

AATRIZINVENTOR SOLUTION FOR INNOVATION BASED ON NATURE'S L.I. Working Document to Build a Specific Solution.

INNOVATION CHALLENGE: Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates

APPLICATION OF NATURE'S LANGUAGE OF INNOVATION / Nature's L.I.

Web site: www.aatrizinventor.com

Reference book: The Nature's Language of Innovation, José Roberto Espinoza, Amazon, Kindle.

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FACTORS OF INNOVATION:

FUNCTION AFFECTED: Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates

PHYSICAL VARIABLE OR CHARACTERISTIC: Less Stripping quality

S1 OBJECT: STRIPPING ROBOT Type: Moving

S2 OBJECT: COPPER SHEETS Type: Moving

DESIRED ACTION VERB: Improve

INNOVATION CHALLENGE:

CHALLENGE: Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates

DESIRED GOAL: More Stripping quality

EVALUATED OBJECT: STRIPPING ROBOT

NEED TO SATISFY > 27. Reliability

SELECTED INNOVATION PARAMETERS TO EVALUATE:

A. UNDESIRABLE EFFECTS CAUSES OF DISSATISFACTION (UDEs)

There are More difficulty to Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates because:

STRIPPING ROBOT Has Less Force or impulse interacting with S2

STRIPPING ROBOT Has Less Strength or resistance interacting with S2

STRIPPING ROBOT Has Less Achievement of desired outcome interacting with S2

STRIPPING ROBOT Has More Harmful factors affecting S2 by mutual interaction

There are undesirable effects that cause dissatisfaction because:

There is Less Stripping quality

B. DESIRED EFFECT FOR NEED TO SATISFY

There is More ease to Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates because:

STRIPPING ROBOT Has More Desired reliability to interact with S2

There is desirable effect for need to satisfy because:

There is More Stripping quality

Table I. RELATIONSHIP WITH UNIVERSAL TRIZ INNOVATION PARAMETERS (maximum of 7

undesirable effects)

CHALLENGE: Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates

This table presents the selected innovation parameters to evaluate the challenge that must be resolved for the interaction between an Object S1 and an Object S2, and no others. The choice of undesirable effects must be based on a thorough review of the current situation, identifying them based on the objective evidence present within the predefined space and time of evaluation. Fulfilling this requirement is crucial: If you do not connect the dots of the current situation properly, the algorithm will deliver a disconnected solution.

The selection of the need to satisfy should reflect the best estimation of the innovation-evolution state of the object S1 being evaluated.

Recognizing the criticality of this selection process, the Aatrizinventor algorithm provides flexibility to change parameters and conducts a sensitivity analysis in order to offer alternative solutions. These alternatives are based on different combinations of the entered parameters, also including a different need to satisfy from the one originally posed.

Parameters to evaluate(s)	It is understood as STRIPPING ROBOT has:
Parámetros of undesirable effects (UDE):	Undesirable effects causes of dissatisfaction:
(-) 10. Force/ Intensity	Less Force or impulse interacting with S2
(-)14. Strength / Resistance	Less Strength or resistance interacting with S2
(-) 29. Fulfillment of desired outcome	Less Achievement of desired outcome interacting with S2
(+) 31. Object-generated harmful factors	More Harmful factors affecting S2 by mutual interaction
Desirable parameter (DE):	Desirable Effect for Need to satisfy:
(+) 27. Reliability	More Desired reliability to interact with S2
TRIZ undesirables parameters for sensitivity analysis	It is understood as STRIPPING ROBOT has:
(-) 12. Shape / composition / configuration	Less Appropriate shape, composition, or configuration interacting with S2
(-) 26. Quantity of substance / Capacity gains	Less Quantity of substance delivered or produced per control unit interacting with S2
n/a	
n/a	
n/a	

EVALUTION RESULTS TABLES

TABLE II. SPECIFIC CONTRADICTION MATRIX FOR UNDESIRABLE EFFECTS AND NEED TO SATISFY. FOR EVALUATED OBJECT: STRIPPING ROBOT AND NEED TO BE SATISFIED > 27. Reliability

CHALLENGE: Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates

(*) Preferred parameters: Improve 27. Reliability & Attenuate or preserve 10. Force/ Intensity.

Contradictions/ E.C: Essential, Comp.:Complementary, Top 5: Up to the major fifth, noted if outside the preferred parameters.

Parameters in the first row are the same as those in the first column.

Parameter to attenuate or preserve => Parameter to improve	Var.	(-) Par.10 PREF.	(-) Par.14	(-) Par.29	(+) Par.31	(+) Par.27	Sum wt
(-) 10. Force/ Intensity	wt		wt.9	wt.19	wt.6	wt.8	44%
	IP(s)	0,0,0,0	35,10,14,27	28,29,37,36	13,3,36,24	3,35,13,21	
(-) 14. Strength / Resistance	wt	wt.12 Compl.		wt.10	wt.4 Top 5	wt.2 Top 5	66%
	IP(s)	10,18,3,14	0,0,0,0	3,27,0,0	15,35,22,2	11,3,0,0	
(-) 29. Fulfillment of desired outcome	wt	wt.16 Compl.	wt.10		wt.17	wt.14	33%
	IP(s)	28,19,34,36	3,27,0,0	0,0,0,0	4,17,34,26	11,32,1,0	
(+) 31. Object-generated harmful factors	wt	wt.7 Compl.	wt.4 Top 5	wt.17		wt.20	40%
	IP(s)	35,28,1,40	15,35,22,2	4,17,34,26	0,0,0,0	24,2,40,39	
(+) 27. Reliability PREF.	wt	wt.1 E.C.	wt.3 Compl.	wt.13 Compl.	wt.15 Compl.		100%
	IP(s)	8,28,10,3	11,28,0,0	11,32,1,0	35,2,40,26	0,0,0,0	
Sum wt		89%	65%	31%	43%	55%	

This table shows the essential contradiction (E.C.) that determines the solution strategy. Additionally, preferred parameters are established where complementary contradictions (Compl.) are found, allowing the definition of the Base Solution shown in Table III.

As a complement to the Base Solution, Table II also provides the following information that could be relevant to obtain an optimal solution:

- The algorithm identifies the top 5 contradictions from the entire Table II and highlights those that are outside the preferred parameters for further review.
- There are inventive principles present in Table II that are not part of the Recommended Solution

proposed in Table V. In the latter, the top three most relevant ones are highlighted, and the contradictions they involve are presented to evaluate whether they contribute significant aspects to the desired solution. For further details, Table VIII provides a prioritization of the inventive principles from Table II, and those not included in the Recommended Solution in Table V are marked with ***.

