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

INNOVATION CHALLENGE: Improve design of large-volume rectangular tank for fuel storage affected by resistance difficulties

APLICATION 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: design of large-volume rectangular tank for fuel storage affected by resistance difficulties
PHYSICAL VARIABLE OR CHARACTERISTIC: Less Capacity to hold fuel
S1 OBJECT: RECTANGULAR FUEL TANK Type: Stationary
S2 OBJECT: CONTAINED FUEL Type: Moving
DESIRED ACTION VERB: Improve

INNOVATION CHALLENGE:
CHALLENGE: Improve design of large-volume rectangular tank for fuel storage affected by resistance difficulties
DESIRED GOAL: More Capacity to hold fuel
EVALUATED OBJECT: RECTANGULAR FUEL TANK
NEED TO SATISFY > 32. Ease of achieving desired outcome

SELECTED INNOVATION PARAMETERS TO EVALUATE:
A. UNDESIRABLE EFFECTS CAUSES OF DISSATISFACTION (UDEs)
There are More difficulty to Improve design of large-volume rectangular tank for fuel storage affected by resistance difficulties because:
RECTANGULAR FUEL TANK Has More Own length or relative distance, whether physical or figurative interacting with S2
RECTANGULAR FUEL TANK Has More Own physical volume or accumulated quantitative volume or three-dimensional scope interacting with S2
RECTANGULAR FUEL TANK Has Less Strength or resistance interacting with S2
RECTANGULAR FUEL TANK Has Less Adaptability or versatility to interaction variability of S2
There are undesirable effects that cause dissatisfaction because:
There is Less Capacity to hold fuel
B. DESIRED EFFECT FOR NEED TO SATISFY
There is More ease to Improve design of large-volume rectangular tank for fuel storage affected by resistance difficulties because:
RECTANGULAR FUEL TANK Has More Ease of achieving desired outcome interacting with S2
There is desirable effect for need to satisfy because:
There is More Capacity to hold fuel

Table I. RELATIONSHIP WITH UNIVERSAL TRIZ INNOVATION PARAMETERS (maximum of 7 undesirable effects)
CHALLENGE: Improve design of large-volume rectangular tank for fuel storage affected by resistance 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 RECTANGULAR FUEL TANK has:
Parámeters of undesirable effects (UDE):	**Undesirable effects causes of dissatisfaction:**
(+) 4. Length of stationary object	More Own length or relative distance, whether physical or figurative interacting with S2
(+) 8. Volume of stationary object	More Own physical volume or accumulated quantitative volume or three-dimensional scope interacting with S2
(-)14. Strength / Resistance	Less Strength or resistance interacting with S2
(-) 35. Adaptability or versatility	Less Adaptability or versatility to interaction variability of S2
Desirable parameter (DE):	**Desirable Effect for Need to satisfy:**
(+) 32. Ease of achieving desired outcome	More Ease of achieving desired outcome interacting with S2
TRIZ undesirables parameters for sensitivity analysis	**It is understood as RECTANGULAR FUEL TANK has:**
(-) 12. Shape / composition / configuration	Less Appropriate shape, composition, or configuration interacting with S2
n/a	
n/a	
n/a	

n/a						

EVALUTION RESULTS TABLES

TABLE II. SPECIFIC CONTRADICTION MATRIX FOR UNDESIRABLE EFFECTS AND NEED TO SATISFY. FOR EVALUATED OBJECT: RECTANGULAR FUEL TANK AND NEED TO BE SATISFIED > 32. Ease of achieving desired outcome
CHALLENGE: Improve design of large-volume rectangular tank for fuel storage affected by resistance difficulties

