

Static study Of the Driving mechanism Of the Mechanical Saw.

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Abstract: To carry out fast and precise sawings on limited dimensions, profiled, tubes, billets, bars, etc. , of steel, of aluminium, copper, one uses the mechanical saws of forms and various dimensions. All these saws are based on the same principle: They cut out the matter by removal of chips using tools with multiple sizes (web).

These machines are distinguished mainly from/to each other by the type of used saw. One finds blade saws alternate, covered disc saws and saws with flexible band mechanical saw bow saw mechanical, object of our study.

A bow saw mechanical is used to saw stems, tubes and the different shapes especially out of steel, iron or non-ferrous metals. cutting can be carried out in the perpendicular plan of the cut object. One proposes to make the design of the driving mechanism of the mechanical saw in draft of all the components, after making the assembly until the final model and checking with simulation of animation of the active part moving.

To lead to a static study of the driving mechanism of the mechanical saw one passes to a modeling by software SOLID WORKS (CAO/DAO); then one applies to the blade the cutting force to see the influence of this last on the unit.

Keywords: design; modeling, static study.

I. Introduction:

In the Seventies. The software of CAO (Computer assisted design) was only software of CAD (Drawing Computer-assisted). They evolved gradually grace, on the one hand with increase in the performances of the computer material and in addition to research in field of the logicie1. But, today, they are not yet truly assistance systems with design. This work tries to put in prospect 1 ' use of the constraints in the process of design and in particular in the process of the preliminary design so that finally this software is tools of assistance to 1a design and creation, are or will be used in the software of CAO for geometrical modeling of the physical object to conceive.

II.The process of design of a product: A product (or produced object) is manufactured by the man in opposition to a natural object. This object artificial can be very diverse but we will limit ourselves here within the framework of the CAO to an object real 3D (produced mechanical: machine element, automobile. plane, furniture, product of industrial design: body of car, cap of an electronic product telephones computer...). In short. Any object 3D which requires or required in the past before the CAO a plan in

2L) (drawing technique) for its realization. In the systems of CAO, which were at the beginning of the software of CAD, the model 2D or 3D is central. The process of design/realization is the passage of the idea to the object. More the object to be manufactured is complex. The more necessary one methodology is and the more the intermediate objects of design. In particular them plans. Are essential. One thus witnesses a rationalization of the production which makes it possible to make to lower the time and the cost of the construction of the product. 4 stapes of the process of design:

- the stage of the specifications or specifications. For a mechanical product, it is the book of loads functional (CDCF).
- the stage of the conceptual design. Development of this phase can allow one more global solution process of design. This stage becomes today. With our opinion, important object of study.
- the stage of the preliminary design which leads to a Summary

Preliminary draft (NOT) with plans with small scale.

- the stage of the design detailed which is, it, covered well by □ software of CAO current and which ends in plans on a large scale.

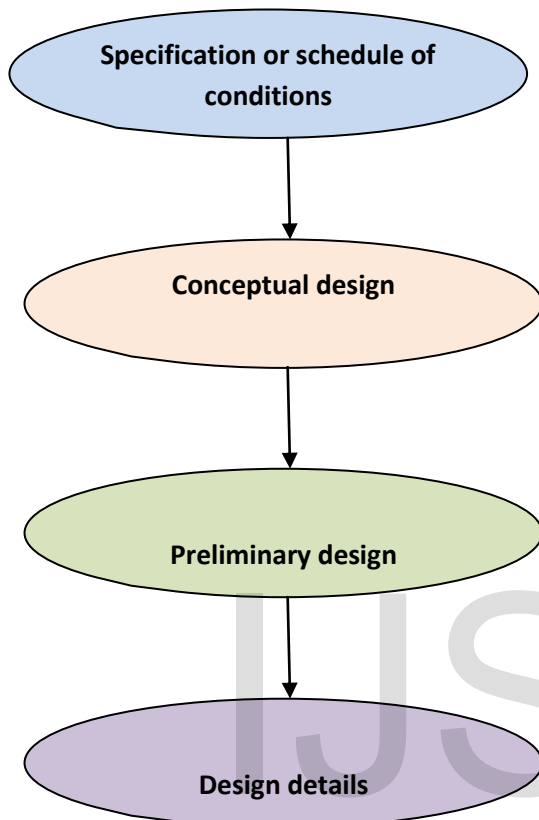


Figure.1: Stages of the process of design

III. Use of Solid software Works for the design of the part port blade (tool saws): The Solid software Works is a mechanical application of design which benefits from the graphic user interface of Microsoft Windows. Thanks to this software, the originators can quickly outline an idea, tested with functions and coasts and produce models and settings in precise plan. As it can pre-empt the possible requirements to reduce to the minimum the efforts de re design when one wants to modify the model. IV. : Performances major of the Solid Solid Works Works adopts driving mechanism of modeling 3D. When the design of a part is made, an entity 3D is shouted. Initial draft and after assembly until the final model. With part of this entity 3D, we can create setting in 2D plan or force various components to create assemblies 3D. We can