TABLE III. BASE SOLUTION FOR THE EVALUATED OBJECT: STRIPPING ROBOT

NEED TO SATISFY > 27. Reliability

CHALLENGE: Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates

Table II Selection: Essential Contradiction wt.1 y Complementary contradictions with preferred parameters (*) wt.3/wt.7/wt.12/wt.13							
Parameter to improve	Parameter to attenuate or preserve	Contradict.	Wt.n	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
(+) 27. Reliability	(-) 10. Force/ Intensity	Essential	wt.1	8 Es.	28 Es.	10 Es.	3 Es.
(+) 27. Reliability	(-) 14. Strength / Resistance	Compl. 1	wt.3	11	28 Es.	0	0
(+) 31. Object-generated harmful factors	(-) 10. Force/ Intensity	Compl. 2	wt.7	35	28 Es.	1	40
(-) 14. Strength / Resistance	(-) 10. Force/ Intensity	Compl. 3	wt.12	10 Es.	18	3 Es.	14
(+) 27. Reliability	(-) 29. Fulfillment of desired outcome	Compl. 4	wt.13	11	32	1	0

Inventive Principles (IP) selected for the Base Solution

- IP.8. Anti-Weight/ Compensation - tactical type
- IP.28. Mechanics Substitution - strategic type
- IP.10. Preliminary Action - strategic type
- IP.3. Local Quality - strategic type
- IP.11. Beforehand Cushioning - tactical type
- IP.35. Transformation / Parameter Changes - strategic type
- IP.1. Segmenting/ Integrating - strategic type
- IP.40. Composite Materials/ Conditions - **operative type**
- IP.18. Mechanical Vibrations/ Energy Variations - tactical type
- IP.14. Spheroidality - Curvature - Angle - tactical type
- IP.32. Perception/ Appearance/ Color Changes - strategic type

Table III shows the essential contradiction, the one with the highest weight, plus the following 4 complementary contradictions in weight, which are located in the row and column of the preferred parameters selected in Table II. These contradictions are considered relevant for the solution and are

described as the Base Solution in Table IX.

Keep in mind that all inventive principles selected for a solution must be evaluated according to the specific context of the contradictions in which they participate.

Inventive principles marked with 'Es.' correspond to inventive principles that belong to the essential contradiction.

TABLE IV. CONTRADICTION MATRIX COVERAGE FOR SOLUTION AMONG NEEDS TO SATISFY FOR EVALUATED OBJECT: STRIPPING ROBOT, NEED TO BE SATISFY: 27. Reliability

Coverage is defined as the extent to which the inventive principles from Table II encompass the inventive principles from Table IV. If weighted coverage is higher, it has been observed that the obtained solution is more likely to have the lowest cost and the maximum benefit-to-cost ratio.

Parameter to improve	Parameter to preserve	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
27. Reliability	39. Productivity	1	35	29	38 nT2
27. Reliability	15. Duration of action of moving object	2	35	3	25 nT2
27. Reliability	33. Ease of operation	27 nT3	17 nT3	40	0
27. Reliability	34. Ease of change, repair or maintain	1	11	0	0
27. Reliability	32. Ease of achieving desired outcome	0	0	0	0
27. Reliability	19. Use of energy by moving object	21 nT3	11	27 nT3	19 nT3
27. Reliability	27. Reliability	0	0	0	0
27. Reliability	38. Extent of automation/ autonomy	11	13 nT3	27 nT3	0
27. Reliability	35. Adaptability or versatility	13 nT3	35	8	24 nT3
27. Reliability	13. Stability	0	0	0	0

Inventive Principles (IP) selected for the Solution of relevant Contradictions between Needs to Satisfy

IP.1. Segmenting/ Integrating - strategic tpe

IP.35. Transformation / Parameter Changes - strategic tpe

IP.29. Controllable Soft Variables - tactical type

IP.38. Strong or Quick Reactions - **operative type**

IP.2. Taking out/ Adding - strategic tpe

IP.3. Local Quality - strategic tpe

IP.25. Self-service - **operative type**

98.17 % weighted coverage of the inventive principles (IP) included in Table IV. of Contradictions between Needs to Satisfy (NS), in relation to the IP included in Table II Specific Contradiction Matrix.

The inventive principles labeled with nT2 are not found in Table II. Due to this condition, the first three contradictions in Table IV containing principles marked with nT2 are described as a Solution among Needs to Satisfy in Table IX. This solution, combined with the previously mentioned Base Solution, forms the Recommended Solution by the Aatrizinventor Algorithm, shown in Table V.

From practical experience, if Table IV contains more than 3 contradictions with inventive principles not included in Table II, then it is likely to be more challenging to construct a specific solution. In that case, it is recommended to look for an alternative combination of parameters in Table VI of sensitivity analysis. It is also an option to select another need to satisfy, which is shown in Table VII Essential Contradictions of Needs to Satisfy (NS) for the same undesirable effects already evaluated for STRIPPING ROBOT.

To evaluate the recommended inventive principles here and the corresponding contradictions in which they participate, it is necessary for the Base Solution to guide an initial context for the solution, as the contradictions between Needs to Satisfy do not identify which variable of the evaluated object S1 should be operated.

Inventive principles labeled with nT3 are included in Table II, but do not participate in the Recommended Solution shown in Table V. The Innovation Team must review the contradictions where they participate, to determine if there were other specific aspects that could be significant for the solution.

Unmarked inventive principles are included in Table II Specific Contradiction Matrix and in Table V Recommended Solution.

TABLE V. RECOMMENDED SOLUTION FOR INNOVATION CHALLENGE FOR EVALUATED OBJECT STRIPPING ROBOT

CHALLENGE: Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates

Evaluated need to satisfy in this report: **27. Reliability**

UDEs: (-) 10. Force/ Intensity// (-)14. Strength / Resistance// (-) 29. Fulfillment of desired outcome// (+) 31.

Object-generated harmful factors

Parameter to improve	Parameter to attenuate or preserve	Contradict.	Wt.n	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
(+) 27. Reliability	(-) 10. Force/ Intensity	Essential	wt.1	8 Es.	28 Es.	10 Es.	3 Es.
(+) 27. Reliability	(-) 14. Strength / Resistance	Compl. 1	wt.3	11	28 Es.	0	0
(+) 31. Object-generated harmful factors	(-) 10. Force/ Intensity	Compl. 2	wt.7	35	28 Es.	1	40
(-) 14. Strength / Resistance	(-) 10. Force/ Intensity	Compl. 3	wt.12	10 Es.	18	3 Es.	14
(+) 27. Reliability	(-) 29. Fulfillment of desired outcome	Compl. 4	wt.13	11	32	1	0

27. Reliability	39. Productivity	NS.1	wns.1	1	35	29	38
27. Reliability	15. Duration of action of moving object	NS.2	wns.2	2	35	3 Es.	25

Relevant inventive principles from Table II not included in Recommended Solution

Before deciding on the solution, make sure you have previously reviewed the contradictions with relevant Inventive Principles from Table II, not included in the Recommended Solution. The 3 most relevant are shown below.

IP.15. Dynamics (Pos.5) ***	IP. Str.	[Par.31][Par.14][IP(s) : 15,35,22,2] - [Par.14][Par.31][IP(s) : 15,35,22,2] -
IP.4. Asymmetry/ Symmetry (Pos.6) ***	IP. Oper.	[Par.31][Par.29][IP(s) : 4,17,34,26] - [Par.29][Par.31][IP(s) : 4,17,34,26] -
IP.13. Reverse or Indirect Action (Pos.8) ***	IP. Str.	[Par.10][Par.31][IP(s) : 13,3,36,24] - [Par.10][Par.27][IP(s) : 3,35,13,21] -

Inventive Principles (IP) selected for Recommended Solution:

To develop a Specific Solution based on the contradictions provided in Table V, where S1: STRIPPING ROBOT interacts with S2: COPPER SHEETS, the Innovation Team must analyze the recommended innovation concepts for each selected inventive principle listed below. At least one concept from each principle that is applicable to the challenge under evaluation should be chosen.

Once the concepts are selected per inventive principle, it is essential to conduct an 'integrated reading' of the contradictions indicated in Table V. If this 'integrated reading' can demonstrate a coherent logical thread for each selected contradiction and as a whole, then it can be considered that there is a potential innovation solution.

