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23116

data M Software

Solutions for the RollForming and MetalBending Industry

data M Software GmbH · Am Marschallfeld 17 · D-83626 Valley/Oberlaindern

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Internet: http://www.datam.de

Valley, 06.09.2005
10045 / MF 362

Final Report

We hereby confirm that Mr. Santosh V. Subbaiah has hold the three days COPRA® RollForm training to Mr. Ahmed Badr, Mr. Ali Abdelsalam and Mr. Ahmed Ali for the software modules

M1 COPRA® Design Module for Sections
M2 COPRA® Design Module for Trapezoidal Sections
H1 COPRA® Roll Design Husk
H2 COPRA® Deformation Technology Husk
H3 COPRA® Flower Technology Husk
H4 COPRA® Roller Technology Husk

at Alexandria National Co. for Metal Forming (ANBORG) S.A.E. from August 22nd to 24th, 2005 as specified in the Contract No. 2005/021, Project No. TF/EGY//03/002, Purchase Order No. 16000822.

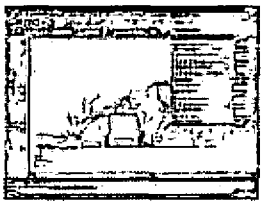
Please find following a comprehensive description of the software's performance and utilizations, content of the training activity and the appraisal of the trainees ability to operate the software:

visit our website
www.datam.de

Description of the COPRA® software

COPRA® Professional Design Module for Sections (M1)

The **COPRA Professional Design Module for Sections** is the software package for every roll form designer. It allows you to do a really professional roll form design for simple as well as most complex shapes. It includes functions like...



- project manager and data archive
- section design library
- 'punched holes' function
- static properties calculation
- strip width calculation
- design of the flower pattern
- COPRA bending sequences for automatic flower design
- Design of flowers for combination tool sets
- interactive tube unfolding functions
- calculation of strip edge strain (wire frame model)

section design:
- COPRA combines the most flexible methods to design profile shapes on the computer screen:
- COPRA has got a library of standard shapes;
- Section design via macro technology:
- COPRA offers a variety of forming elements;
- COPRA also offers direct entry (list editor);

No "external" CAD-construction of profile sections required.
COPRA is integrated in CAD systems, i.e. designing is simply done within the CAD program (keeps the learning curve down to a minimum).
COPRA allows designers to "mix up" or switch between the possibilities available!

static properties calculation
COPRA calculates the static section codes and prints out result lists or adds the results to the CAD display on screen together with the reference system.
The reference system can be selected independently (strain directions!) The user is free to choose whether it is an open or a closed profile (e.g. an unidirectional lock seams). Even punched profile sections will be considered!
The calculation programs in the COPRA program system will determine:

- area
- weight
- coordinates of center of gravity
- geometrical moments of inertia
- section modulus
- torsional geometrical moments
- vaulting resistance
- coordinates of load center

strip width calculation

COPRA offers seven different methods to choose from (yours is definitely included!). As you may know: different forming methods require different calculation formula. COPRA helps you to find the right method.
COPRA will not only check every bending zone and give reports on the possibly problem elements automatically, such as element with inner radius 0, but also suggests the best calculation method for the respective elements.
And additionally, company-specific calculation methods can be included easily.

design of the flower pattern

The user is not only able to unfold the profile. He can even bend up (fold) individual elements. For practical applications this means that users are not restricted to work from the finished flower to the flat sheet. During the process he can bend or over bend individual areas (even straight elements!). Experience has shown that functions like these are especially important, in order to, for example, open undercuts (to be able to form them with top or bottom rolls).
There are much more than just three arc types. With COPRA, users have even more powerful methods at their disposal:

- With each unfolding step the user can freely choose the desired calibration method.
- It would be quite inflexible, if an arc type could only be selected once.
- Instead, the user selects calibration method and profile element via mouse click on screen and chooses the respective unfolding or bending angle and immediately the new geometry will be displayed on screen.
- It is no problem to change between constant radius method and power bending (or any other procedure)

The following calibration methods are available:

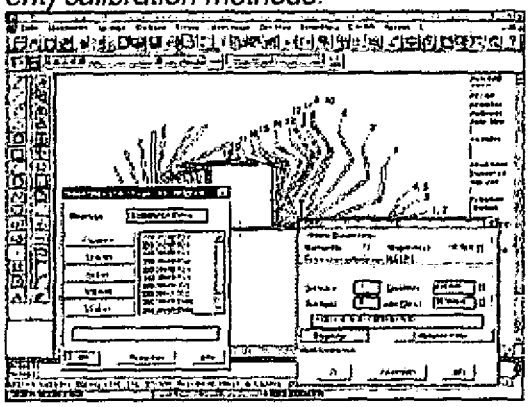
- Arc bending,
- constant radius method - the method allows to calculate the length compensation pieces in front and at the end or with any mixed up distribution (percentage).
- Of special importance is thereby the so-called track-holding unfolding method, during which the compensation pieces are calculated in a way that the strip guide is straight (important with undercut shapes, where material flow is impaired, e.g. dovetailed shapes).
- Track-holding unfolding is again a unique COPRA feature!

If the constant radius method under COPRA is used, a compensation element can furthermore be positioned at the center of any arc (can be selected by the user in the respective dialogue box).

- For lock-seams or sharp edges (internal radius = 0) COPRA also provides a calibration method (the so-called Angle/Radius Method).
- Arc profiling should not be confused with...
- ...tube profiling, which is also implemented in COPRA. The method allows to unfold arc elements even if adjacent features are not straight. The method was especially developed for round tube forming or for open profiles with similar pre-requisites.

With only three arc types as provided in literature and competitive design software programs, the needs for complex or difficult roll form applications can never be covered!

➪Single parts of flower patterns or forming passes can be combined to new variations/ variants of designs. Gauge (sheet metal thickness) can be modified - for all passes in one command, even if you have already finished the whole flower design using various (even different) calibration methods.



COPRA bending sequences for automatic flower design
This is a database-supported software module for automatic unfolding of profile sections.

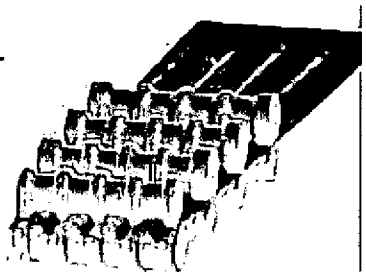
Design of flowers for combination tool sets
This allows users to exchange and combine section or flower parts in order to perform an effective design for combination tool sets.
The increasing variety of forms of roll-shaped profiles with at the same time decreasing lot sizes will force the manufacturer to take far-reaching measures to streamline production. As the production of roll tools is on the one hand expensive and on the other hand cannot often be integrated into unit prices the application of combination tool sets is the obvious solution. Manufacturing costs will be allocated to several orders and, thus, the utilization ratio will increase considerably. This might begin with the utilization of a tool set for the production of similar profile forms with different dimensions and in extreme cases lead to exclusive use of standardized shapes.
Each of those applications has its special requirements which COPRA - in relation to the problem -takes into account. COPRA provides the following functions:
- Automatic adaptation of an existing profile flower to various dimensions. Profiles similar in form, thus, only have to be unfolded once
- Combination of different, already unfolded profile half
- Automatic combination of the roll tools
- Documentation of the required spacer widths
- Optimization of the required spacers relative to total length and weight
- Management of the roll stock by a professional database-management-system

Your advantage:
- From now on, for a profile section e.g. in three dimensions you will only have to unfold one profile.
- By simultaneous visualization (overlapping with different colors) of profile flower and basic dimensions of the roll tools you may detect at once where a roll has to be modified or spacers have to be inserted.

tube unfolding functions
This COPRA module for section design and unfolding already offers an effective functionality for tube flower design.

Calculation of theoretical strip edge strain (2nd generation)
COPRA® for sections contains per default the very first calculation module for a theoretical strip edge strain calculation: COPRA® 3D elongation calculation (Strain calculation according to the "2. generation" method). This allows the user a very quick estimate of resulting longitudinal material strain values according to a triangle method. By means of the integrated wire model the user will be able to detect critical zones. This method is much more accurate than the known competitive software programs. For a description about the calculation method and the accuracy achievable.