thus create settings in 2D plan of assembly 3D. The intention of design is a property of Solid Works, it describes the way in which one wishes to make react the model to any loading that one wishes to bring there. The intention of design is before a a whole question of planning. Driving mechanism adopted to create the model determines how the changes will be reflected there. Rained the execution of the design respects the intention of design, plus the model will be optimized. The process of design passes by the following stages:

- ✓ Pegging.
- ✓ Conceptualization of the model on the basis of identified need.
- ✓ Development of the model on the basis of elaborate concept.
- ✓ Analysis of the results of the development of the model.
- ✓ Prototyping of the model.
- ✓ Construction of the model.
- ✓ Edition of the model so necessary.

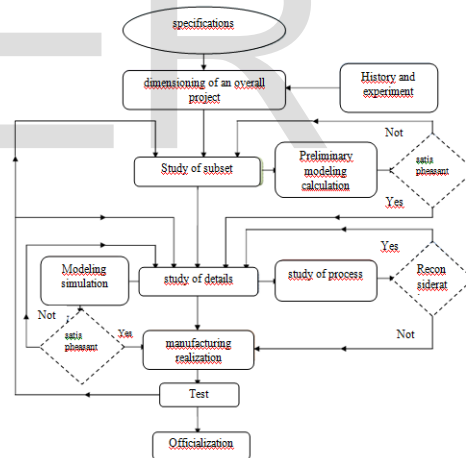


Figure 2: General process of design

V. Application: Static study of the driving mechanism of the mechanical saw: One proposes to make the design of the driving mechanism of the mechanical saw in draft of all the components, after making the assembly until the final model and checking and simulation of animation of the active part moving. The following figures illustrate this idea. VI. Functions: Once the supplemented draft, one can create a model 3D by using functions such as the extrusion and the

revolution of the parts. Certain functions based on drafts present particular forms (embossing, removal of matter, drillings, etc). Of other, such as smoothings and sweepings, use a profile along a trajectory. Others still are functions applied such as the vacation, the chamfers and the hulls. All the parts

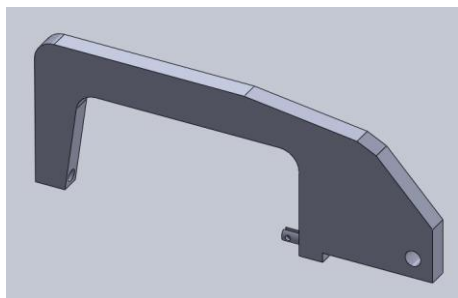


Figure3a: driving mechanism of the mechanical saw.