To complete the definition of the specific solution, it is necessary to review the relevant inventive principles from Table II that were not included in the Recommended Solution in Table V, which are presented above.

For more details on the selected contradictions, you can review the complete descriptions of the inventive principles by contradiction, as shown in Table IX.

In the Starting Manual, Fundamentals of Aatrizinventor, Point 11, an example is provided for developing the Specific Solution based on the Recommended Solution by the Aatrizinventor algorithm, based on the 'Language of Nature Innovation.' The identification of a specific solution is a systematic and iterative process involving multiple concepts, aiming to determine a comprehensive solution with minimal implementation costs and maximum benefit-to-cost ratio.

It's important noting that an asterisk (*) has been added to the name of the object under evaluation to remind that the descriptions of the inventive principles may consider that STRIPPING ROBOT can be in its current physical and functional state, or in a modified state, or even in a new state, as needed to achieve the desired objective. Please, make the most of your relational thinking skills.

Summary description of the Inventive Principles included in the Recommended Solution shown above, applicable to the challenge under evaluation for the defined space and time:

N°1 Improve: (+) 27. Reliability and Attenuate or Preserve: (-) 10. Force/ Intensity

IP.8. Anti-Weight/ Compensation - tactical type (1)

- a. To compensate for the heaviness/lightness or incidence of STRIPPING ROBOT*, merge it with other objects or independent own parts that provide an effect to improve the current situation.
- b. To compensate for the heaviness/lightness or incidence of STRIPPING ROBOT*, make it interact with the environment.

IP.28. Mechanics Substitution - strategic type (2)

- a. Replace a direct or manual action in, or for, STRIPPING ROBOT*, with a mechanical action or a tool.
- b. Replace a mechanical means in, or for, STRIPPING ROBOT*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.
- c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields gto improve action of STRIPPING ROBOT*.
- d. Change from static fields in, or for, STRIPPING ROBOT* to moving fields, from unstructured fields to those with structure, or vice versa.
- e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and ferromagnetic particles) in, or for, STRIPPING ROBOT*.

IP.10. Preliminary Action - strategic type (3)

- a. Perform the required change in, or for, STRIPPING ROBOT*, before it is needed (either fully or partially).
- b. Pre-arrange STRIPPING ROBOT* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

IP.3. Local Quality - strategic type (4)

- a. Improve quality in a localized way, for parts, components, or conditions of STRIPPING ROBOT*.
- b. Change the structure, action, or procedure of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.
- c. Change the external environment (or external influence) of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.
- d. Make each part of STRIPPING ROBOT* function in the conditions that are most suitablx for its operation.
- e. Make each part of STRIPPING ROBOT* fulfill a different and useful function.

N°2 Improve: (+) 27. Reliability and Attenuate or Preserve: (-) 14. Strength / Resistance

IP.11. Beforehand Cushioning - tactical type (5)

- a. Prepare emergency means, beforehand, to compensate for the relatively low reliability of STRIPPING ROBOT*.

IP.28. Mechanics Substitution - strategic type (6)

- a. Replace a direct or manual action in, or for, STRIPPING ROBOT*, with a mechanical action or a tool.
- b. Replace a mechanical means in, or for, STRIPPING ROBOT*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.
- c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields gto improve action of STRIPPING ROBOT*.
- d. Change from static fields in, or for, STRIPPING ROBOT* to moving fields, from unstructured fields to

those with structure, or vice versa.

e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and ferromagnetic particles) in, or for, STRIPPING ROBOT*.

N°3 Improve: (+) 31. Object-generated harmful factors and Attenuate or Preserve: (-) 10. Force/ Intensity

IP.35. Transformation / Parameter Changes - strategic type (7)

a. Change STRIPPING ROBOT*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).

b. Change the composition or condition of STRIPPING ROBOT* by adding or removing components.

c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of STRIPPING ROBOT*.

IP.28. Mechanics Substitution - strategic type (8)

a. Replace a direct or manual action in, or for, STRIPPING ROBOT*, with a mechanical action or a tool.

b. Replace a mechanical means in, or for, STRIPPING ROBOT*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.

c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields to improve action of STRIPPING ROBOT*.

d. Change from static fields in, or for, STRIPPING ROBOT* to moving fields, from unstructured fields to those with structure, or vice versa.

e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and ferromagnetic particles) in, or for, STRIPPING ROBOT*.

IP.1. Segmenting/ Integrating - strategic type (9)

a. Divide STRIPPING ROBOT* into existing and/or new parts, shapes, phases, states, or conditions.

b. Integrate different existing or new parts, forms, phases, states or conditions of STRIPPING ROBOT* in a single entity.

c. Make STRIPPING ROBOT* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of STRIPPING ROBOT*.

IP.40. Composite Materials/ Conditions - operative type (10)

a. Change from a uniform material, property, state, or condition in, or for, STRIPPING ROBOT* , to a composite one, or vice versa.

N°4 Improve: (-) 14. Strength / Resistance and Attenuate or Preserve: (-) 10. Force/ Intensity

IP.10. Preliminary Action - strategic type (11)

a. Perform the required change in, or for, STRIPPING ROBOT*, before it is needed (either fully or partially).

b. Pre-arrange STRIPPING ROBOT* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

IP.18. Mechanical Vibrations/ Energy Variations - tactical type (12)

a. Move STRIPPING ROBOT* by cycles with energies that activate it.

b. Cause STRIPPING ROBOT* to oscillate or vibrate. Increase its frequency (even up to the ultrasonic). Use the resonant frequency of STRIPPING ROBOT*. If necessary, decrease frequency.

c. Use vibration-generating fields in, or for, STRIPPING ROBOT* instead of mechanical vibration generators. Combine sources of oscillations.

d. Apply alternation of STRIPPING ROBOT* or its parts or functions.

IP.3. Local Quality - strategic type (13)

- a. Improve quality in a localized way, for parts, components, or conditions of STRIPPING ROBOT*.
- b. Change the structure, action, or procedure of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.
- c. Change the external environment (or external influence) of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.
- d. Make each part of STRIPPING ROBOT* function in the conditions that are most suitable for its operation.
- e. Make each part of STRIPPING ROBOT* fulfill a different and useful function.

IP.14. Spheroidality - Curvature - Angle - tactical type (14)

- a. For the interaction between STRIPPING ROBOT* and Object S2, instead of using rectilinear parts, surfaces, or shapes, use curvilinear, enveloping, or angled parts.
- b. For the interaction between STRIPPING ROBOT* and Object S2, instead of acting in a linear or direct way, interact in an indirect way or with curvilinear, surrounding, or angled movements.
- c. Move STRIPPING ROBOT* from flat to spherical surfaces; from parts shaped as a cube (parallelepiped) to ball-shaped structures.
- d. Use rolls, balls, spirals, domes in, or for, STRIPPING ROBOT*.
- e. Go from linear to rotary motion, use centrifugal forces in, or for, STRIPPING ROBOT*.
- f. If there is Spheroidality, curvature or angle, increase or reduce, as applicable, in, or for, STRIPPING ROBOT*.

N°5 Improve: (+) 27. Reliability and Attenuate or Preserve: (-) 29. Fulfillment of desired outcome

IP.11. Beforehand Cushioning - tactical type (15)

- a. Prepare emergency means, beforehand, to compensate for the relatively low reliability of STRIPPING ROBOT*.