(*) Preferred parameters: Improve 4. Length of stationary object & Attenuate or preserve 8. Volume of stationary 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.4	(+) Par.8 PREF.	(-) Par.14	(-) Par.35	(+) Par.32	Sum wt
(+) 4. Length of stationary object PREF.	wt		wt.3 Compl.	wt.14 Compl.	wt.5 Compl.	wt.12 Compl.	76%
	IP(s)	0,0,0,0	35,8,2,14	15,14,28,26	1,35,0,0	15,17,27,0	
(+) 8. Volume of stationary object	wt	wt.4 Top 5		wt.2 Top 5	-	wt.7	100%
	IP(s)	35,8,2,14	0,0,0,0	9,14,17,15	0,0,0,0	35,0,0,0	
(-) 14. Strength / Resistance	wt	wt.15	wt.1 E.C.		wt.10	wt.16	73%
	IP(s)	15,14,28,26	9,14,17,15	0,0,0,0	15,3,32,0	11,3,10,32	
(-) 35. Adaptability or versatility	wt	wt.9	-	wt.17		wt.18	23%
	IP(s)	1,35,16,0	0,0,0,0	35,3,32,6	0,0,0,0	1,13,31,0	
(+) 32. Ease of achieving desired outcome	wt	wt.13	wt.6 Compl.	wt.11	wt.8		48%
	IP(s)	15,17,27,0	35,0,0,0	1,3,10,32	2,13,15,0	0,0,0,0	
Sum wt		58%	100%	71%	54%	37%	

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:

a) The algorithm identifies the top 5 contradictions from the entire Table II and highlights those that are outside the preferred parameters for further review.

b) 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: RECTANGULAR FUEL TANK

NEED TO SATISFY > 32. Ease of achieving desired outcome

CHALLENGE: Improve design of large-volume rectangular tank for fuel storage affected by resistance difficulties

Table II Selection: Essential Contradiction wt.1 y Complementary contradictions with preferred parameters (*) wt.3/wt.5/wt.6/wt.12							
Parameter to improve	Parameter to attenuate or preserve	Contradict.	Wt.n	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
(-) 14. Strength / Resistance	(+) 8. Volume of stationary object	Essential	wt.1	9 Es.	14 Es.	17 Es.	15 Es.
(+) 4. Length of stationary object	(+) 8. Volume of stationary object	Compl. 1	wt.3	35	8	2	14 Es.
(+) 4. Length of stationary object	(-) 35. Adaptability or versatility	Compl. 2	wt.5	1	35	0	0
(+) 32. Ease of achieving desired outcome	(+) 8. Volume of stationary object	Compl. 3	wt.6	35	0	0	0
(+) 4. Length of stationary object	(+) 32. Ease of achieving desired outcome	Compl. 4	wt.12	15 Es.	17 Es.	27	0

Inventive Principles (IP) selected for the Base Solution

IP.9. Preliminary Anti-action - **operative type**

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

IP.17. Another Dimension or Field - tactical type

IP.15. Dynamics - strategic type

IP.35. Transformation / Parameter Changes - strategic type

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

IP.2. Taking out/ Adding - strategic type

IP.1. Segmenting/ Integrating - strategic type

IP.27. Cheap Short-Living Objects - 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: RECTANGULAR FUEL TANK, NEED TO BE SATISFY: 32. Ease of achieving desired outcome

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
32. Ease of achieving desired outcome	33. Ease of operation	2	5 nT2	13	16
32. Ease of achieving desired outcome	20. Use of energy by stationary object	1	4 nT2	0	0
32. Ease of achieving desired outcome	34. Ease of change, repair or maintain	35	1	11 nT3	9
32. Ease of achieving desired outcome	32. Ease of achieving desired outcome	0	0	0	0
32. Ease of achieving desired outcome	39. Productivity	35	1	10 nT3	28 nT3
32. Ease of achieving desired outcome	27. Reliability	0	0	0	0
32. Ease of achieving desired outcome	38. Extent of automation/ autonomy	8	28 nT3	1	0
32. Ease of achieving desired outcome	35. Adaptability or versatility	2	13	15	0
32. Ease of achieving desired outcome	13. Stability	11 nT3	13	1	0
32. Ease of achieving desired outcome	16. Duration of action by stationary object	35	16	0	0

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

IP.2. Taking out/ Adding - strategic tpe

IP.5. Merging/ Separating - **operative type**

IP.13. Reverse or Indirect Action - strategic tpe

IP.16. Partial or Excessive Actions - **operative type**

IP.1. Segmenting/ Integrating - strategic tpe

IP.4. Asymmetry/ Symmetry - **operative type**

94.67 % 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 RECTANGULAR FUEL TANK.

