

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

INNOVATION CHALLENGE: IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES

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.

AATRIZINVENTOR Aatrizinventor is property of Open TRIZ Second Wave Chile / All Rights Reserved

FACTORS OF INNOVATION:

FUNCTION AFFECTED: BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN
COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES

PHYSICAL VARIABLE OR CHARACTERISTIC: Less Design commitments

S1 OBJECT: CAR MANUFACTURING SYSTEM Type: Moving

S2 OBJECT: NEW CAR MODEL Type: Moving

DESIRED ACTION VERB: IMPROVE

INNOVATION CHALLENGE:

CHALLENGE: IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN
COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES

DESIRED GOAL: More Design commitments

EVALUATED OBJECT: CAR MANUFACTURING SYSTEM

NEED TO SATISFY > 33. Ease of operation

SELECTED INNOVATION PARAMETERS TO EVALUATE:

A. UNDESIRABLE EFFECTS CAUSES OF DISSATISFACTION (UDEs)

There are More difficulty to IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN
COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES because:

CAR MANUFACTURING SYSTEM Has More Heaviness, value, cost, or restriction, whether physical or
figurative interacting with S2

CAR MANUFACTURING SYSTEM Has Less Achievement of desired outcome interacting with S2

CAR MANUFACTURING SYSTEM Has Less Adaptability or versatility to interaction variability of S2

There are undesirable effects that cause dissatisfaction because:

There is Less Design commitments

B. DESIRED EFFECT FOR NEED TO SATISFY

There is More ease to IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN
COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES because:

CAR MANUFACTURING SYSTEM Has More Desired ease of operation to interact with S2

There is desirable effect for need to satisfy because:

There is More Design commitments

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

undesirable effects)

**CHALLENGE: IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN
COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES**

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 CAR MANUFACTURING SYSTEM has:
Parámetros of undesirable effects (UDE):	Undesirable effects causes of dissatisfaction:
(+) 1. Heaviness of moving object	More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2
(-) 29. Fulfillment of desired outcome	Less Achievement of desired outcome interacting with S2
(-) 35. Adaptability or versatility	Less Adaptability or versatility to interaction variability of S2
n/a	
Desirable parameter (DE):	Desirable Effect for Need to satisfy:
(+) 33. Ease of operation	More Desired ease of operation to interact with S2
TRIZ undesirables parameters for sensitivity analysis	It is understood as CAR MANUFACTURING SYSTEM has:
(-) 12. Shape / composition / configuration	Less Appropriate shape, composition, or configuration interacting with S2
(+) 25. Loss of Time	More Loss of time or causes a bottleneck interacting with S2
(-) 26. Quantity of substance / Capacity gains	Less Quantity of substance delivered or produced per control unit interacting with S2
(+) 36. Complexity of Device/ Action	More Complexity of equipment or action interacting with S2
n/a	

EVALUTION RESULTS TABLES

TABLE II. SPECIFIC CONTRADICTION MATRIX FOR UNDESIRABLE EFFECTS AND NEED TO SATISFY. FOR EVALUATED OBJECT: CAR MANUFACTURING SYSTEM AND NEED TO BE SATISFIED > 33. Ease of operation

CHALLENGE: IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES

(*) Preferred parameters: Improve 33. Ease of operation & Attenuate or preserve 1. Heaviness of moving object.

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.1 PREF.	(-) Par.29	(-) Par.35	Par.0	(+) Par.33	Sum wt
(+) 1. Heaviness of moving object	wt		wt.9	wt.7	-	wt.10	32%
	IP(s)	0,0,0,0	28,35,26,18	29,5,15,8	0,0,0,0	35,3,2,24	
(-) 29. Fulfillment of desired outcome	wt	wt.8 Compl.		-	-	wt.4 Top 5	47%
	IP(s)	28,32,13,18	0,0,0,0	0,0,0,0	0,0,0,0	1,32,35,23	
(-) 35. Adaptability or versatility	wt	wt.6 Compl.	-		-	wt.2 Top 5	61%
	IP(s)	1,6,15,8	0,0,0,0	0,0,0,0	0,0,0,0	15,34,1,16	
n/a	wt	-	-	-		-	0%
	IP(s)	0,0,0,0	0,0,0,0	0,0,0,0	0,0,0,0	0,0,0,0	
(+) 33. Ease of operation PREF.	wt	wt.5 Compl.	wt.3 Compl.	wt.1 E.C.	-		100%
	IP(s)	25,2,13,15	1,32,35,23	15,34,1,16	0,0,0,0	0,0,0,0	
Sum wt		63%	47%	51%	0%	80%	

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: CAR MANUFACTURING SYSTEM

NEED TO SATISFY > 33. Ease of operation

CHALLENGE: IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN

COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES

Table II Selection: Essential Contradiction wt.1 y Complementary contradictions with preferred parameters (*) wt.3/wt.5/wt.6/wt.8							
Parameter to improve	Parameter to attenuate or preserve	Contradict.	Wt.n	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
(+) 33. Ease of operation	(-) 35. Adaptability or versatility	Essential	wt.1	15 Es.	34 Es.	1 Es.	16 Es.
(+) 33. Ease of operation	(-) 29. Fulfillment of desired outcome	Compl. 1	wt.3	1 Es.	32	35	23
(+) 33. Ease of operation	(+) 1. Heaviness of moving object	Compl. 2	wt.5	25	2	13	15 Es.
(-) 35. Adaptability or versatility	(+) 1. Heaviness of moving object	Compl. 3	wt.6	1 Es.	6	15 Es.	8
(-) 29. Fulfillment of desired outcome	(+) 1. Heaviness of moving object	Compl. 4	wt.8	28	32	13	18