IP.32. Perception/ Appearance/ Color Changes - strategic type (16)

- a. Change how is perceived, the appearance or shape of STRIPPING ROBOT* in relation to the object S2 with which it interacts.
- b. Change the color, or appearance, of STRIPPING ROBOT* or its external environment.
- c. Change the transparency of STRIPPING ROBOT* or its external environment.

IP.1. Segmenting/ Integrating - strategic type (17)

- a. Divide STRIPPING ROBOT* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different existing or new parts, forms, phases, states or conditions of STRIPPING ROBOT* in a single entity.
- c. Make STRIPPING ROBOT* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of STRIPPING ROBOT*.

N°6 Improve: 27. Reliability and Preserve: 39. Productivity

IP.1. Segmenting/ Integrating - strategic type (18)

- a. Divide STRIPPING ROBOT* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different existing or new parts, forms, phases, states or conditions of STRIPPING ROBOT* in a single entity.
- c. Make STRIPPING ROBOT* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of STRIPPING ROBOT*.

IP.35. Transformation / Parameter Changes - strategic type (19)

- a. Change STRIPPING ROBOT*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).

- b. Change the composition or condition of STRIPPING ROBOT* by adding or removing components.
- c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of STRIPPING ROBOT*.

IP.29. Controllable Soft Variables - tactical type (20)

- a. Use external, controllable soft variables (manual, physical, mechanical, pneumatic, hydraulic, electrical, magnetic, electromagnetic, digital, chemical, biological, social, psychological, physiological, etc.) to interact with STRIPPING ROBOT* facilitating goal fulfillment of the function performed with Object S2.
- b. Make easier STRIPPING ROBOT* interact with Object S2 using internal, controllable soft variables (manual, physical, mechanical, pneumatic, hydraulic, electrical, magnetic, electromagnetic, digital, chemical, biological, social, psychological, physiological, etc.) available in S1 and / or S2, facilitating goal fulfillment.

IP.38. Strong or Quick Reactions - operative type (21)

- a. Apply strong and/or quick reactions to STRIPPING ROBOT* (e.g., apply strong oxidants, sudden change.).

N°7 Improve: 27. Reliability and Preserve: 15. Duration of action of moving object

IP.2. Taking out/ Adding - strategic type (22)

- a. Separate an interfering part or a property from STRIPPING ROBOT*, or single out the only necessary part (or property) of STRIPPING ROBOT*. b. Add new parts or properties to STRIPPING ROBOT*.

IP.35. Transformation / Parameter Changes - strategic type (23)

- a. Change STRIPPING ROBOT*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).
- b. Change the composition or condition of STRIPPING ROBOT* by adding or removing components.
- c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of STRIPPING ROBOT*.

IP.3. Local Quality - strategic type (24)

- a. Improve quality in a localized way, for parts, components, or conditions of STRIPPING ROBOT*.
- b. Change the structure, action, or procedure of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.
- c. Change the external environment (or external influence) of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.
- d. Make each part of STRIPPING ROBOT* function in the conditions that are most suitable for its operation.
- e. Make each part of STRIPPING ROBOT* fulfill a different and useful function.

IP.25. Self-service - operative type (25)

- a. Make STRIPPING ROBOT* serve itself by performing helpful auxiliary functions.
- b. Use resources, energy or substances that are wasted or unused by STRIPPING ROBOT*. c. Incorporate resources and/or functions into STRIPPING ROBOT* for self-service during operation.

N°8 Improve: and Preserve:

Relevant inventive principles from Table II not included in Recommended Solution

IP.15. Dynamics (Pos.(5) - strategic type (26)

- a. Allow (or design) the characteristics of STRIPPING ROBOT*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

- b. Divide STRIPPING ROBOT* into parts that are capable of relative movement between each other.
- c. If STRIPPING ROBOT* (or process) is rigid or inflexible, make it flexible or adaptive.
- d. To enhance the dynamics of STRIPPING ROBOT* or the process, use feature(s) or object(s) available in the nearby environment.

IP.4. Asymmetry/ Symmetry (Pos.(6) - operative type (27)

- a. Change the shape of STRIPPING ROBOT* from symmetrical to asymmetrical, permanent, or variable in time, or vice versa.
- b. If STRIPPING ROBOT* is asymmetrical, increase its degree of asymmetry, or vice versa.

IP.13. Reverse or Indirect Action (Pos.(8) - strategic type (28)

- a. Inverse the applied action or apply an indirect action to perform the current function of STRIPPING ROBOT* to interact with object S2 It should be identified how STRIPPING ROBOT* currently performs an action with Object S2 and from there evaluate an inverse or indirect action.
- b. Make moving parts of STRIPPING ROBOT* (or the external environment) fixed, and fixed parts moving.
- c. Turn STRIPPING ROBOT* (or process) 'upside down', 'change the position', 'change the condition'.

TABLE VI. RESULTS OF SENSITIVITY ANALYSIS FOR THE EVALUATED OBJECT STRIPPING ROBOT CHALLENGE: Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates

Coverage obtained for the current evaluation to compare with sensitivity analysis

Order	Par.1	Par.2	Par.3	Par.4	Par.5	Cob. NS (%)	Cob. EC (%)	Cob. GL (%)
#	10	14	29	31	27. Reliability	98.17	27.57	80.52

Table VI presents the 10 most favorable parameter combinations recommended by the Aatrizinventor algorithm. It is suggested to evaluate the 2 or 3 most relevant ones. Practice teaches that they often contain the best solution for the evaluated challenge.

(E) Combination of TRIZ innovation parameters evaluated in this Aatrizinventor Solution is prioritized here

(U) Combination of TRIZ innovation parameters shows a match only in the evaluated undesirable effects.

A. PRIORITISED CONTRADICTIONS BY GLOBAL COVERAGE (Cob.GL)

Par.5 is automatically selected

Order	Par.1	Par.2	Par.3	Par.4	Par.5	Cob. NS (%)	Cob. EC (%)	Cob. GL (%)
I.a	10	12	14	31	27. Reliability	92.97	100	94.73
II.a	10	14	29	31	19. Use of energy by moving object (U)	90.78	100	93.09
III.a	10	12	29	31	19. Use of energy by moving object	87.83	100	90.87

IV.a	10	12	29	31	27. Reliability	86.96	100	90.22
V.a	10	12	14	31	35. Adaptability or versatility	86.74	100	90.05

B. PRIORITIZATION OF CONTRADICTIONS BY COVERAGE OF NEEDS TO SATISFY (Cob.NS)

Par.5 is automatically selected

Order	Par.1	Par.2	Par.3	Par.4	Par.5	Cob. NS (%)	Cob. EC (%)	Cob. GL (%)	Table VI.A
I.b	10	14	29	31	27. Reliability (E)	98.17	27.57	80.52	-
II.b	10	14	26	31	27. Reliability	94.33	10.63	73.4	-
III.b	10	12	14	31	27. Reliability	92.97	100	94.73	I.a
IV.b	10	14	31	0	27. Reliability	92.97	15.36	73.57	-
V.b	10	12	14	31	19. Use of energy by moving object	92	18.89	73.72	-

TABLE VII ESSENTIAL CONTRADICTIONS MATRIX FOR NEEDS TO SATISFY (NS) FOR THE SAME UNDESIRABLE EFFECTS EVALUATED OF: STRIPPING ROBOT

CHALLENGE: Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates

Evaluated need to satisfy in this report: **27. Reliability**

UDEs: (-) 10. Force/ Intensity// (-)14. Strength / Resistance// (-) 29. Fulfillment of desired outcome// (+) 31. Object-generated harmful factors

This table allows the Innovation Team to compare the coverages obtained for the evaluated need to satisfy with those of the other defined needs, for the same undesirable effects. This way, they can decide whether to choose any of the suggested innovation parameter combinations here that offer better coverage.