COPRA® Professional Design Module for Trapezoidal Sections (M2)



The **COPRA Professional Design Module for Trapezoidal Sections** is the software package for the roll form designer working with corrugated or trapezoidal sections.
- It includes similar functionality as the Section Design Module, plus
- calculation of an optimized forming sequence (for trapezoidal shapes)
- calculation of horizontal material movements
- and contains also semi automatic roll tool design
(only in combination with H1 - module for roll design)

COPRA® Roll Design Husk (H1)

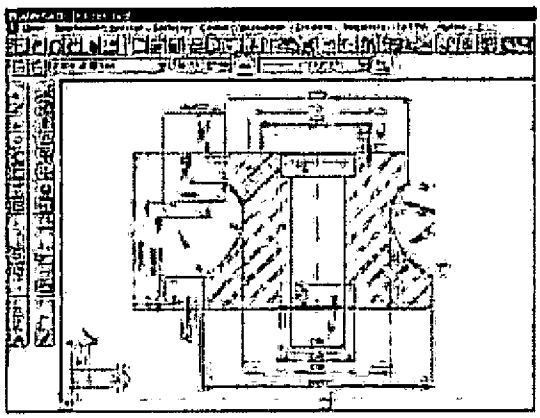
An accurate and sound design of roll tooling is - as well as the design of the flower pattern - decisive for the quality and manufacturing costs of a roll formed section. COPRA® is offering in its roll editor a variety of features for an effective roll tool design.

Following some examples of features implemented:

- automatic or interactive definition of machine axes
- automatic definition of tool contour layout (not just for open shapes but for even complex contours as well as side rolls etc.)
- both - interactive or automatic
- large number of editing functions
- COPRA® offers you several methods to generate roll tools for a specific profile shape.

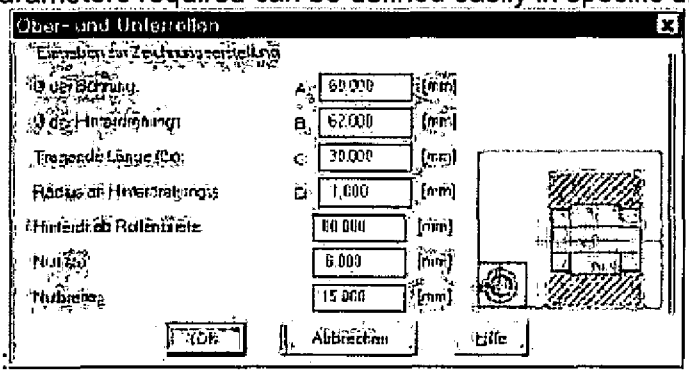
- as COPRA® is completely integrated in AutoCAD the user can choose from both - COPRA® internal or AutoCAD editing commands (best of both worlds...)
- For designer who used to work with DOS programs:
COPRA® does also have a list editor
- Lines are not just drawn as a contour in the CAD system (as usual in CAD systems) but each roll is stored in the COPRA data base - as a separate object
- automatic single roll dimensioning
- automatic assembly plan dimensioning
- design of combination tool sets (in module roller technology)
- fully automatic roll design and detailing for hat, U-type or C-Channels
- you will hardly find a similar number of roll form specific feature in any other software
- COPRA® has got a (optional) data base management system which allows for a company wide management of roll tool and profile data - including QM data. data M Software has got a long experience in roll data management - staring from PCs up to midrange server technology. We have got the solution for your needs.