Inventive Principles (IP) selected for the Base Solution

- IP.15. Dynamics - strategic type
- IP.34. Discarding and Recovering - tactical type
- IP.1. Segmenting/ Integrating - strategic type
- IP.16. Partial or Excessive Actions - **operative type**
- IP.32. Perception/ Appearance/ Color Changes - strategic type
- IP.35. Transformation / Parameter Changes - strategic type
- IP.23. Feedback - **operative type**
- IP.25. Self-service - **operative type**
- IP.2. Taking out/ Adding - strategic type
- IP.13. Reverse or Indirect Action - strategic type
- IP.6. Universality - tactical type
- IP.8. Anti-Weight/ Compensation - tactical type
- IP.28. Mechanics Substitution - strategic type
- IP.18. Mechanical Vibrations/ Energy Variations - tactical 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: CAR MANUFACTURING SYSTEM, NEED TO BE SATISFY: 33. Ease of operation

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
33. Ease of operation	27. Reliability	17 nT2	27 nT2	8	40 nT2
33. Ease of operation	34. Ease of change, repair or maintain	12 nT2	26	1	32
33. Ease of operation	32. Ease of achieving desired outcome	2	5	12 nT2	0
33. Ease of operation	38. Extent of automation/ autonomy	1	34	12 nT2	3 nT3
33. Ease of operation	13. Stability	32	35	30 nT2	0
33. Ease of operation	33. Ease of operation	0	0	0	0
33. Ease of operation	19. Use of energy by moving object	1	13	24 nT3	0
33. Ease of operation	39. Productivity	15	1	28	0
33. Ease of operation	35. Adaptability or versatility	15	34	1	16
33. Ease of operation	15. Duration of action of moving object	29 nT3	3 nT3	8	25

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

IP.17. Another Dimension or Field - tactical type

IP.27. Cheap Short-Living Objects - strategic tpe

IP.8. Anti-Weight/ Compensation - tactical type

- IP.40. Composite Materials/ Conditions - **operative type**
- IP.12. Equipotentiality - tactical type
- IP.26. Copying/ Replicating - strategic tpe
- IP.1. Segmenting/ Integrating - strategic tpe
- IP.32. Perception/ Appearance/ Color Changes - strategic tpe
- IP.2. Taking out/ Adding - strategic tpe
- IP.5. Merging/ Separating - **operative type**

79.69 % 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 CAR MANUFACTURING SYSTEM.

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 CAR MANUFACTURING SYSTEM

CHALLENGE: IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES

Evaluated need to satisfy in this report: **33. Ease of operation**

UDEs: (+) 1. Heaviness of moving object// (-) 29. Fulfillment of desired outcome// (-) 35. Adaptability or versatility// n/a

Parameter to improve	Parameter to attenuate or preserve	Contradict.	Wt.n	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
(+) 33. Ease of operation	(-) 35. Adaptability or versatility	Essential	wt.1	15 Es.	34 Es.	1 Es.	16 Es.
(+) 33. Ease of operation	(-) 29. Fulfillment of desired outcome	Compl. 1	wt.3	1 Es.	32	35	23

(+) 33. Ease of operation	(+) 1. Heaviness of moving object	Compl. 2	wt.5	25	2	13	15 Es.
(-) 35. Adaptability or versatility	(+) 1. Heaviness of moving object	Compl. 3	wt.6	1 Es.	6	15 Es.	8
(-) 29. Fulfillment of desired outcome	(+) 1. Heaviness of moving object	Compl. 4	wt.8	28	32	13	18
33. Ease of operation	27. Reliability	NS.1	wns.1	17	27	8	40
33. Ease of operation	34. Ease of change, repair or maintain	NS.2	wns.2	12	26	1 Es.	32
33. Ease of operation	32. Ease of achieving desired outcome	NS.3	wns.3	2	5	12	0

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.29. Controllable Soft Variables (Pos.5) ***	IP. Tac.	[Par.1][Par.35][IP(s) : 29,5,15,8] -
IP.3. Local Quality (Pos.12) ***	IP. Str.	[Par.1][Par.33][IP(s) : 35,3,2,24] -
IP.24. Intermediary (Pos.19) ***	IP. Tac.	[Par.1][Par.33][IP(s) : 35,3,2,24] -

Inventive Principles (IP) selected for Recommended Solution:

To develop a Specific Solution based on the contradictions provided in Table V, where S1: CAR MANUFACTURING SYSTEM interacts with S2: NEW CAR MODEL, 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 CAR MANUFACTURING SYSTEM 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: (+) 33. Ease of operation and Attenuate or Preserve: (-) 35. Adaptability or versatility

IP.15. Dynamics - strategic type (1)

- a. Allow (or design) the characteristics of CAR MANUFACTURING SYSTEM*, external environment, or process to change to an optimal, or to find an optimal, operating condition.
- b. Divide CAR MANUFACTURING SYSTEM* into parts that are capable of relative movement between each other.
- c. If CAR MANUFACTURING SYSTEM* (or process) is rigid or inflexible, make it flexible or adaptive.
- d. To enhance the dynamics of CAR MANUFACTURING SYSTEM* or the process, use feature(s) or object(s) available in the nearby environment.

IP.34. Discarding and Recovering - tactical type (2)

- a. Make portions of CAR MANUFACTURING SYSTEM*, which have fulfilled their functions or are unnecessary, go away (discard by absorption, dissolving, evaporating, etc.).
- b. Conversely, restore consumable parts of CAR MANUFACTURING SYSTEM* directly in operation.

IP.1. Segmenting/ Integrating - strategic type (3)

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

IP.16. Partial or Excessive Actions - operative type (4)

- a. If the objective of CAR MANUFACTURING SYSTEM* in its interaction with NEW CAR MODEL is difficult to fully achieve using a given solution, then use 'a little less' or 'a little more' of the same solution.