Need to Satisfy	Parameter to improve	Parameter to attenuate or preserve	Contradict. Essential	Cob. NS (%)	Cob. between EC (%)	Cob. GL (%) 3/1
19. Use of energy by moving object	(-)14. Strength / Resistance	(+) 31. Object-generated harmful factors	[15,35,22,2]	90.78	100	93.09
15. Duration of action of moving object	(+) 31. Object-generated harmful factors	(-)14. Strength / Resistance	[15,35,22,2]	77.07	100	82.8
27. Reliability	(+) 27. Reliability	(-) 10. Force/ Intensity	[8,28,10,3]	98.17	27.57	80.52
35. Adaptability or versatility	(-) 10. Force/ Intensity	(-)14. Strength / Resistance	[35,10,14,27]	90.68	48.46	80.13

39. Productivity	(+) 39. Productivity	(-)14. Strength / Resistance	[29,28,10,18]	86.82	46.59	76.76
38. Extent of automation/ autonomy	(+) 31. Object-generated harmful factors	(-)14. Strength / Resistance	[15,35,22,2]	68.57	100	76.43
34. Ease of change, repair or maintain	(-) 10. Force/ Intensity	(-)14. Strength / Resistance	[35,10,14,27]	84.65	48.46	75.6
13. Stability	(-) 10. Force/ Intensity	(-)14. Strength / Resistance	[35,10,14,27]	82.21	48.46	73.77
32. Ease of achieving desired outcome	(-) 10. Force/ Intensity	(+) 32. Ease of achieving desired outcome	[15,37,18,1]	88.14	23.35	71.94
33. Ease of operation	(+) 31. Object-generated harmful factors	(-) 10. Force/ Intensity	[35,28,1,40]	83.97	22.69	68.65

Table VII shows the essential contradictions obtained for each of the defined Needs to Satisfy, taking into account the same undesirable effects that have been evaluated. This table is based on the calculation of a global coverage (Cob.GL), which is determined by combining two values: the coverage from Table IV (Cob.NS) already explained, and a relative coverage (Cob. between EC) that is obtained in this table VII, when each other comparing the essential contradictions identified for the 10 parameters of Needs to Satisfy.

This global coverage (GL) is based on expert weighting criteria to prioritize the solutions for the different Needs to Satisfy. Experience with aatrizinventor indicates that the most effective solutions are those with higher global coverage, preferably exceeding 90%, if possible.

The Innovation Team may decide if it is appropriate to carry out a new evaluation with another Need to Satisfy, selected from the results provided in Table VII. This decision will be primarily made when the evaluated Need to Satisfy is not ranked in the first position of Table VII. In this table, the position of the evaluated Need to Satisfy is highlighted: 27. Reliability.

TABLE VIII. ORDER OF INCIDENCE OF INVENTIVE PRINCIPLES (POS.n)

CHALLENGE: Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates

Participation analysis of inventive principles in TABLE II SPECIFIC CONTRADICTION MATRIX.

Evaluated parameters for Object STRIPPING ROBOT:

Par. UDEs:

(-) 10. Force/ Intensity

(-)14. Strength / Resistance

(-) 29. Fulfillment of desired outcome

(+) 31. Object-generated harmful factors

Par. NS: (+) 27. Reliability

***: Inventive Principles from the Specific Contradiction Matrix (Table II) not described in the Recommend Solution (Table IX). It is recommended to perform an additional review following the order of position.

Inventive principles of Table II	IP type	Tables	Contradictions
IP.11. Beforehand Cushioning (Pos.1)	IP. Tac.	II / III / IV	[Par.27][Par.14][IP(s) : 11,28,0,0] - [Par.27][Par.29][IP(s) : 11,32,1,0] - [Par.14][Par.27][IP(s) : 11,3,0,0] - [Par.29][Par.27][IP(s) : 11,32,1,0] -
IP.35. Transformation / Parameter Changes (Pos.2)	IP. Str.	II / III / IV	[Par.31][Par.10][IP(s) : 35,28,1,40] - [Par.10][Par.14][IP(s) : 35,10,14,27] - [Par.31][Par.14][IP(s) : 15,35,22,2] - [Par.14][Par.31][IP(s) : 15,35,22,2] - [Par.27][Par.31][IP(s) : 35,2,40,26] - [Par.10][Par.27][IP(s) : 3,35,13,21] -
IP.3. Local Quality (Pos.3)	IP. Str.	II / III / IV	[Par.14][Par.10][IP(s) : 10,18,3,14] - [Par.27][Par.10][IP(s) : 8,28,10,3] - [Par.29][Par.14][IP(s) : 3,27,0,0] - [Par.14][Par.29][IP(s) : 3,27,0,0] - [Par.10][Par.31][IP(s) : 13,3,36,24] - [Par.10][Par.27][IP(s) : 3,35,13,21] - [Par.14][Par.27][IP(s) : 11,3,0,0] -
IP.28. Mechanics Substitution (Pos.4)	IP. Str.	II / III / IV	[Par.29][Par.10][IP(s) : 28,19,34,36] - [Par.31][Par.10][IP(s) : 35,28,1,40] - [Par.27][Par.10][IP(s) : 8,28,10,3] - [Par.27][Par.14][IP(s) : 11,28,0,0] - [Par.10][Par.29][IP(s) : 28,29,37,36] -
IP.15. Dynamics (Pos.5) ***	IP. Str.	II /	[Par.31][Par.14][IP(s) : 15,35,22,2] - [Par.14][Par.31][IP(s) : 15,35,22,2] -
IP.4. Asymmetry/ Symmetry (Pos.6) ***	IP. Oper.	II /	[Par.31][Par.29][IP(s) : 4,17,34,26] - [Par.29][Par.31][IP(s) : 4,17,34,26] -
IP.10. Preliminary Action (Pos.7)	IP. Str.	II / III / IV	[Par.14][Par.10][IP(s) : 10,18,3,14] - [Par.27][Par.10][IP(s) : 8,28,10,3] - [Par.10][Par.14][IP(s) : 35,10,14,27] -
IP.13. Reverse or Indirect Action (Pos.8) ***	IP. Str.	II / IV	[Par.10][Par.31][IP(s) : 13,3,36,24] - [Par.10][Par.27][IP(s) : 3,35,13,21] -
IP.24. Intermediary (Pos.9) ***	IP. Tac.	II / IV	[Par.10][Par.31][IP(s) : 13,3,36,24] - [Par.31][Par.27][IP(s) : 24,2,40,39] -
IP.8. Anti-Weight/ Compensation (Pos.10)	IP. Tac.	II / III / IV	[Par.27][Par.10][IP(s) : 8,28,10,3] -
IP.2. Taking out/ Adding (Pos.11)	IP. Str.	II / IV	[Par.31][Par.14][IP(s) : 15,35,22,2] - [Par.14][Par.31][IP(s) : 15,35,22,2] - [Par.27][Par.31][IP(s) : 35,2,40,26] - [Par.31][Par.27][IP(s) : 24,2,40,39] -

