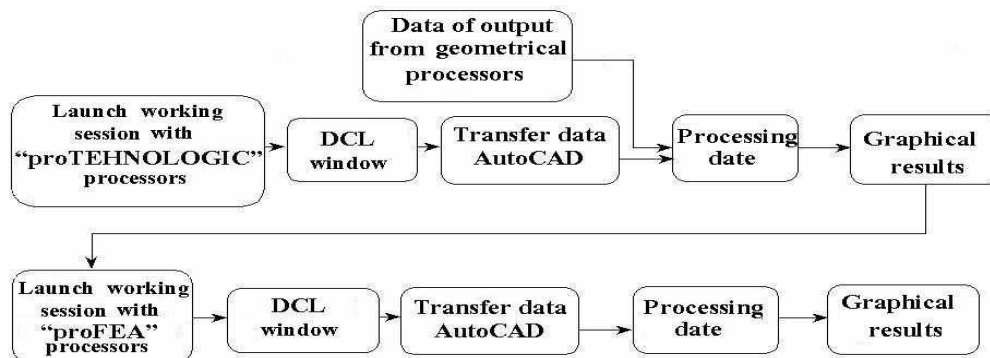


Figure 1.  Block scheme of a working session with technological processors

In case of a cast triangular flange data of entrance into the geometric processor are the following:
- external radius of the flange's pipe (r1);
- internal pipe's radius (r2);
- radius of disposal of the flange's holes (r3);
- radius of flange's holes (r4);
- radius of connection between neck and pipe (r5);
- value of the tension, stress – vertical in the point 1 (Bi);
- value of the tension, stress – horizontal in the point I (Ai);
- total length of the flange (L);
- neck length (H);
- roughness on each surface apart;
- addition at casting according to SR ISO 8062 – 95
- radius of connection of the cast blank;
    Data of output are the following:
- drawing of execution of the triangular flange;
- drawing of cast piece;
- drawing the cores and tracing the plan of separation between mould parts;
- the three-dimensional sample of the finite piece;
- the three-dimensional sample of the cast blank and core.

## 3.  Description and graphic interface of the processors "proTEHNOLOGIC"

Data of input (insertion) in the processors of type "proTEHNOLOGIC" are the following:
- data of output from the according geometric processor "proGRAFICA" regarding the position of points that occur while making the orthogonal projections or the three-dimensional samples;

- blank's volume expressed in mm3;
- volume mass of cast iron in Kg/dm3;
- height of the funnel's stand (foot) that is also the height of the casting frame;
- ration of convergence feeder – collector;
- ratio of convergence feeder – funnel's stand (foot);
- option for whistlers;
- option for feeding head.
The program DCL used for processing data from the user has the following structure:

```
DIALOG
    |-ROW
    |    |-BOXED_COLUMN
    |    |       |-IMAGE
    |    |-BOXED_COLUMN
    |            |
    |            |-EDIT BOX
    |            |
    |            |-EDIT BOX
    |            |
    |            |-EDIT BOX
    |            |
    |            |-EDIT BOX
    |            |
    |            |-EDIT BOX
    |                 |- ROW
    |                      |- BOXED_COLUMN
    |                      |       |- TOGGLE
    |                      |- BOXED_COLUMN
    |                              |- TOGGLE
    |-ROW
    |    |-BOXED_COLUMN
    |            |-IMAGE
    |-BUTON (OK)
    |-BUTON (CANCEL)
```

Data of output from the processors of type "proTEHNOLOGIC" are the following:

- technologic drawing of bushed bearing, including the casting network, whistlers and feeding head;
- sample 3D of the casting funnel;
- sample 3D of the feeders ;

- sample 3D of slag collector;
- sample 3D of whistlers and feeding head;