N°2 Improve: (+) 33. Ease of operation and Attenuate or Preserve: (-) 29. Fulfillment of desired outcome

IP.1. Segmenting/ Integrating - strategic type (5)

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

IP.32. Perception/ Appearance/ Color Changes - strategic type (6)

- a. Change how is perceived, the appearance or shape of CAR MANUFACTURING SYSTEM* in relation to

the object S2 with which it interacts.

b. Change the color, or appearance, of CAR MANUFACTURING SYSTEM* or its external environment.

c. Change the transparency of CAR MANUFACTURING SYSTEM* or its external environment.

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

a. Change CAR MANUFACTURING SYSTEM*'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 CAR MANUFACTURING SYSTEM* 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 CAR MANUFACTURING SYSTEM*.

IP.23. Feedback - operative type (8)

a. To interact with CAR MANUFACTURING SYSTEM*, introduce feedback (referring to cross-checking) to improve a process or action.

b. If feedback with CAR MANUFACTURING SYSTEM*, is already being used, change its magnitude or influence.

N°3 Improve: (+) 33. Ease of operation and Attenuate or Preserve: (+) 1. Heaviness of moving object

IP.25. Self-service - operative type (9)

a. Make CAR MANUFACTURING SYSTEM* serve itself by performing helpful auxiliary functions.

b. Use resources, energy or substances that are wasted or unused by CAR MANUFACTURING SYSTEM*.

c. Incorporate resources and/or functions into CAR MANUFACTURING SYSTEM* for self-service during operation.

IP.2. Taking out/ Adding - strategic type (10)

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

IP.13. Reverse or Indirect Action - strategic type (11)

a. Inverse the applied action or apply an indirect action to perform the current function of CAR MANUFACTURING SYSTEM* to interact with object S2 It should be identified how CAR MANUFACTURING SYSTEM* currently performs an action with Object S2 and from there evaluate an inverse or indirect action.

b. Make moving parts of CAR MANUFACTURING SYSTEM* (or the external environment) fixed, and fixed parts moving.

c. Turn CAR MANUFACTURING SYSTEM* (or process) 'upside down', 'change the position', 'change the condition'.

IP.15. Dynamics - strategic type (12)

a. Allow (or design) the characteristics of CAR MANUFACTURING SYSTEM*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

b. Divide CAR MANUFACTURING SYSTEM* into parts that are capable of relative movement between each other.

c. If CAR MANUFACTURING SYSTEM* (or process) is rigid or inflexible, make it flexible or adaptive.

d. To enhance the dynamics of CAR MANUFACTURING SYSTEM* or the process, use feature(s) or object(s) available in the nearby environment.

N°4 Improve: (-) 35. Adaptability or versatility and Attenuate or Preserve: (+) 1. Heaviness of moving

object

IP.1. Segmenting/ Integrating - strategic type (13)

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

IP.6. Universality - tactical type (14)

- a. Make a part or the whole of CAR MANUFACTURING SYSTEM* perform multiple functions.
- b. Eliminate the need of CAR MANUFACTURING SYSTEM* for others parts.

IP.15. Dynamics - strategic type (15)

- a. Allow (or design) the characteristics of CAR MANUFACTURING SYSTEM*, external environment, or process to change to an optimal, or to find an optimal, operating condition.
- b. Divide CAR MANUFACTURING SYSTEM* into parts that are capable of relative movement between each other.
- c. If CAR MANUFACTURING SYSTEM* (or process) is rigid or inflexible, make it flexible or adaptive.
- d. To enhance the dynamics of CAR MANUFACTURING SYSTEM* or the process, use feature(s) or object(s) available in the nearby environment.

IP.8. Anti-Weight/ Compensation - tactical type (16)

- a. To compensate for the heaviness/lightness or incidence of CAR MANUFACTURING SYSTEM*, 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 CAR MANUFACTURING SYSTEM*, make it interact with the environment.

N°5 Improve: (-) 29. Fulfillment of desired outcome and Attenuate or Preserve: (+) 1. Heaviness of moving object

IP.28. Mechanics Substitution - strategic type (17)

- a. Replace a direct or manual action in, or for, CAR MANUFACTURING SYSTEM*, with a mechanical action or a tool.
- b. Replace a mechanical means in, or for, CAR MANUFACTURING SYSTEM*, 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 CAR MANUFACTURING SYSTEM*.
- d. Change from static fields in, or for, CAR MANUFACTURING SYSTEM* 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, CAR MANUFACTURING SYSTEM*.

IP.32. Perception/ Appearance/ Color Changes - strategic type (18)

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

IP.13. Reverse or Indirect Action - strategic type (19)

- a. Inverse the applied action or apply an indirect action to perform the current function of CAR

MANUFACTURING SYSTEM* to interact with object S2 It should be identified how CAR MANUFACTURING SYSTEM* currently performs an action with Object S2 and from there evaluate an inverse or indirect action.

b. Make moving parts of CAR MANUFACTURING SYSTEM* (or the external environment) fixed, and fixed parts moving.

c. Turn CAR MANUFACTURING SYSTEM* (or process) 'upside down', 'change the position', 'change the condition'.

IP.18. Mechanical Vibrations/ Energy Variations - tactical type (20)

a. Move CAR MANUFACTURING SYSTEM* by cycles with energies that activate it.

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

c. Use vibration-generating fields in, or for, CAR MANUFACTURING SYSTEM* instead of mechanical vibration generators. Combine sources of oscillations.

d. Apply alternation of CAR MANUFACTURING SYSTEM* or its parts or functions.

N°6 Improve: 33. Ease of operation and Preserve: 27. Reliability

IP.17. Another Dimension or Field - tactical type (21)

a. Add or remove physical dimensions or fields of action of CAR MANUFACTURING SYSTEM*.

b. Move CAR MANUFACTURING SYSTEM* to a new dimension in space or performance field.

c. Use for CAR MANUFACTURING SYSTEM* multi-story arrangement of objects instead of a single-story arrangement.

d. Tilt or re-orient CAR MANUFACTURING SYSTEM*; lay it on its side.

e. Use another side of a given dimension or field of CAR MANUFACTURING SYSTEM*.