IP.27. Cheap Short-Living Objects (Pos.12) ***	IP. Str.	II / IV	[Par.10][Par.14][IP(s) : 35,10,14,27] - [Par.29][Par.14][IP(s) : 3,27,0,0] - [Par.14][Par.29][IP(s) : 3,27,0,0] -
IP.32. Perception/ Appearance/ Color Changes (Pos.13)	IP. Str.	II / III /	[Par.27][Par.29][IP(s) : 11,32,1,0] - [Par.29][Par.27][IP(s) : 11,32,1,0] -
IP.17. Another Dimension or Field (Pos.14) ***	IP. Tac.	II / IV	[Par.31][Par.29][IP(s) : 4,17,34,26] - [Par.29][Par.31][IP(s) : 4,17,34,26] -
IP.29. Controllable Soft Variables (Pos.15)	IP. Tac.	II / IV	[Par.10][Par.29][IP(s) : 28,29,37,36] -
IP.19. Time-Varying Action/ Periodic or Pulsating (Pos.16) ***	IP. Str.	II / IV	[Par.29][Par.10][IP(s) : 28,19,34,36] -
IP.18. Mechanical Vibrations/ Energy Variations (Pos.17)	IP. Tac.	II / III /	[Par.14][Par.10][IP(s) : 10,18,3,14] -
IP.34. Discarding and Recovering (Pos.18) ***	IP. Tac.	II /	[Par.29][Par.10][IP(s) : 28,19,34,36] - [Par.31][Par.29][IP(s) : 4,17,34,26] - [Par.29][Par.31][IP(s) : 4,17,34,26] -
IP.1. Segmenting/ Integrating (Pos.19)	IP. Str.	II / III / IV	[Par.31][Par.10][IP(s) : 35,28,1,40] - [Par.27][Par.29][IP(s) : 11,32,1,0] - [Par.29][Par.27][IP(s) : 11,32,1,0] -
IP.40. Composite Materials/ Conditions (Pos.20)	IP. Oper.	II / III / IV	[Par.31][Par.10][IP(s) : 35,28,1,40] - [Par.27][Par.31][IP(s) : 35,2,40,26] - [Par.31][Par.27][IP(s) : 24,2,40,39] -
IP.22. Convert harm in benefit (Pos.21) ***	IP. Str.	II /	[Par.31][Par.14][IP(s) : 15,35,22,2] - [Par.14][Par.31][IP(s) : 15,35,22,2] -
IP.36. Phase, State or Condition Transitions (Pos.22) ***	IP. Oper.	II /	[Par.29][Par.10][IP(s) : 28,19,34,36] - [Par.10][Par.29][IP(s) : 28,29,37,36] - [Par.10][Par.31][IP(s) : 13,3,36,24] -
IP.14. Spheroidality - Curvature - Angle (Pos.23)	IP. Tac.	II / III /	[Par.14][Par.10][IP(s) : 10,18,3,14] - [Par.10][Par.14][IP(s) : 35,10,14,27] -
IP.37. Useful Perceptible Change (Pos.24) ***	IP. Oper.	II /	[Par.10][Par.29][IP(s) : 28,29,37,36] -
IP.26. Copying/ Replicating (Pos.25) ***	IP. Str.	II /	[Par.31][Par.29][IP(s) : 4,17,34,26] - [Par.29][Par.31][IP(s) : 4,17,34,26] - [Par.27][Par.31][IP(s) : 35,2,40,26] -

IP.39. Inert Atmosphere / Environment (Pos.26) ***	IP. Oper.	II /	[Par.31][Par.27][IP(s) : 24,2,40,39] -
IP.21. Skipping/ Avoiding (Pos.27) ***	IP. Tac.	II / IV	[Par.10][Par.27][IP(s) : 3,35,13,21] -

TABLE IX. RECOMMENDED SOLUTION ACCORDING TO THE MOST RELEVANT CONTRADICTIONS IDENTIFIED FOR THE EVALUATED OBJECT: STRIPPING ROBOT

CHALLENGE: Improve Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates

This table displays the relevant contradictions identified by the algorithm, which are crucial for determining the direction and scope of the solution to the innovation challenge under evaluation. The specific solution will be obtained by applying the updated inventive principles detailed below.

It is essential to bear in mind that we are evaluating STRIPPING ROBOT when it interacts with COPPER SHEETS and there is an affected function: Robotic stripping of copper sheets from titanium plates affected by strong adhesion of the sheets to the plates, in a specific space and time. STRIPPING ROBOT may require changes in space, time, its physical composition, or its functional characteristic, as well as partial or total replacement with another object or other recommended changes. To emphasize this concept, we mark STRIPPING ROBOT with an asterisk. Do not read the name of the evaluated object literally; associate it with a possible solution for STRIPPING ROBOT*.

Each inventive principle described here may contain more than one innovation concept recommended by TRIZ, identified as a, b, c, ..., not all of which are applicable to a specific case under evaluation. The Innovation Team must select those innovation concepts that best relate to the evaluated innovation challenge, based on their own knowledge and the analysis of relational thinking that they must carry out.

Additionally, technological research may be necessary for its solution, as the specific solution recommended by the inventive principles described here likely already exists somewhere in the world. The interpretation of the inventive principles, to apply them specifically to the evaluated case, is a recursive process that generally ranges from strategic to tactical and operational levels. We recommend completing the reading of the inventive principles described below to envision a possible solution and then rereading the principles to reinforce the coherence of the emerging solution. As a result of the finally determined innovation solution, there will be a change in STRIPPING ROBOT, in a new context guided by the inventive principles, probably not previously imagined.

The Language of Nature's Innovation provides speed and focus for guided and systematic innovation thinking for individuals. The foundation for innovation is a profound understanding of the current situation.

IX.A BASE SOLUTION FOR INNOVATION CHALLENGE FOR THE EVALUATED OBJECT STRIPPING

ROBOT NEED TO SATISFY: 27. Reliability

Strategic inventive principles: Str. IP

Tactical inventive principles: Tac. IP

Operative inventive principles: Oper. IP

Pos.n : Order of importance n of an inventive principle included in Table II.

ESSENTIAL CONTRADICTION

Contradiction order wt.1

Parameter to improve: (+) 27. Reliability

TO IMPROVE (DE): STRIPPING ROBOT has More Desired reliability to interact with S2

Parameter to attenuate or preserve: (-) 10. Force/ Intensity

TO ATTENUATE OR PRESERVE (UDE): STRIPPING ROBOT has Less Force or impulse interacting with S2

Inventive principles IP(s) : [8,28,10,3]

8. Anti-weight/ Compensation, Tac. IP (Pos.10):

- a. To compensate for the heaviness/lightness or incidence of STRIPPING ROBOT*, merge it with other objects or independent own parts that provide an effect to improve the current situation.
- b. To compensate for the heaviness/lightness or incidence of STRIPPING ROBOT*, make it interact with the environment.

For example, compensate for the heaviness of STRIPPING ROBOT* subject to a gravitational field, or exposed to a magnetic field, or subject to an economic value or price, or subject to a chemical bond, or subject to intellectual rigidity, a paradigm, or prejudices.