➪Automatic dimensioning of roll drawings
- both - single roll drawings as well as assembly plans
- *dimensioning strategies can be set by the user*



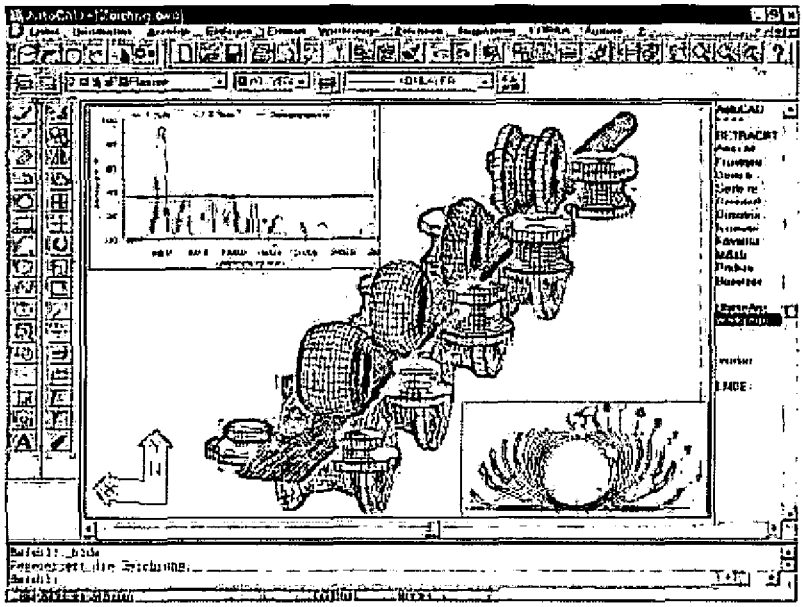
fully automatic dimensioned roll drawing

The parameters required can be defined easily in specific dialogue boxes:



Side roll Parameters

H2 COPRA® Deformation Technology Module (DTM Simulation)



COPRA® Deformation Technology Module (DTM) is a software program for the simulation of the roll forming process. It enables the design engineer to verify and optimize the chosen forming/calibration method with regard to machine parameters and quality requirements. COPRA® DTM is taking into account parameters like material, forming length, geometry of forming zone and tooling diameter.

- COPRA® DTM is particularly no longer working according to the known but unreliable "strip edge stress" method (triangle calculation method). This approach is already bound to fail when calculating simple C-shaped sections.
- COPRA® DTM is based on extensive FEA calculations and research results (data M Software has been working using high end FEA solvers since 1992...)
- COPRA® DTM is a software program of the "third generation"
- data M Software GmbH has been cooperating with a number of research institutes around the world and is continuously integrating respective experiences in its own research and development activities.
- COPRA DTM has always been (and still is) continuously improved by our developers.

The simulation model **COPRA®-Software DTM** (**D**eformation **T**echnology **M**odule) is calculation the maximum theoretical deformation elongation values in longitudinal and transversal direction. The knowledge of these deformations are extremely helpful in order to successfully develop a new roll set. COPRA DTM is not based on finite elements but on the theory of thin shells. The fast computing time of this analysis software tool has made it possible for the very first time to develop optimized roll sets taking into account parameters like profile cross section, forming length (not to be mixed up with "horizontal distance of passes...") and respective geometry, strip thickness, tool diameter and coil material.
The main target during development of this software program was the need of a fast and ergonomic tool for roll form simulation for the roll tooling engineer.

The simulation calculation is being performed inside of the COPRA® software package. The DTM module is providing the complete visualization of the forming sequence. In addition the user gets shown diagrams with information about theoretical maximal and actual deformations in the most critical areas. This allows for an accurate and fast estimate of the design's quality.
Undesired effects like exceeding elongation values or even compression areas can be identified by means of the simulation model. The calculation results give answers on areas having most probably too high plastic deformations and show whether the material is getting stretched homogenously, e.g. without peaks, throughout the roll forming mill.
Questions if intermediate passes could be helpful or just to determine the optimum position of a profile in the mill can be answered easily.
For the tooling engineer it is of importance to learn about critical passes before starting the tool design or even -manufacturing.
If a profile has to be punched or notched he can make sure that especially these areas will have reduced longitudinal strain- and reduced stress values. This reduces any misshape of punched patterns.

Based on these results the tool designer is able to modify respective forming steps accordingly and to detail the roll tooling. He will be able to compare different forming strategies and methods against each other and to choose the optimum forming method in terms of machine requirements and/or product quality - without causing any tooling costs and wasting setup time.