IP.27. Cheap Short-Living Objects - strategic type (22)

a. Replace or divide (either fully or partially) CAR MANUFACTURING SYSTEM* or its action with multiple inexpensive or short-living objects, actions, or sub-parts, which compress or simplify its characteristics and properties, and/or are limited but sufficient to achieve the desired objective.

b. Compress certain qualities of CAR MANUFACTURING SYSTEM* (e.g., the degree of participation, complexity, or lifetime), with no loss of functionality, to achieve the desired objective.

IP.8. Anti-Weight/ Compensation - tactical type (23)

a. To compensate for the heaviness/lightness or incidence of CAR MANUFACTURING SYSTEM*, 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 CAR MANUFACTURING SYSTEM*, make it interact with the environment.

IP.40. Composite Materials/ Conditions - operative type (24)

a. Change from a uniform material, property, state, or condition in, or for, CAR MANUFACTURING SYSTEM* , to a composite one, or vice versa.

N°7 Improve: 33. Ease of operation and Preserve: 34. Ease of change, repair or maintain

IP.12. Equipotentiality - tactical type (25)

a. In a potential field, limit position changes or energy variations of CAR MANUFACTURING SYSTEM*.

b. Change operating conditions to eliminate the need to change the position or energy quality of CAR MANUFACTURING SYSTEM* in a potential field.

IP.26. Copying/ Replicating - strategic type (26)

- a. Instead of using CAR MANUFACTURING SYSTEM*, or any of its unavailable, expensive, fragile parts or properties, use simpler and inexpensive copies or replicates to perform the desired function and, if possible, do so with improved characteristics and properties, while disregarding the harmful, undesirable, or unnecessary ones.
- b. Imitate CAR MANUFACTURING SYSTEM*, or any of its parts or properties, leveraging the relevant available environment.
- c. If simple copies, or replicates are already being used, apply copies, or replicates of a higher level or technical

IP.1. Segmenting/ Integrating - strategic type (27)

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

IP.32. Perception/ Appearance/ Color Changes - strategic type (28)

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

N°8 Improve: 33. Ease of operation and Preserve: 32. Ease of achieving desired outcome

IP.2. Taking out/ Adding - strategic type (29)

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

IP.5. Merging/ Separating - operative type (30)

- a. Bring CAR MANUFACTURING SYSTEM* closer or merge with other objects with similar or identical operations or functions.
- b. Bring CAR MANUFACTURING SYSTEM* closer or merge with other objects with similar operations or functions for them to act together at the same time.
- c. Merge different shapes or actions into CAR MANUFACTURING SYSTEM*.
- d. If there are objects fused to CAR MANUFACTURING SYSTEM, and if necessary, apply a separation action.

IP.12. Equipotentiality - tactical type (31)

- a. In a potential field, limit position changes or energy variations of CAR MANUFACTURING SYSTEM*.
- b. Change operating conditions to eliminate the need to change the position or energy quality of CAR MANUFACTURING SYSTEM* in a potential field.

Relevant inventive principles from Table II not included in Recommended Solution

IP.29. Controllable Soft Variables (Pos.(5) - tactical type (32)

- a. Use external, controllable soft variables (manual, physical, mechanical, pneumatic, hydraulic, electrical, magnetic, electromagnetic, digital, chemical, biological, social, psychological, physiological, etc.) to interact with CAR MANUFACTURING SYSTEM* facilitating goal fulfillment of the function performed with Object S2.

b. Make easier CAR MANUFACTURING SYSTEM* 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.3. Local Quality (Pos.(12) - strategic type (33)

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

IP.24. Intermediary (Pos.(19) - tactical type (34)

- a. for CAR MANUFACTURING SYSTEM*, use an intermediary carrier article or intermediary process.
- b. Merge CAR MANUFACTURING SYSTEM* temporarily with another object (which can be easily removed or removed by itself).

TABLE VI. RESULTS OF SENSITIVITY ANALYSIS FOR THE EVALUATED OBJECT CAR MANUFACTURING SYSTEM

CHALLENGE: IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES

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 (%)
#	1	29	35	0	33. Ease of operation	79.69	11.3	62.59

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.

Combination of TRIZ innovation parameters evaluated in this Aatrizinventor Solution is not prioritized here

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	1	12	29	36	33. Ease of operation	97.59	100	98.19

II.a	1	29	35	36	19. Use of energy by moving object	96.35	100	97.26
III.a	12	25	29	36	19. Use of energy by moving object	96.35	100	97.26
IV.a	1	12	35	36	34. Ease of change, repair or maintain	95.17	100	96.38
V.a	1	12	29	35	19. Use of energy by moving object	94.61	100	95.96

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	1	12	35	36	33. Ease of operation	100	70.11	92.53	-
II.b	1	26	35	36	33. Ease of operation	99.13	50.85	87.06	-
III.b	1	29	35	36	33. Ease of operation	99.13	39.41	84.2	-
IV.b	1	25	35	36	33. Ease of operation	99.13	22.66	80.01	-
V.b	1	12	29	36	33. Ease of operation	97.59	100	98.19	I.a

TABLE VII ESSENTIAL CONTRADICTIONS MATRIX FOR NEEDS TO SATISFY (NS) FOR THE SAME UNDESIRABLE EFFECTS EVALUATED OF: CAR MANUFACTURING SYSTEM

CHALLENGE: IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN

COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES

Evaluated need to satisfy in this report: **33. Ease of operation**

UDEs: (+) 1. Heaviness of moving object// (-) 29. Fulfillment of desired outcome// (-) 35. Adaptability or versatility// n/a