Figure.3b: axis of tightening of the blade

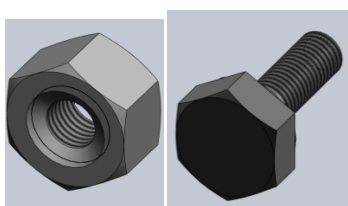


Figure3d: Screw and nut H

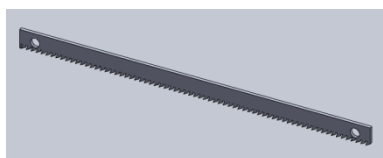


Figure.3c: tool blade

- 1 Body
- 2 Tool blade
- 3 Thumb screw
- 4 Connecting holding bolt

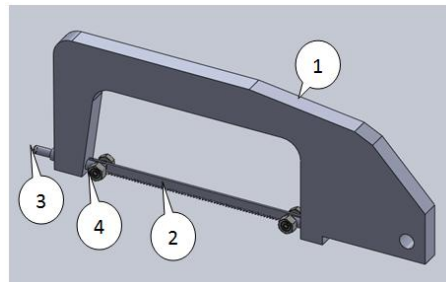


Figure.4: design of the driving mechanism of the mechanical saw

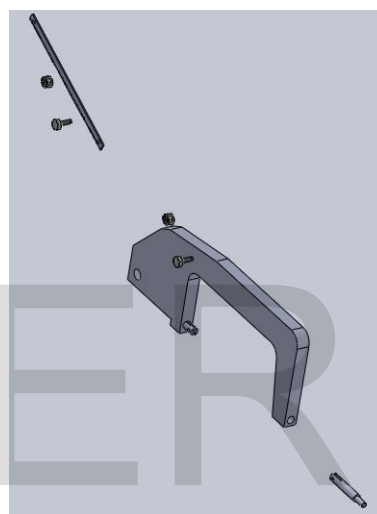


Figure.5: sight burst of the unit

VI.3Modélisation: To lead to a study statiquedu driving mechanism of the mechanical saw one passes to a modeling by software OLID WORKS (CAO/DAO); then one applies to the blade of the cutting forces to see the influence of this last on the unit.

VII. Calculation of the driving mechanism by the finite element method: The finite element method (MEF) is a reliable technique for analysis the problems of engineering. It replaces an extremely complex problem by a large number of problems simple. It consists in dividing the complex geometry of the model into small entities called elements. Generally, the great phases of a calculation are the following ones:

Definition 3D of the geometry of the assembly studied.

- Introduction of the forces applied to the driving mechanism.
- Operation of «grid» of the assembly, while being based on the geometry of, the assembly realized before. It is the operation which consists in dividing a complex structure into multiple simple parts: elements.
- Application of the boundary conditions and loadings: external efforts, imposed pressures, displacements.
- Phase of calculation itself; Analysis of computation results, leading to the qualification of the driving mechanism of the mechanical saw from the theoretical point of view or to a resumption of the geometry of the driving mechanism of the mechanical saw for new calculations.

VII .1. Why do calculations? After having créée driving mechanism of the mechanical saw with the help of the software of D.A.O and C.A.O. "Solid Works", it will be necessary to answer certain questions, such as:

- will Mondispositif of training of the mechanical saw break?
- will it much become deformed?
- can I use less matter without to decrease the performance? Without computational tool, these questions cannot find answers that by carrying out cycles of develop long and expensive. A development cycle of product generally understands:
- the creation of the model in the system of. CAO Solide Works
- the manufacturing of a prototype.
- the test of the prototype under the conditions of use.
- modification of the design on the basis of lesson of tests. This process continuous until an acceptable solution is found. Calculation can thus help with:
- To rather reduce the costs by testing the products on computer than during real tests long and expensive.
- To reduce the time of development by reducing the number of development cycles.
- To optimize the products by quickly simulating many designs and scenarios before making a final

decision, which enables us to explore more potential solutions.

VII .2.Définition 3D of the geometry of the assembly studied:

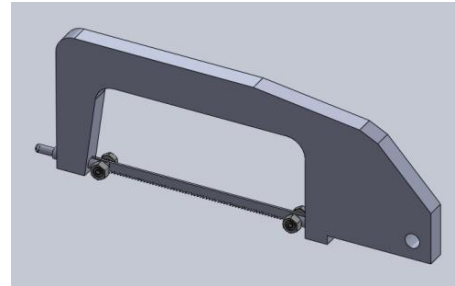


Figure.6: Definition 3D of the geometry del' assembly studied

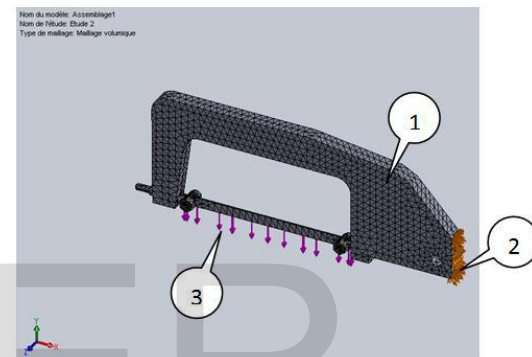


Figure.7: Operation of «grid» of the assembly and Application of the boundary conditions and of loadings

VII.3.Opération of «grid» of the assembly:

Information for the grid: ·

Number of the nodes = 2959 nodes · Many elements = 10417 elements · Many DDL = 8877 DDL.

1: Grid of the unit.

2: Boundary condition (fixed Geometry).

3: Cutting force $F= 1000N$.