Plastic strain values:
From COPRA release 2003 the user of COPRA DTM does not only get graphs and diagrams showing residual strain values on the profile's cross section (on top or bottom surface) in each forming stand but also the accumulated plastic strain values. This feature takes into account the permanent deformation (possible yield of material) in each forming stand and the elastic recovery in longitudinal direction after the forming pass. The accumulated value give an idea about how much the material it getting overworked and how much remaining formability the final product is going to have.

With COPRA® DTM the tool designer gets hints on the profile quality before any foot/ meter gets into production. The computer model of the roll forming process is being generated automatically. This means: the designer doesn't need to care about modeling the roll forming process, except the definition of the so called flower pattern and mill/machine parameters. The values required are put in by means of easy to use and self-explaining dialogue boxes. Company specific values can be stored in the system's data base.
The coil is being displayed in a 3 dimensional view where the user can choose from various viewpoints and perspectives.
Up to now the only way to verify a tool design was the practical test on the roll forming mill. Using COPRA® DTM the designer has become able to verify his design and to correct or optimize it at an early stage.
The known "stomach aches" before setting up a new roll set have gone now. The often unknown time and costs for the setup period of a new roll set can be reduced and estimated much more accurately now.

➪ COPRA® DTM is the only commercial strain/stress analysis software on the market taking into account in its analysis the influence of the forming roll tooling (roll position or roll diameter) on the material's theoretical strain values. COPRA® DTM also shows you the influence of coil thickness, strain distribution on top or bottom surface (elongation- or compression zone) and the sheet metal curvature in the forming area (allowing you a comparison with your actual forming line).

COPRA® Flower Technology (H3)

COPRA Flower Technology offers you an effective tool box for technical calculations which is extending the basic functionality of M1 module.
It includes features like:
- Exploded view of the flower with user-definable distance and various options
- Spring back calculation according to Biswas and Oehler

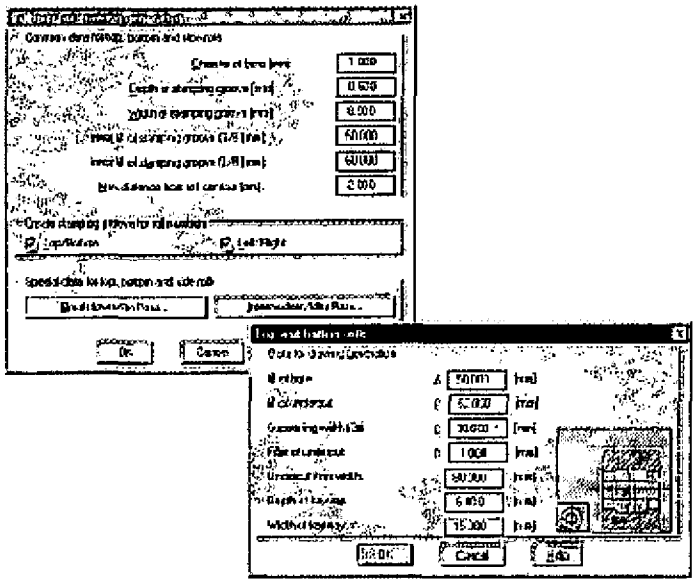
As the method according to Oehler is bound to fail with large bending radii, data M has integrated also the spring back calculation method according to Biswas. The latter one is, by the way, even more accurate.
- Calculation of specific strategies like the so-called Down-Hill forming method (constant center of gravity or according to optimized and minimized strain values). You won't find such kind of methods in no other commercial software package, by the way.
- 3D wire frame model for theoretical strain calculation ("2nd generation")

COPRA® Roller Technology Husk (H4)

Once the roll design is finished, the data often has to be processed rapidly so as to avoid time losses. The COPRA -process chain also covers this field.
- automatic calculation of roller blank sizes taking into account the additions for diameter and widths
- automatic calculation of finished roll weight, taking into account the bore hole details
- cutting list and roller weight list can be exported in text format or WINDOWS Excel table format
- NC data generation for the final roll contour in ISO format, DXF or full CNC code (module H5 only).
- data exchange between different projects for an easy handling of combination tool-sets