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
-----------------	----------------------	------------------------------------	-----------------------	-------------	---------------------	-----------------

34. Ease of change, repair or maintain	(+) 1. Heaviness of moving object	(+) 34. Ease of change, repair or maintain	[2,27,28,11]	90.87	100	93.15
19. Use of energy by moving object	(-) 35. Adaptability or versatility	(+) 19. Use of energy by moving object	[19,35,29,13]	93.4	24.31	76.12
39. Productivity	(+) 1. Heaviness of moving object	(-) 29. Fulfillment of desired outcome	[28,35,26,18]	88.99	20.83	71.95
32. Ease of achieving desired outcome	(+) 1. Heaviness of moving object	(+) 32. Ease of achieving desired outcome	[27,28,1,36]	87.83	23.36	71.71
13. Stability	(+) 1. Heaviness of moving object	(-) 29. Fulfillment of desired outcome	[28,35,26,18]	84.14	20.83	68.32
38. Extent of automation/ autonomy	(+) 1. Heaviness of moving object	(-) 29. Fulfillment of desired outcome	[28,35,26,18]	78.18	20.83	63.84
27. Reliability	(-) 29. Fulfillment of desired outcome	(+) 27. Reliability	[11,32,1,0]	77.36	18.63	62.68
33. Ease of operation	(+) 33. Ease of operation	(-) 35. Adaptability or versatility	[15,34,1,16]	79.69	11.3	62.59
15. Duration of action of moving object	(+) 15. Duration of action of moving object	(-) 35. Adaptability or versatility	[1,35,13,0]	74.12	15.28	59.41
35. Adaptability or versatility	(+) 1. Heaviness of moving object	(+) 35. Adaptability or versatility	[29,5,15,8]	69.86	10.88	55.12

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: 33. Ease of operation.

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

CHALLENGE: IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN

COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES

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

Evaluated parameters for Object CAR MANUFACTURING SYSTEM:

Par. UDEs:

(+) 1. Heaviness of moving object

(-) 29. Fulfillment of desired outcome

(-) 35. Adaptability or versatility

n/a

Par. NS: (+) 33. Ease of operation

***: 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.1. Segmenting/ Integrating (Pos.1)	IP. Str.	II / III / IV	[Par.35][Par.1][IP(s) : 1,6,15,8] - [Par.33][Par.29][IP(s) : 1,32,35,23] - [Par.33][Par.35][IP(s) : 15,34,1,16] - [Par.29][Par.33][IP(s) : 1,32,35,23] - [Par.35][Par.33][IP(s) : 15,34,1,16] -
IP.15. Dynamics (Pos.2)	IP. Str.	II / III / IV	[Par.35][Par.1][IP(s) : 1,6,15,8] - [Par.33][Par.1][IP(s) : 25,2,13,15] - [Par.1][Par.35][IP(s) : 29,5,15,8] - [Par.33][Par.35][IP(s) : 15,34,1,16] - [Par.35][Par.33][IP(s) : 15,34,1,16] -
IP.28. Mechanics Substitution (Pos.3)	IP. Str.	II / III / IV	[Par.29][Par.1][IP(s) : 28,32,13,18] - [Par.1][Par.29][IP(s) : 28,35,26,18] -
IP.35. Transformation / Parameter Changes (Pos.4)	IP. Str.	II / III / IV	[Par.1][Par.29][IP(s) : 28,35,26,18] - [Par.33][Par.29][IP(s) : 1,32,35,23] - [Par.1][Par.33][IP(s) : 35,3,2,24] - [Par.29][Par.33][IP(s) : 1,32,35,23] -
IP.29. Controllable Soft Variables (Pos.5) ***	IP. Tac.	II / IV	[Par.1][Par.35][IP(s) : 29,5,15,8] -
IP.25. Self-service (Pos.6)	IP. Oper.	II / III / IV	[Par.33][Par.1][IP(s) : 25,2,13,15] -
IP.32. Perception/ Appearance/ Color Changes (Pos.7)	IP. Str.	II / III / IV	[Par.29][Par.1][IP(s) : 28,32,13,18] - [Par.33][Par.29][IP(s) : 1,32,35,23] - [Par.29][Par.33][IP(s) : 1,32,35,23] -
IP.34. Discarding and Recovering (Pos.8)	IP. Tac.	II / III / IV	[Par.33][Par.35][IP(s) : 15,34,1,16] - [Par.35][Par.33][IP(s) : 15,34,1,16] -

IP.2. Taking out/ Adding (Pos.9)	IP. Str.	II / III / IV	[Par.33][Par.1][IP(s) : 25,2,13,15] - [Par.1][Par.33][IP(s) : 35,3,2,24] -
IP.6. Universality (Pos.10)	IP. Tac.	II / III / IV	[Par.35][Par.1][IP(s) : 1,6,15,8] -
IP.5. Merging/ Separating (Pos.11)	IP. Oper.	II / IV	[Par.1][Par.35][IP(s) : 29,5,15,8] -
IP.3. Local Quality (Pos.12) ***	IP. Str.	II / IV	[Par.1][Par.33][IP(s) : 35,3,2,24] -
IP.13. Reverse or Indirect Action (Pos.13)	IP. Str.	II / III / IV	[Par.29][Par.1][IP(s) : 28,32,13,18] - [Par.33][Par.1][IP(s) : 25,2,13,15] -
IP.26. Copying/ Replicating (Pos.14)	IP. Str.	II / IV	[Par.1][Par.29][IP(s) : 28,35,26,18] -
IP.23. Feedback (Pos.15)	IP. Oper.	II / III / IV	[Par.33][Par.29][IP(s) : 1,32,35,23] - [Par.29][Par.33][IP(s) : 1,32,35,23] -
IP.18. Mechanical Vibrations/ Energy Variations (Pos.16)	IP. Tac.	II / III / IV	[Par.29][Par.1][IP(s) : 28,32,13,18] - [Par.1][Par.29][IP(s) : 28,35,26,18] -
IP.16. Partial or Excessive Actions (Pos.17)	IP. Oper.	II / III / IV	[Par.33][Par.35][IP(s) : 15,34,1,16] - [Par.35][Par.33][IP(s) : 15,34,1,16] -
IP.8. Anti-Weight/ Compensation (Pos.18)	IP. Tac.	II / III / IV	[Par.35][Par.1][IP(s) : 1,6,15,8] - [Par.1][Par.35][IP(s) : 29,5,15,8] -
IP.24. Intermediary (Pos.19) ***	IP. Tac.	II / IV	[Par.1][Par.33][IP(s) : 35,3,2,24] -