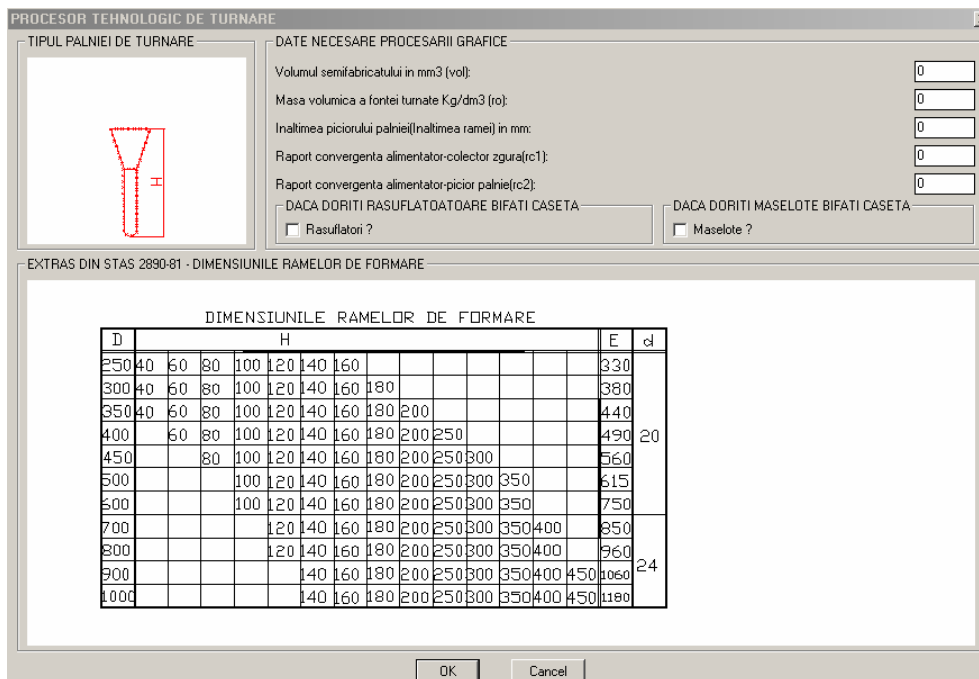The graphic interface generated by the according program DCL is presented in the figure 2:



Figure 2. Dialog Box DCL for inserting data into the processors "proTEHNOLOGIC"

## 4. Description and graphic interface of the processors "proFEA"

Data of input (insertion) in the processors of type "FEA" are the following:
- data of output from the according geometric processor "proGRAFICA" regarding the position of points that occur while making the orthogonal projections or the three-dimensional samples;
- data of output from the according processor "proTEHNOLOGIC" regarding the position of points that occur while making the orthogonal projection and the three-dimensional samples of the casting network, feeding heads, whistlers;
- inner diameter of the formation frame;
- distance between the elements of guidance – fastening
- diameter of the elements of guidance – fastening;
- option for simulation 3D of the formation frames;
- option for simulation 3D of the casting mould parts

Output data from the processors type "proFEA" are the following:
- drawing of the assembled form;
- sample 3D of the inferior frame;
- sample 3D of the superior frame;
- sample 3D of the inferior mould part ;

- sample 3D of the superior mould part;

The program DCL used for processing data from the user has the following structure:

```
DIALOG
    |
    |-ROW
    |    |-BOXED_COLUMN
    |    |        |
    |    |        |-IMAGE
    |    |
    |    |-BOXED_COLUMN
    |             |
    |             |-EDIT BOX
    |             |
    |             |-EDIT BOX
    |             |
    |             |-EDIT BOX
    |             |
    |             |-EDIT BOX
    |             |
    |             |-EDIT BOX
    |                 |
    |                 |- BOXED-ROW
    |                 |      |- TOGGLE
    |                 |- BOXED_ROW
    |                        |- TOGGLE
    |
    |-ROW
    |    |-BOXED_COLUMN
    |            |-IMAGE
```

```
        |
        |-BUTON (OK)
        |-BUTON (CANCEL)
```