Separation principle for STRIPPING ROBOT* : Separation alternative

Solution strategy for STRIPPING ROBOT* : Improving attributes

28. Mechanics Substitution, Str. IP (Pos.4):

- a. Replace a direct or manual action in, or for, STRIPPING ROBOT*, with a mechanical action or a tool.
- b. Replace a mechanical means in, or for, STRIPPING ROBOT*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.
- c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields to improve action of STRIPPING ROBOT*.
- d. Change from static fields in, or for, STRIPPING ROBOT* to moving fields, from unstructured fields to those with structure, or vice versa.
- e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and ferromagnetic particles) in, or for, STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation by condition

Solution strategy for STRIPPING ROBOT* : Improving attributes

10. Preliminary Action, Str. IP (Pos.7):

- a. Perform the required change in, or for, STRIPPING ROBOT*, before it is needed (either fully or partially).
- b. Pre-arrange STRIPPING ROBOT* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

Separation principle for STRIPPING ROBOT* : Separation in time

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving performance

3. Local quality, Str. IP (Pos.3):

- a. Improve quality in a localized way, for parts, components, or conditions of STRIPPING ROBOT*.

- b. Change the structure, action, or procedure of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.
- c. Change the external environment (or external influence) of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.
- d. Make each part of STRIPPING ROBOT* function in the conditions that are most suitable for its operation.
- e. Make each part of STRIPPING ROBOT* fulfill a different and useful function.

Separation principle for STRIPPING ROBOT* : Separation in space

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

COMPLEMENTARY CONTRADICTION 1

Contradiction order wt.3

Parameter to improve: (+) 27. Reliability

TO IMPROVE (DE): STRIPPING ROBOT has More Desired reliability to interact with S2

Parameter to attenuate or preserve: (-) 14. Strength / Resistance

TO ATTENUATE OR PRESERVE (UDE): STRIPPING ROBOT has Less Strength or resistance interacting with S2

Inventive principles IP(s) : [11,28,0,0]

11. Beforehand Cushioning, Tac. IP (Pos.1):

a. Prepare emergency means, beforehand, to compensate for the relatively low reliability of STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation in time

Solution strategy for STRIPPING ROBOT* : Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

28. Mechanics Substitution, Str. IP (Pos.4):

a. Replace a direct or manual action in, or for, STRIPPING ROBOT*, with a mechanical action or a tool.

b. Replace a mechanical means in, or for, STRIPPING ROBOT*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.

c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields to improve action of STRIPPING ROBOT*.

d. Change from static fields in, or for, STRIPPING ROBOT* to moving fields, from unstructured fields to those with structure, or vice versa.

e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and ferromagnetic particles) in, or for, STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation by condition

Solution strategy for STRIPPING ROBOT* : Improving attributes

COMPLEMENTARY CONTRADICTION 2

Contradiction order wt.7

Parameter to improve: (+) 31. Object-generated harmful factors

TO IMPROVE (UDE): STRIPPING ROBOT has More Harmful factors affecting S2 by mutual interaction

Parameter to attenuate or preserve: (-) 10. Force/ Intensity

TO ATTENUATE OR PRESERVE (UDE): STRIPPING ROBOT has Less Force or impulse interacting with S2

Inventive principles IP(s) : [35,28,1,40]

35. Transformation/ Parameter Changes, Str. IP (Pos.2):

- a. Change STRIPPING ROBOT*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).
- b. Change the composition or condition of STRIPPING ROBOT* by adding or removing components.
- c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation by condition / Separation alternative

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

28. Mechanics Substitution, Str. IP (Pos.4):

- a. Replace a direct or manual action in, or for, STRIPPING ROBOT*, with a mechanical action or a tool.
- b. Replace a mechanical means in, or for, STRIPPING ROBOT*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.
- c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields to improve action of STRIPPING ROBOT*.
- d. Change from static fields in, or for, STRIPPING ROBOT* to moving fields, from unstructured fields to those with structure, or vice versa.
- e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and ferromagnetic particles) in, or for, STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation by condition

Solution strategy for STRIPPING ROBOT* : Improving attributes

1. Segmenting/ Integrating, Str. IP (Pos.19):

- a. Divide STRIPPING ROBOT* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different parts, shapes, phases, states, or existing or new conditions of a STRIPPING ROBOT* into a single entity..
- c. Make STRIPPING ROBOT* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation in space / Separation in subsystem

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

40. Composite Materials/ Conditions, Oper. IP (Pos.20):

- a. Change from a uniform material, property, state, or condition in, or for, STRIPPING ROBOT* , to a composite one, or vice versa.

Separation principle for STRIPPING ROBOT* : Separation by condition

Solution strategy for STRIPPING ROBOT* : Improving attributes

COMPLEMENTARY CONTRADICTION 3

Contradiction order wt.12

Parameter to improve: (-) 14. Strength / Resistance

TO IMPROVE (UDE): STRIPPING ROBOT has Less Strength or resistance interacting with S2

Parameter to attenuate or preserve: (-) 10. Force/ Intensity

TO ATTENUATE OR PRESERVE (UDE): STRIPPING ROBOT has Less Force or impulse interacting with S2

Inventive principles IP(s) : [10,18,3,14]

10. Preliminary Action, Str. IP (Pos.7):

- a. Perform the required change in, or for, STRIPPING ROBOT*, before it is needed (either fully or partially).
- b. Pre-arrange STRIPPING ROBOT* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

Separation principle for STRIPPING ROBOT* : Separation in time

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving performance

18. Mechanical Vibrations/ Energy Variations, Tac. IP (Pos.17):

- a. Move STRIPPING ROBOT* by cycles with energies that activate it
- b. Cause STRIPPING ROBOT* to oscillate or vibrate. Increase its frequency (even up to the ultrasonic). Use the resonant frequency of STRIPPING ROBOT*. If necessary, decrease frequency.
- c. Use vibration-generating fields in, or for, STRIPPING ROBOT* instead of mechanical vibration generators. Combine sources of oscillations (e.g., ultrasonic, and electromagnetic).
- d. Apply alternation of STRIPPING ROBOT* or its functions.

Separation principle for STRIPPING ROBOT* : Separation in time

Solution strategy for STRIPPING ROBOT* : Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

3. Local quality, Str. IP (Pos.3):

- a. Improve quality in a localized way, for parts, components, or conditions of STRIPPING ROBOT*.
- b. Change the structure, action, or procedure of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.
- c. Change the external environment (or external influence) of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.
- d. Make each part of STRIPPING ROBOT* function in the conditions that are most suitable for its operation.
- e. Make each part of STRIPPING ROBOT* fulfill a different and useful function.

Separation principle for STRIPPING ROBOT* : Separation in space

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

14. Spheroidality – Curvature - Angle, Tac. IP (Pos.23):

- a. For the interaction between STRIPPING ROBOT* and S2 Object, instead of using rectilinear parts, surfaces, or shapes, use curvilinear, enveloping, or angled parts.
- b. For the interaction between STRIPPING ROBOT* and S2 Object, instead of acting in a linear or direct way, interact in an indirect way or with curvilinear, surrounding, or angled movements.
- c. Move STRIPPING ROBOT* from flat to spherical surfaces; from parts shaped as a cube (parallelepiped) to ball-shaped structures.
- d. Use rolls, balls, spirals, domes in, or for, STRIPPING ROBOT*.
- e. Go from linear to rotary motion, use centrifugal forces in, or for, STRIPPING ROBOT*.
- f. If there is Spheroidality, curvature or angle, increase or reduce, as applicable, in, or for, STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation alternative

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving if a solution has not yet emerged

COMPLEMENTARY CONTRADICTION 4

Contradiction order wt.13

Parameter to improve: (+) 27. Reliability

TO IMPROVE (DE): STRIPPING ROBOT has More Desired reliability to interact with S2

Parameter to attenuate or preserve: (-) 29. Fulfillment of desired outcome

TO ATTENUATE OR PRESERVE (UDE): STRIPPING ROBOT has Less Achievement of desired outcome interacting with S2

Inventive principles IP(s) : [11,32,1,0]

11. Beforehand Cushioning, Tac. IP (Pos.1):

a. Prepare emergency means, beforehand, to compensate for the relatively low reliability of STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation in time

Solution strategy for STRIPPING ROBOT* : Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

32. Perception/ Appearance/ Color Changes, Str. IP (Pos.13):

a. Change how is perceived, the appearance or shape of STRIPPING ROBOT* in relation to the object (S2) with which it interacts.

b. Change the color, or appearance, of STRIPPING ROBOT* or its external environment.

c. Change the transparency of STRIPPING ROBOT* or its external environment.