Creation of a sawing/ cutting list
The 'COPRA '-module "sawing list" will supply the dimensions of the blanks to be cut within seconds. It takes into account user defined addition for diameter and width of the blanks. Also a diameter list may be used. This will be an automatic run. The sawing list created may directly have a printer output so as to avoid a time-consuming search for the dimensions necessary for production and construction, at this point again, the operator may concentrate on more important tasks. The sawing list contains as well the weight of the stock material.

Optionally the data set can be imported into a spread sheet calculation program like Microsoft Excel

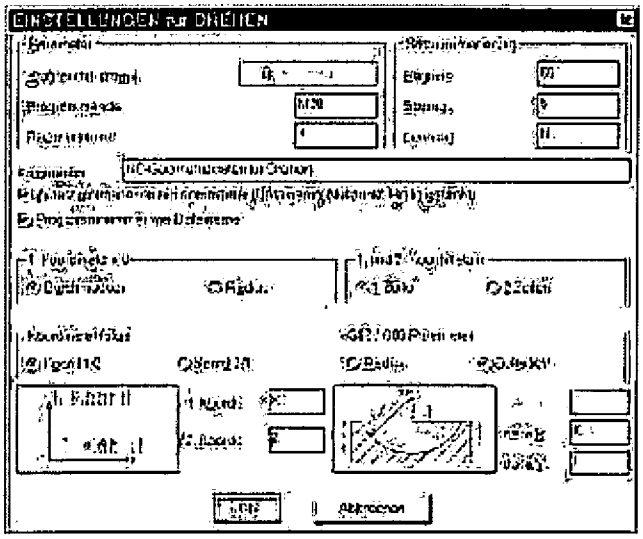


Calculation of the final roll weight

The production of a roll set is no low-cost activity. Often it is very difficult for the designer to calculate a realistic price for the rolls as the roll weight cannot be calculated but only estimated. The problem with estimates is always their inaccuracy. COPRA will automatically calculate the final weight of all rolls. Boring, keyway and chamfer of the roll bore will equally be deducted.
On the base of the calculated weight of the final roll set and the total weight of the blanks the volume of the material to be removed may be calculated. This information allows for an exact weight-cost calculation.
The result is also stored to disk and can be exported to spread sheet programs as well.

Generation of NC data files

The NC file format can easily be adapted depending on the specific machine used. The zero point and the working direction can be easily defined as well as the step numbering, the accuracy, the program end and the usage of the G02 and G03 parameters.



- no contour tracing necessary any more; all roll tools are already stored in COPRA's data base
- all NC data can be processed at one single command - saves a lot of time
- all NC data at highest accuracy
- NC format can be set in order to adapt it to various machines
- optionally (not in this module): CNC technology providing the full CNC code ready to be processed to the turning mill

Combination tool sets (data exchange between different projects)

The increasing variety of forms of roll-shaped profiles with at the same time decreasing lot sizes will force the manufacturer to take far-reaching measures to streamline production. As the production of roll tools is on the one hand expensive and on the other hand cannot often be integrated into unit prices the application of combination tool sets is the obvious solution. Manufacturing costs will be allocated to several orders and, thus, the utilization ratio will increase considerably. This might begin with the utilization of a tool set for the production of similar profile forms with different dimensions and in extreme cases lead to exclusive use of standardized shapes.

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Report on the COPRA® Rollform Software training

Conducted at Company:
Alexandria Nat. Corp. For Metal Forming - ANBORG,
New borg el Arab City,
4th Industrial Area Block #23- P#9,
P.O.Box 105, Borg El-Arab
Alexandria, EGYPT

Software Modules:
M1 COPRA® Design Module for Sections
M2 COPRA® Design Module for Trapezoidal Sections
H1 COPRA® Roll Design Husk
H2 COPRA® Deformation Technology Husk
H3 COPRA® Flower Technology Husk
H4 COPRA® Roller Technology Husk.