TABLE IX. RECOMMENDED SOLUTION ACCORDING TO THE MOST RELEVANT CONTRADICTIONS IDENTIFIED FOR THE EVALUATED OBJECT: CAR MANUFACTURING SYSTEM
CHALLENGE: IMPROVE BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES

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 CAR MANUFACTURING SYSTEM when it interacts with NEW CAR MODEL and there is an affected function: BUILDING THE BEST CAR IN THE WORLD WITHOUT DESIGN COMPROMISES AFFECTED BY PRODUCTION DIFFICULTIES, in a specific space and time. CAR MANUFACTURING SYSTEM 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 CAR MANUFACTURING SYSTEM with an

asterisk. Do not read the name of the evaluated object literally; associate it with a possible solution for CAR MANUFACTURING SYSTEM*.

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 CAR MANUFACTURING SYSTEM, 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 CAR MANUFACTURING SYSTEM NEED TO SATISFY: 33. Ease of operation

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: (+) 33. Ease of operation

TO IMPROVE (DE): CAR MANUFACTURING SYSTEM has More Desired ease of operation to interact with S2

Parameter to attenuate or preserve: (-) 35. Adaptability or versatility

TO ATTENUATE OR PRESERVE (UDE): CAR MANUFACTURING SYSTEM has Less Adaptability or versatility to interaction variability of S2

Inventive principles IP(s) : [15,34,1,16]

15. Dynamics, Str. IP (Pos.2):

- a. Allow (or design) the characteristics of CAR MANUFACTURING SYSTEM*, external environment, or process to change to an optimal, or to find an optimal, operating condition.
- b. Divide CAR MANUFACTURING SYSTEM* into parts that are capable of relative movement between each other.
- c. If CAR MANUFACTURING SYSTEM* (or process) is rigid or inflexible, make it flexible or adaptive.

d. To enhance the dynamics of CAR MANUFACTURING SYSTEM* or the process, use feature(s) or object(s) available in the nearby environment.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in time

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

34. Discarding and Recovering, Tac. IP (Pos.8):

a. Make portions of CAR MANUFACTURING SYSTEM* , which have fulfilled their functions or are unnecessary, go away (discard by absorption, dissolving, evaporating, etc.).

b. Conversely, restore consumable parts of CAR MANUFACTURING SYSTEM* directly in operation.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in time

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving if a solution has not yet emerged

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

a. Divide CAR MANUFACTURING SYSTEM* 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 CAR MANUFACTURING SYSTEM* into a single entity..

c. Make CAR MANUFACTURING SYSTEM* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of CAR MANUFACTURING SYSTEM*.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in space / Separation in subsystem

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

16. Partial or Excessive Actions, Oper. IP (Pos.17):

a. If the goal of CAR MANUFACTURING SYSTEM* is hard to achieve fully, using a given solution's method; then the problem may be considerably easier to solve, using "slightly less" or "slightly more" of the same method.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in time

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving performance

COMPLEMENTARY CONTRADICTION 1

Contradiction order wt.3

Parameter to improve: (+) 33. Ease of operation

TO IMPROVE (DE): CAR MANUFACTURING SYSTEM has More Desired ease of operation to interact with S2

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

TO ATTENUATE OR PRESERVE (UDE): CAR MANUFACTURING SYSTEM has Less Achievement of desired outcome interacting with S2

Inventive principles IP(s) : [1,32,35,23]

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

a. Divide CAR MANUFACTURING SYSTEM* 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 CAR MANUFACTURING SYSTEM* into a single entity..
- c. Make CAR MANUFACTURING SYSTEM* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of CAR MANUFACTURING SYSTEM*.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in space / Separation in subsystem

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

32. Perception/ Appearance/ Color Changes, Str. IP (Pos.7):

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

Separation principle for CAR MANUFACTURING SYSTEM* : Separation by condition

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving if a solution has not yet emerged

35. Transformation/ Parameter Changes, Str. IP (Pos.4):

- a. Change CAR MANUFACTURING SYSTEM*'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 CAR MANUFACTURING SYSTEM* 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 CAR MANUFACTURING SYSTEM*.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation by condition / Separation alternative

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

23. Feedback, Oper. IP (Pos.15):

- a. To interact with CAR MANUFACTURING SYSTEM*, introduce feedback (referring to cross-checking) to improve a process or action.
- b. If feedback with CAR MANUFACTURING SYSTEM*, is already being used, change its magnitude or influence.

Separation principle for CAR MANUFACTURING SYSTEM* : Integration in supersystem

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving performance

COMPLEMENTARY CONTRADICTION 2

Contradiction order wt.5

Parameter to improve: (+) 33. Ease of operation

TO IMPROVE (DE): CAR MANUFACTURING SYSTEM has More Desired ease of operation to interact with S2

Parameter to attenuate or preserve: (+) 1. Heaviness of moving object

TO ATTENUATE OR PRESERVE (UDE): CAR MANUFACTURING SYSTEM has More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2

Inventive principles IP(s) : [25,2,13,15]

25. Self-service, Oper. IP (Pos.6):

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

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in subsystem / Separation alternative

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

2. Taking Out/ Adding, Str. IP (Pos.9):

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

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in space

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving attributes

13. Inverse or Indirect Action, Str. IP (Pos.13):

- a. Inverse the applied action or apply an indirect action to perform the current function of CAR MANUFACTURING SYSTEM* to interact with object (S2)

It should be identified how CAR MANUFACTURING SYSTEM* currently performs an action with S2 Object and from there evaluate an inverse or indirect action.