Separation principle for STRIPPING ROBOT* : Separation by condition

Solution strategy for STRIPPING ROBOT* : Improving if a solution has not yet emerged

1. Segmenting/ Integrating, Str. IP (Pos.19):

a. Divide STRIPPING ROBOT* into existing and/or new parts, shapes, phases, states, or conditions.

b. Integrate different parts, shapes, phases, states, or existing or new conditions of a STRIPPING ROBOT* into a single entity..

c. Make STRIPPING ROBOT* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation in space / Separation in subsystem

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

IX.B SOLUTION TO MORE RELEVANT CONTRADICTIONS BETWEEN NEEDS TO SATISFY (Cob.NS)

Included in each inventive principle described below is the incidence level or position number it occupies in Table II. If it is not shown, it means that it only appears in Table IV. and requires attention.

CONTRADICTION BETWEEN NEEDS TO SATISFY N° 1

Parameter to improve 27. Reliability

MEJORAR > STRIPPING ROBOT tiene More Desired reliability to interact with S2

Parameter to preserve 39. Productivity

PRESERVAR > STRIPPING ROBOT tiene más efecto deseable por párametro 39. Productivity

Inventive principles IP(s) : [1,35,29,38]

1. Segmenting/ Integrating, Str. IP (Pos.19):

- a. Divide STRIPPING ROBOT* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different parts, shapes, phases, states, or existing or new conditions of a STRIPPING ROBOT* into a single entity..
- c. Make STRIPPING ROBOT* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation in space / Separation in subsystem

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

35. Transformation/ Parameter Changes, Str. IP (Pos.2):

- a. Change STRIPPING ROBOT*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).
- b. Change the composition or condition of STRIPPING ROBOT* by adding or removing components.
- c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation by condition / Separation alternative

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

29. Controllable Soft Variables, Tac. IP (Pos.15):

- a. Use external, controllable soft variables (manual, physical, mechanical, pneumatic, hydraulic, electrical, magnetic, electromagnetic, digital, chemical, biological, social, psychological, physiological , etc.) to interact with STRIPPING ROBOT* facilitating goal fulfillment of the function performed with S2 Object.
- b. Make easier STRIPPING ROBOT* interact with S2 Object using internal, controllable soft variables (manual, physical, mechanical, pneumatic, hydraulic, electrical, magnetic, electromagnetic, digital, chemical, biological, social, psychological, physiological , etc.) available in S1 and / or S2, facilitating goal fulfillment.

Separation principle for STRIPPING ROBOT* : Separation in time

Solution strategy for STRIPPING ROBOT* : Improving if a solution has not yet emerged

38. Strong or Fast Reactions, Oper. IP (Pos.):

- a. Apply strong and/or quick reactions to STRIPPING ROBOT* (e.g., apply strong oxidants, sudden change.).

Separation principle for STRIPPING ROBOT* : Separation by condition

Solution strategy for STRIPPING ROBOT* : Improving if a solution has not yet emerged

CONTRADICTION BETWEEN NEEDS TO SATISFY N° 2

Parameter to improve 27. Reliability

MEJORAR > STRIPPING ROBOT tiene More Desired reliability to interact with S2

Parameter to preserve 15. Duration of action of moving object

PRESERVAR > STRIPPING ROBOT tiene más efecto deseable por párametro 15. Duration of action of moving object

Inventive principles IP(s) : [2,35,3,25]

2. Taking Out/ Adding, Str. IP (Pos.11):

- a. Separate an interfering part or a property from STRIPPING ROBOT*, or single out the only necessary part (or property) of STRIPPING ROBOT*.

b. Add new parts or properties to STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation in space

Solution strategy for STRIPPING ROBOT* : Improving attributes

35. Transformation/ Parameter Changes, Str. IP (Pos.2):

a. Change STRIPPING ROBOT*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).

b. Change the composition or condition of STRIPPING ROBOT* by adding or removing components.

c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of STRIPPING ROBOT*.

Separation principle for STRIPPING ROBOT* : Separation by condition / Separation alternative

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

3. Local quality, Str. IP (Pos.3):

a. Improve quality in a localized way, for parts, components, or conditions of STRIPPING ROBOT*.

b. Change the structure, action, or procedure of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.

c. Change the external environment (or external influence) of STRIPPING ROBOT* from uniform to non-uniform, or vice versa.

d. Make each part of STRIPPING ROBOT* function in the conditions that are most suitable for its operation.

e. Make each part of STRIPPING ROBOT* fulfill a different and useful function.

Separation principle for STRIPPING ROBOT* : Separation in space

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

25. Self-service, Oper. IP (Pos.):

a. Make STRIPPING ROBOT* serve itself by performing helpful auxiliary functions.

b. Use resources, energy or substances that are wasted or unused by STRIPPING ROBOT*.

c. Incorporate resources and/or functions into STRIPPING ROBOT* for self-service during operation.

Separation principle for STRIPPING ROBOT* : Separation in subsystem / Separation alternative

Solution strategy for STRIPPING ROBOT* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

Anexo

List of applicable Inventive Principles for Innovation Solutions

IP.1. Segmenting/ Integrating	IP.21. Skipping/ Avoiding
IP.2. Taking out/ Adding	IP.22. Convert harm in benefit
IP.3. Local Quality	IP.23. Feedback
IP.4. Asymmetry/ Symmetry	IP.24. Intermediary
IP.5. Merging/ Separating	IP.25. Self-service
IP.6. Universality	IP.26. Copying/ Replicating

IP.7. Nesting/ Dispersing	IP.27. Cheap Short-Living Objects
IP.8. Anti-Weight/ Compensation	IP.28. Mechanics Substitution
IP.9. Preliminary Anti-action	IP.29. Controllable Soft Variables
IP.10. Preliminary Action	IP.30. Simple Shapes/ Ways to Interact
IP.11. Beforehand Cushioning	IP.31. 31.Using/ Removing Unused Parts
IP.12. Equipotentiality	IP.32. Perception/ Appearance/ Color Changes
IP.13. Reverse or Indirect Action	IP.33. Homogeneity / Compatibility
IP.14. Spheroidality - Curvature - Angle	IP.34. Discarding and Recovering
IP.15. Dynamics	P.35. Transformation / Parameter Changes
IP.16. Partial or Excessive Actions	IP.36. Phase, State or Condition Transitions
IP.17. Another Dimension or Field	IP.37. Useful Perceptible Change
IP.18. Mechanical Vibrations/ Energy Variations	IP.38. Strong or Quick Reactions
IP.19. Time-Varying Action/ Periodic or Pulsating	IP.39. Inert Atmosphere / Environment
IP.20. Continuity of Useful Action	IP.40. Composite Materials/ Conditions

Available Aatrizinventor solutions: 0 - You can get more solutions in home page link.

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