VII.4.Analyse Static of the driving mechanism:

The linear static analysis, calculates displacements, the strains and the stresses in The assembly made with materials given for each part, under the action of loading given to the tool and of blocking given on the face of the part, a material yields when the constraints reach a certain level. A tool for

simulation of SOLIDWORKS used for the linear static analysis, based on the finite element method to calculate the constraints, deformations and displacements of the nodes of the elements of grid. The static analysis allows moreover the checking the resistance and the rigidity of all the structure or all the modeled overall device.

1 Choice of Materials: In accordance with the note delivered by manufacturing for the studied model, the materials of the various parts of the device are indexed in the table below.

✓ For part 1:

Table 1: Information on materials

property	Value	Unit
Modulus of elasticity	6.61781e+010	N/m ²
Poisson's ratio	0.27	S.O.
Modulus of rigidity	5e +010	N/m ²
Density	7200	Kg/m ³
Limit of traction	151658000	N/m ²
Limit of compression according to X	572156000	N/m ²
Elastic limit		N/m ²
Thermal dilation coefficient	1.2 e-005	/K

✓ For part 2:

Table 2: Information on materials

Property	Value	Unit
Modulus of elasticity	1.9e+011	N/m ²
Poisson's ratio	0.29	S.O.
Modulus of rigidity	7.5e +010	N/m ²
Density	8000	Kg/m ³
Limit of traction	517017000	N/m ³
Limit of compression according to X		N/m ²
Elastic limit	206807000	N/m ²
Thermal dilation coefficient	1.8 e-005	/K
Thermal conductivity	16	W/(m.K)

✓ For parts 3 and 4:

Table 3: Information on materials

Property	value	Unit
Modulus of elasticity	2.1e+011	N/m ²
Poisson's ratio	0.28	S.O.
Modulus of rigidity	7.9e +010	N/m ²
Density	7700	Kg/m ³
Limit of traction	723825600	N/m ³
Limit of compression according to X		N/m ²
Elastic limit	620422000	N/m ²
Thermal dilation coefficient	1.3 e-005	/K
Thermal conductivity	50	W/(m.K)

2 - Results of the static study:

· Results in displacements:

- Resulting displacement:

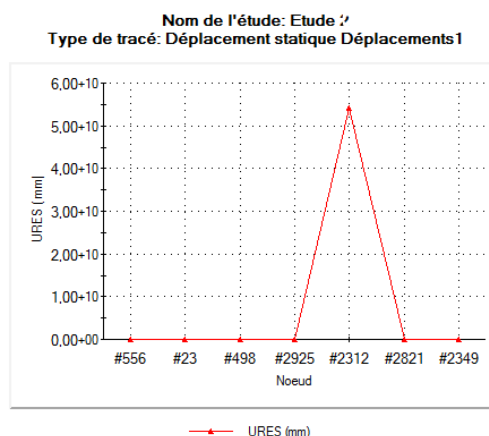
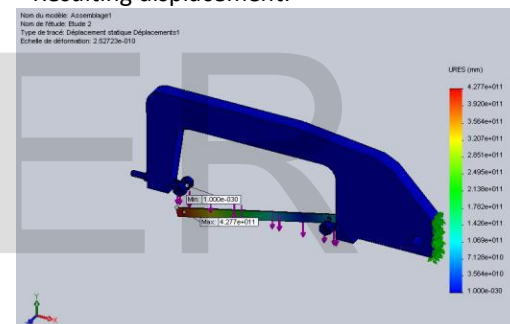


Figure8: resulting displacement

- Displacement -X:

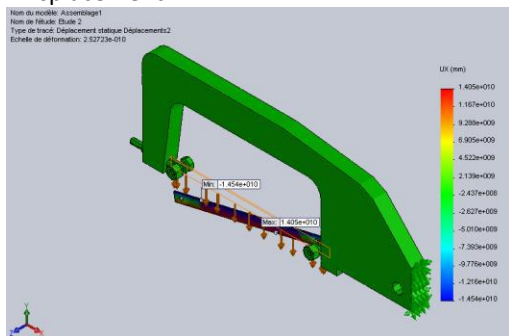


Figure9: following displacement – X

- Displacement -Y:

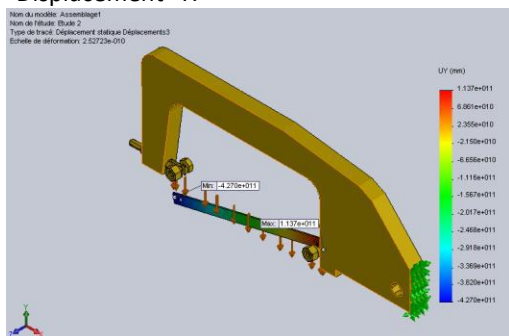


Figure10: following displacement – Y

- Displacement -Z:

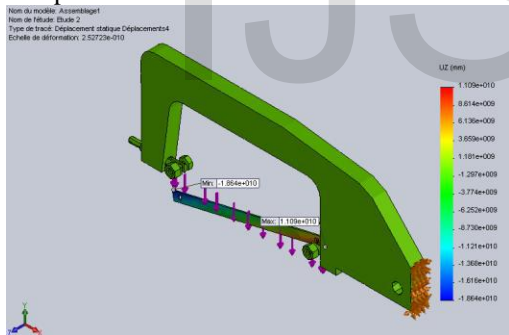


Figure11: following displacement –Z

• Results in Constraints:

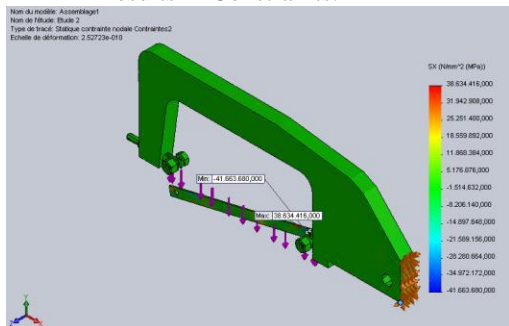


Figure12: Static stress according to X

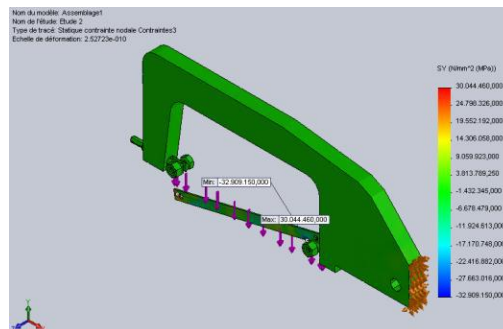


Figure13: Static stress according to Y

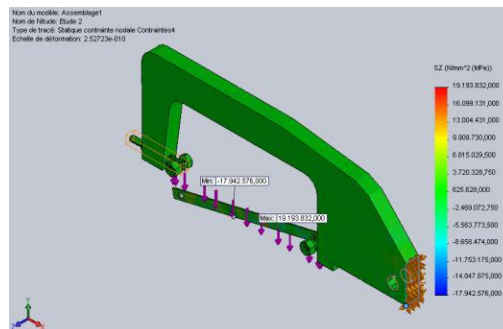


Figure14: Static stress according to Z

- Constraint of Von Mises:

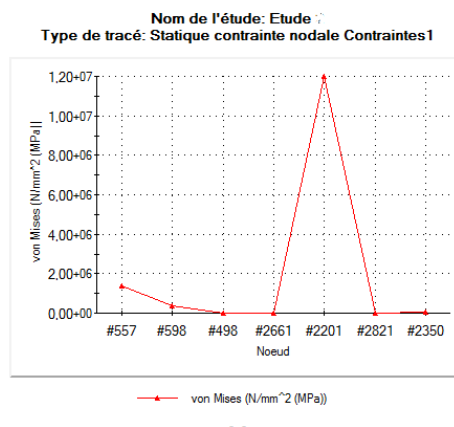
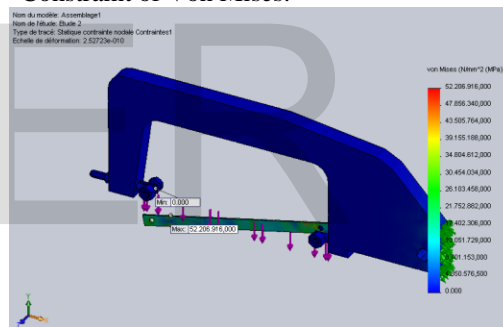


Figure15: Constraint of Von Mises with the curve of the constraint Von Mises.