Trainees:
Mr. Ahmed Badr
Mr. Ali Abdelsalam,
Mr. Ahmed Ali.

Training dates:
22nd – 24th August, 2005.

Place of Training:
At company address as mentioned above.

Contents of the Training:

1. Initialise COPRA® - Toolbar "COPRA®"
2. COPRA® Basic Settings
    - 2.1. Pass- and Roll numbering
    - 2.2. COPRA® - Technology for data export
    - 2.3. COPRA® - Options
3. The COPRA® CAD-Finder
    - 3.1. Create a new project
    - 3.2. Roll attribute File
4. Flower design via COPRA® RF SpreadSheet
    - 4.1. Start COPRA® SpreadSheet
    - 4.2. Import DXF file to COPRA® RF SpreadSheet
    - 4.3. Create an own template
    - 4.4. Change background colours in COPRA® SpreadSheet
    - 4.5. Unfolding Plane
    - 4.6. Start unfolding
        - 4.6.1. Change Numbering to Numbering with Stations
    - 4.7. Save Flower
    - 4.8. Flower
    - 4.9. Strip Width Calculation
    - 4.10. Move Fixpoint / Reference Point
    - 4.11. Reference Point in Plane of Unfolding
    - 4.12. Save Flower
    - 4.13. Adaptive Flower design in COPRA® RF SpreadSheet
        - 4.13.1. Changing profile dimensions
    - 4.14. Change radii – adaptive flower design
        - 4.14.1. Change Sheet thickness
    - 4.15. Import SpreadSheet Flower to COPRA® RF
    - 4.16. Material selection
5. Alternatively - Flower design with standard COPRA® RF
    - 5.1. Create Profile for COPRA® via AutoCAD
    - 5.2. Take AutoCAD Profile into COPRA®
    - 5.3. Strip width calculation
    - 5.4. Define unfolding plane
    - 5.5. Flower - Design
        - 5.5.1. Interactive Unfolding
        - 5.5.2. Execute unfolding steps
        - 5.5.3. Automatic unfolding
        - 5.5.4. Execute unfolding

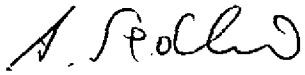
- 11.9. Add bearings
- 11.10. Copy roll attributes

12. Individual RollNumbering
    - 12.1. Disable COPRA® Station Numbering.
    - 12.2. Start Individual Roll Numbering
        - 12.2.1. Shortcuts
        - 12.2.2. Set for Project
13. Station Attributes
    - 13.1. Station number 0 = Entry Guide
    - 13.2. Station Subtype
    - 13.3. Later Inserted Stations and their Roll-numbering
        - 13.3.1. Insert Station
14. Roller weight – automatically saved to CADFinder
    - 14.1. Sawing List – automatically saved to CADFinder
15. Single roll dimensioning
    - 15.1. Attributes in Template
    - 15.2. Start Single Roll Dimensioning
    - 15.3. Enable Attributes from Template in COPRA®
        - 15.3.1. Project Info
        - 15.3.2. Machine Info
        - 15.3.3. Roll Info
        - 15.3.4. Paper Info
    - 15.4. CADFinder
    - 15.5. Roll drawings in CADFinder.

Appraisal of the trainees:

After the training program on Second day, the trainees were able to input the actual details of their machines and do the designs of rolls as per the desired specifications. The trainees are familiar with the functionality available in the software modules they have purchased and have understood that they would need to practice with more real time design to make the best use of the software.

data M Software GmbH



Albert Sedlmaier
Managing Director

ALEXANDRIA NATIONAL CO. FOR METAL FORMING (ANBORG) S.A.E.

شـركـة الإسـكـنـدريـة الوطنيـة لتشـكيل المعـادن (أنبـرج) ش.م.م

Certificate of Receipt

We hereby confirm the receipt of the documentation and the unlimited code for software

M1 COPRA® Design Module for Sections
M2 COPRA® Design Module for Trapezoidal Sections
H1 COPRA® Roll Design Husk
H2 COPRA® Deformation Technology Husk
H3 COPRA® Flower Technology Husk
H4 COPRA® Roller Technology Husk

in compliance with Contract No. 2005/021, Purchase Order No. 16000822, undersigned on June 8, 2005.