- b. Make moving parts of CAR MANUFACTURING SYSTEM* (or the external environment) fixed, and fixed parts moving.
- c. Turn CAR MANUFACTURING SYSTEM* (or process) “upside down”, “change the position”, “change the condition”.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in space / Separation inverse

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

15. Dynamics, Str. IP (Pos.2):

- a. Allow (or design) the characteristics of CAR MANUFACTURING SYSTEM*, external environment, or process to change to an optimal, or to find an optimal, operating condition.
- b. Divide CAR MANUFACTURING SYSTEM* into parts that are capable of relative movement between each other.
- c. If CAR MANUFACTURING SYSTEM* (or process) is rigid or inflexible, make it flexible or adaptive.
- d. To enhance the dynamics of CAR MANUFACTURING SYSTEM* or the process, use feature(s) or object(s) available in the nearby environment.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in time

Solution strategy for CAR MANUFACTURING SYSTEM* : 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 3

Contradiction order wt.6

Parameter to improve: (-) 35. Adaptability or versatility

TO IMPROVE (UDE): CAR MANUFACTURING SYSTEM has Less Adaptability or versatility to interaction variability of S2

Parameter to attenuate or preserve: (+) 1. Heaviness of moving object

TO ATTENUATE OR PRESERVE (UDE): CAR MANUFACTURING SYSTEM has More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2

Inventive principles IP(s) : [1,6,15,8]

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

- a. Divide CAR MANUFACTURING SYSTEM* 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 CAR MANUFACTURING SYSTEM* into a single entity..
- c. Make CAR MANUFACTURING SYSTEM* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of CAR MANUFACTURING SYSTEM*.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in space / Separation in subsystem

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

6. Universality, Tac. IP (Pos.10):

- a. Make a part or the whole of CAR MANUFACTURING SYSTEM* perform multiple functions.
- b. Eliminate the need of CAR MANUFACTURING SYSTEM* for others parts.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation alternative

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving if a solution has not yet emerged

15. Dynamics, Str. IP (Pos.2):

- a. Allow (or design) the characteristics of CAR MANUFACTURING SYSTEM*, external environment, or process to change to an optimal, or to find an optimal, operating condition.
- b. Divide CAR MANUFACTURING SYSTEM* into parts that are capable of relative movement between each other.
- c. If CAR MANUFACTURING SYSTEM* (or process) is rigid or inflexible, make it flexible or adaptive.
- d. To enhance the dynamics of CAR MANUFACTURING SYSTEM* or the process, use feature(s) or object(s) available in the nearby environment.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in time

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

8. Anti-weight/ Compensation, Tac. IP (Pos.18):

- a. To compensate for the heaviness/lightness or incidence of CAR MANUFACTURING SYSTEM*, 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 CAR MANUFACTURING SYSTEM*, make it interact with the environment.

For example, compensate for the heaviness of CAR MANUFACTURING SYSTEM* 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 CAR MANUFACTURING SYSTEM* : Separation alternative

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving attributes

COMPLEMENTARY CONTRADICTION 4

Contradiction order wt.8

Parameter to improve: (-) 29. Fulfillment of desired outcome

TO IMPROVE (UDE): CAR MANUFACTURING SYSTEM has Less Achievement of desired outcome interacting with S2

Parameter to attenuate or preserve: (+) 1. Heaviness of moving object

TO ATTENUATE OR PRESERVE (UDE): CAR MANUFACTURING SYSTEM has More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2

Inventive principles IP(s) : [28,32,13,18]

28. Mechanics Substitution, Str. IP (Pos.3):

- a. Replace a direct or manual action in, or for, CAR MANUFACTURING SYSTEM*, with a mechanical action or a tool.
- b. Replace a mechanical means in, or for, CAR MANUFACTURING SYSTEM*, 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 CAR MANUFACTURING SYSTEM*.
- d. Change from static fields in, or for, CAR MANUFACTURING SYSTEM* 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, CAR MANUFACTURING SYSTEM*.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation by condition

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving attributes

32. Perception/ Appearance/ Color Changes, Str. IP (Pos.7):

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

Separation principle for CAR MANUFACTURING SYSTEM* : Separation by condition

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving if a solution has not yet emerged

13. Inverse or Indirect Action, Str. IP (Pos.13):

- a. Inverse the applied action or apply an indirect action to perform the current function of CAR MANUFACTURING SYSTEM* to interact with object (S2)

It should be identified how CAR MANUFACTURING SYSTEM* currently performs an action with S2 Object and from there evaluate an inverse or indirect action.