- Static deformation

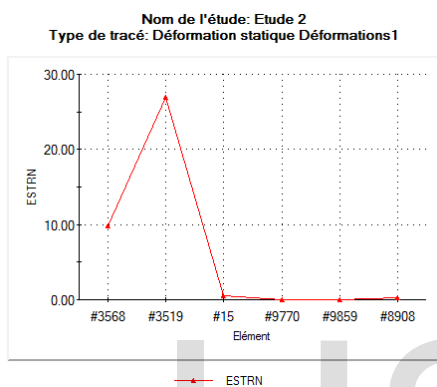
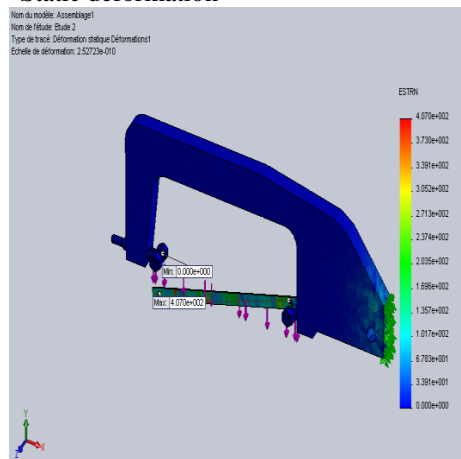


Figure16: Static deformation and the curve of deformation

- Deformation according to – X

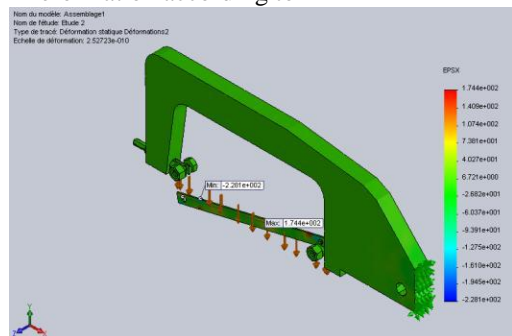


Figure17: Deformation according to – X

- Deformation according to – Y

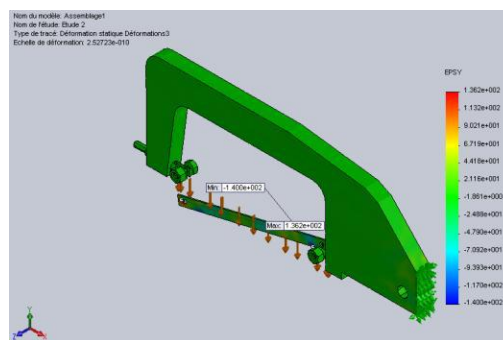


Figure18: Deformation according to – Y

- Deformation according to – Z

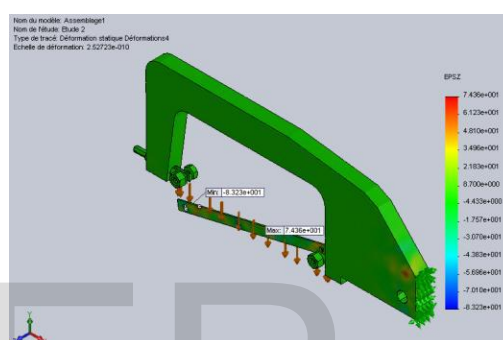


Figure19: Deformation according to – Z

- Description of design and discussion of design:

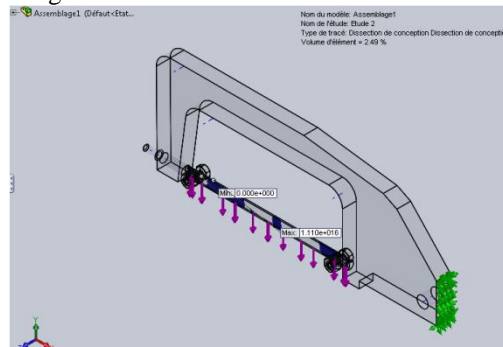


Figure20: Description of design and discussion of design

3-Description and discussion: Adjust the cursor to trace a continuous trajectory between the external actions. The transparent parts of the layout of dissection take part less in the behaviour of the loading applied than the opaque portions. These transparent zones can be removed with an aim of reducing the weight of the design. It is recommended to

check a new design by carrying out a new study.

4-Conclusion: The results obtained at the time of the static study has show to us that for a thickness of 3mm of the blade tool saws with was moved and a deformation according to X, Y and Z, with constraints along the three axes as indicates the figures.

- Deformation according to – X Figure18:
Deformation according to – Y - Description of design and discussion of design: Figure20:

Description of design and discussion of design
Conflict of Interest: bracket on the blade the cutting force to see the influence of this last on the unit.

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