The graphic interface generated by the according program DCL is presented in the figure 3:
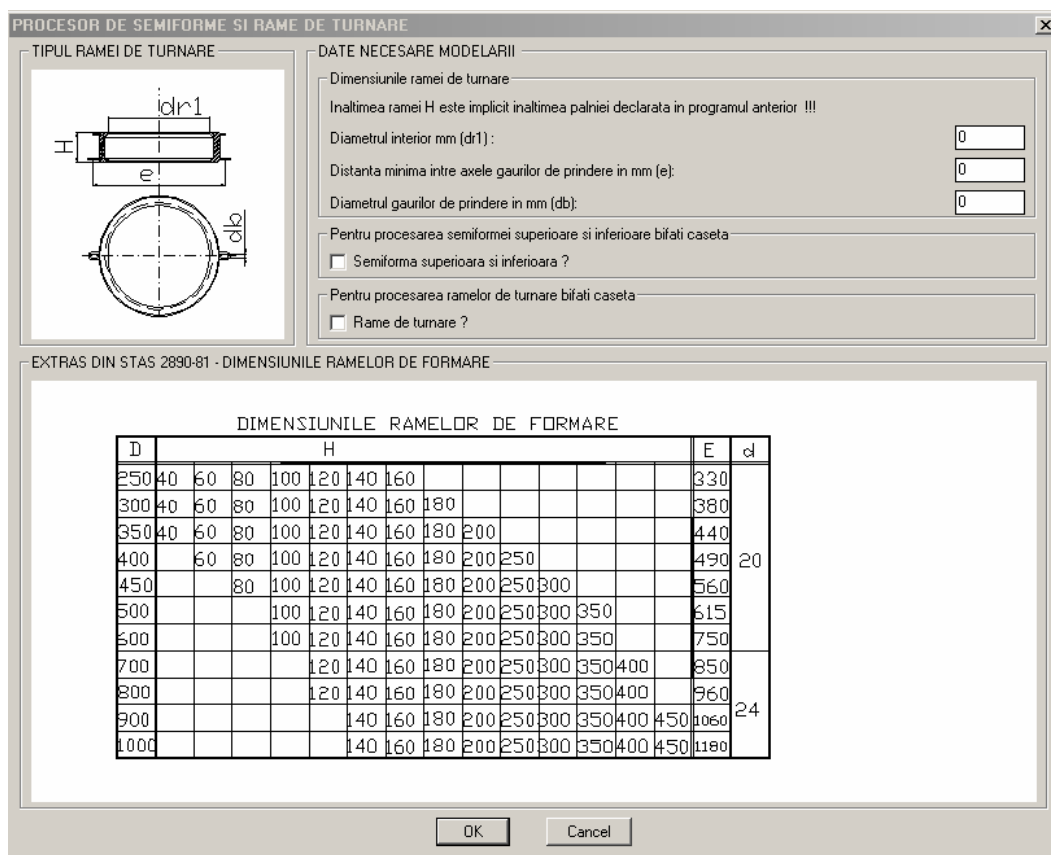


Figure 3. Dialog Box DCL for insertion of data in the processors "proFEA"

## 5. Conclusions and results

As a conclusion, the advantages of the automatic designing method with technologic processors achieved in the environment AUTOLISP & DCL are the following:

- work in a programming environment that could be purchased for free from the internet, on the site autodesk.com;
- the possibility to transform the code source into code ARX, this increasing the working speed;
- it provides the confidentiality of the ideas in the program;
- it replaces the hard work with color pens;
- it offers a high quality if using printers or plotters ink jet;
- it decreases the working time of the technologist engineer in the casting house;
- it generates three-dimensional samples which can be exported and analyzed with software type FEA, and if the conclusions resulted from the analyze FEA are not favorable, re-design is immediately performed;
- it generates three-dimensional samples which can be exported and analyzed with specialized software in the analyze of process;
- it gets the execution drawing of the bench mark in the family of bushed bearings, square and triangular flanges;
- it gets the drawing for cast piece for the blank in the families above mentioned;
- laying out the separation plan between mould parts;
- it gets the three – dimensional sample of the finite piece;
- it gets the three-dimensional sample of the blank and of the core.

## References:

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