- b. Make moving parts of CAR MANUFACTURING SYSTEM* (or the external environment) fixed, and fixed parts moving.
- c. Turn CAR MANUFACTURING SYSTEM* (or process) “upside down”, “change the position”, “change the condition”.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in space / Separation inverse

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving attributes; Improving performance;

Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

18. Mechanical Vibrations/ Energy Variations, Tac. IP (Pos.16):

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

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in time

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

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 33. Ease of operation

MEJORAR > CAR MANUFACTURING SYSTEM tiene More Desired ease of operation to interact with S2

Parameter to preserve 27. Reliability

PRESERVAR > CAR MANUFACTURING SYSTEM tiene más efecto deseable por parámetro 27. Reliability

Inventive principles IP(s) : [17,27,8,40]

17. Another Dimension or Field, Tac. IP (Pos.):

- a. Add or remove physical dimensions or fields of action of CAR MANUFACTURING SYSTEM*.
- b. Move CAR MANUFACTURING SYSTEM* to a new dimension in space or performance field.
- c. Use for CAR MANUFACTURING SYSTEM* multi-story arrangement of objects instead of a single-story arrangement.
- d. Tilt or re-orient CAR MANUFACTURING SYSTEM*; lay it on its side.
- e. Use another side of a given dimension or field of CAR MANUFACTURING SYSTEM*.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in space

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

27. Cheap Short-Living Objects, Str. IP (Pos.):

- a. Replace or divide (either fully or partially) CAR MANUFACTURING SYSTEM* or its action with multiple inexpensive or short-living objects, actions, or sub-parts, which compress or simplify its characteristics and properties, and/or are limited but sufficient to achieve the desired objective.
- b. Comprising certain qualities of CAR MANUFACTURING SYSTEM* (e.g., the degree of participation, complexity, or lifetime), with no loss of functionality, to achieve the desired objective.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in subsystem

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

8. Anti-weight/ Compensation, Tac. IP (Pos.18):

- a. To compensate for the heaviness/lightness or incidence of CAR MANUFACTURING SYSTEM*, 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 CAR MANUFACTURING SYSTEM*, make it interact with the environment.

For example, compensate for the heaviness of CAR MANUFACTURING SYSTEM* 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 CAR MANUFACTURING SYSTEM* : Separation alternative

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving attributes

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

a. Change from a uniform material, property, state, or condition in, or for, CAR MANUFACTURING SYSTEM* , to a composite one, or vice versa.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation by condition

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving attributes

CONTRADICTION BETWEEN NEEDS TO SATISFY N° 2

Parameter to improve 33. Ease of operation

MEJORAR > CAR MANUFACTURING SYSTEM tiene More Desired ease of operation to interact with S2

Parameter to preserve 34. Ease of change, repair or maintain

PRESERVAR > CAR MANUFACTURING SYSTEM tiene más efecto deseable por parámetro 34. Ease of change, repair or maintain

Inventive principles IP(s) : [12,26,1,32]

12.- Equipotentiality, Tac. IP (Pos.):

a. In a potential field, limit position changes or energy variations of CAR MANUFACTURING SYSTEM*.

b. Change operating conditions to eliminate the need to change the position or energy quality of CAR MANUFACTURING SYSTEM* in a potential field.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation by condition to satisfy contradiction

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving if a solution has not yet emerged

26. Copying/ Replicating, Str. IP (Pos.14):

a. Instead of using CAR MANUFACTURING SYSTEM*, or any of its unavailable, expensive, fragile parts or properties, use simpler and inexpensive copies or replicates to perform the desired function and, if possible, do so with improved characteristics and properties, while disregarding the harmful, undesirable, or unnecessary ones.

b. Imitate or replicate CAR MANUFACTURING SYSTEM*, or any of its parts or properties, leveraging the relevant available environment.

c. If simple copies, or replicates are already being used, apply copies, or replicates of a higher level or technical complexity.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in space

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving if a solution has not yet emerged

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

a. Divide CAR MANUFACTURING SYSTEM* 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 CAR MANUFACTURING SYSTEM* into a single entity..

c. Make CAR MANUFACTURING SYSTEM* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of CAR MANUFACTURING SYSTEM*. Separation principle for CAR MANUFACTURING SYSTEM* : Separation in space / Separation in subsystem

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

32. Perception/ Appearance/ Color Changes, Str. IP (Pos.7):

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

b. Change the color, or appearance, of CAR MANUFACTURING SYSTEM* or its external environment.

c. Change the transparency of CAR MANUFACTURING SYSTEM* or its external environment.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation by condition

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving if a solution has not yet emerged

CONTRADICTION BETWEEN NEEDS TO SATISFY N° 3

Parameter to improve 33. Ease of operation

MEJORAR > CAR MANUFACTURING SYSTEM tiene More Desired ease of operation to interact with S2

Parameter to preserve 32. Ease of achieving desired outcome

PRESERVAR > CAR MANUFACTURING SYSTEM tiene más efecto deseable por parámetro 32. Ease of achieving desired outcome

Inventive principles IP(s) : [2,5,12,0]

2. Taking Out/ Adding, Str. IP (Pos.9):

a. Separate an interfering part or a property from CAR MANUFACTURING SYSTEM*, or single out the only necessary part (or property) of CAR MANUFACTURING SYSTEM*.

b. Add new parts or properties to CAR MANUFACTURING SYSTEM*.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation in space

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving attributes

5. Merging/ Separating, Str. IP (Pos.11):

a. Bring CAR MANUFACTURING SYSTEM* closer or merge with other objects with similar or identical operations or functions.

b. Bring CAR MANUFACTURING SYSTEM* closer or merge with other objects with similar operations or functions so that they can act together at the same time.

c. If there are objects fused to CAR MANUFACTURING SYSTEM*, and if necessary, apply a separation action.

d. If objects are merged, and if necessary, apply a separation action.

Separation principle for CAR MANUFACTURING SYSTEM* : Integration in supersystem

Solution strategy for CAR MANUFACTURING SYSTEM* : Improving attributes

12.- Equipotentiality, Tac. IP (Pos.):

a. In a potential field, limit position changes or energy variations of CAR MANUFACTURING SYSTEM*.

b. Change operating conditions to eliminate the need to change the position or energy quality of CAR MANUFACTURING SYSTEM* in a potential field.

Separation principle for CAR MANUFACTURING SYSTEM* : Separation by condition to satisfy contradiction

Solution strategy for CAR MANUFACTURING SYSTEM* : 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.

ALGORITHM AATRIZINVENTOR FROM NATURE'S L.I.