Alexandria, August 22nd, 2005

Alexandria National Co. for Metal Forming

.....

ALEXANDRIA NATIONAL CO. FOR METAL FORMING
ANBORG
ALEXANDRIA PLANT
A.R.E.

ALEXANDRIA NATIONAL CO. FOR METAL FORMING (ANBORG) S.A.E.

شـــركـة الإسكنـــدريـة الوطنيـة لتشـــكيل المعـــادن (أنبـــــرج) ش.م.م

Certificate of Acceptance

We hereby confirm that the software

M1 COPRA® Design Module for Sections
M2 COPRA® Design Module for Trapezoidal Sections
H1 COPRA® Roll Design Husk
H2 COPRA® Deformation Technology Husk
H3 COPRA® Flower Technology Husk
H4 COPRA® Roller Technology Husk

which was supplied and the training which was hold from August 22nd to 24th, 2005 comply with the contract No. 2005/021, Purchase Order No. 16000822, and that we are accepting the software and the work.

Alexandria, August 24th, 2005

Alexandria National Co. for Metal Forming

A. Bolla

.....

ALEXANDRIA NATIONAL CO. FOR METAL FORMING
ANBORG
ALEXANDRIA PLANT
S.A.E.

to be
Signed by
MD
counterpart
MC

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83626 Valley/ Oberlaindern
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http://www.datam.de

August 2001

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data M Software

Software Maintenance and Support Agreement

between

Alexandria National Co. for Metal Forming, Egypt

&

data M Software GmbH, Germany

This agreement is between Alexandria National Co. for Metal Forming, New Borg El-Arab City, 4th Industrial Area Block #23- P#9, Alexandria, Egypt hereinafter called ANBORG and data M Software GmbH, Am Marschallfeld 17, D-83626 Valley/Oberlaindern, Germany hereinafter called data M.

The following stipulations apply to the maintenance and support of data M-Software.

data M has supplied to ANBORG following COPRA® Roll Forming software modules

- M1 COPRA® Design Module for Sections
  M2 COPRA® Design Module for Trapezoidal Sections
  H1 COPRA® Roll Design Husk
  H2 COPRA® Deformation Technology Husk
  H3 COPRA® Flower Technology Husk
  H4 COPRA® Roller Technology Husk
  Dongle No. 3519, 1 licence to use; OS- and CAD-Software used: MS Windows; AutoCAD software (MS Windows and AutoCAD are not part of this agreement)
- based on Contract No. 2005/021, Purchase Order No. 16000822 , undersigned on June 8, 2005
- Yearly price for maintenance and support of above modules: USD 3,420.00
- The Maintenance and Support Contract is starting with September 1st, 2005 and ends on August 31st, 2006.

The term of the maintenance and support agreement is one year.

This maintenance and support fee shall be paid yearly in advance at the beginning of the contract.

ANBORG will be entitled to free update of the above-mentioned modules of COPRA® Roll Forming software.

data M will use all its available resources, to answer ANBORG's questions within its means. Support is limited to the programs resp. those parts that are required to work with COPRA® Software. Further problems with operating system, data base or Hardware, being independent of COPRA®, are not covered by the maintenance and support agreement. data M's support department may be contacted via Telefax, Post or E-Mail (preferred). In case of emergency also by phone.

The place of legal settlement for any disputes between the parties to this agreement shall be Miesbach. This agreement shall be subject to the law of the Federal Republic of Germany.

This agreement is signed by ANBORG and data M in confirmation of the points mentioned above.

Valley/Oberlaindern, 6th Sept. '05
(location, date)

Alexandria, 29th August
(location, date)

data M Software GmbH

Alexandria National Co. for Metal Forming

(stamp/signature)

(stamp/signature)

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data M Software GmbH

ALEXANDRIA NATIONAL CO. FOR METAL FORMING
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