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 RECTANGULAR FUEL TANK

CHALLENGE: Improve design of large-volume rectangular tank for fuel storage affected by resistance difficulties

Evaluated need to satisfy in this report: **32. Ease of achieving desired outcome**

UDEs: (+) 4. Length of stationary object// (+) 8. Volume of stationary object// (-)14. Strength / Resistance// (-) 35. Adaptability or versatility

Parameter to improve	Parameter to attenuate or preserve	Contradict.	Wt.n	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
(-) 14. Strength / Resistance	(+) 8. Volume of stationary object	Essential	wt.1	**9** **Es.**	**14** **Es.**	**17** **Es.**	**15** **Es.**
(+) 4. Length of stationary object	(+) 8. Volume of stationary object	Compl. 1	wt.3	35	8	2	**14** **Es.**

(+) 4. Length of stationary object	(-) 35. Adaptability or versatility	Compl. 2	wt.5	1	35	0	0
(+) 32. Ease of achieving desired outcome	(+) 8. Volume of stationary object	Compl. 3	wt.6	35	0	0	0
(+) 4. Length of stationary object	(+) 32. Ease of achieving desired outcome	Compl. 4	wt.12	**15 Es.**	**17 Es.**	27	0
32. Ease of achieving desired outcome	33. Ease of operation	NS.1	wns.1	2	5	13	16
32. Ease of achieving desired outcome	20. Use of energy by stationary object	NS.2	wns.2	1	4	0	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.3. Local Quality (Pos.7) ***	IP. Str.	[Par.35][Par.14][IP(s) : 35,3,32,6] - [Par.32][Par.14][IP(s) : 1,3,10,32] - [Par.14][Par.35][IP(s) : 15,3,32,0] - [Par.14][Par.32][IP(s) : 11,3,10,32] -
IP.11. Beforehand Cushioning (Pos.8) ***	IP. Tac.	[Par.14][Par.32][IP(s) : 11,3,10,32] -
IP.32. Perception/ Appearance/ Color Changes (Pos.12) ***	IP. Str.	[Par.35][Par.14][IP(s) : 35,3,32,6] - [Par.32][Par.14][IP(s) : 1,3,10,32] - [Par.14][Par.35][IP(s) : 15,3,32,0] - [Par.14][Par.32][IP(s) : 11,3,10,32] -

Inventive Principles (IP) selected for Recommended Solution:

To develop a Specific Solution based on the contradictions provided in Table V, where S1: RECTANGULAR FUEL TANK interacts with S2: CONTAINED FUEL, 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 RECTANGULAR FUEL TANK 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: (-) 14. Strength / Resistance and Attenuate or Preserve: (+) 8. Volume of stationary object

IP.9. Preliminary Anti-action - operative type (1)

a. If RECTANGULAR FUEL TANK* needs to perform an action with harmful and useful effects, this action should be replaced with anti-actions to control harmful effect.

b. Create beforehand actions in RECTANGULAR FUEL TANK* that will oppose known undesirable working stresses later.

IP.14. Spheroidality - Curvature - Angle - tactical type (2)

a. For the interaction between RECTANGULAR FUEL TANK* and Object S2, instead of using rectilinear parts, surfaces, or shapes, use curvilinear, enveloping, or angled parts.

b. For the interaction between RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK* 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, RECTANGULAR FUEL TANK*.

e. Go from linear to rotary motion, use centrifugal forces in, or for, RECTANGULAR FUEL TANK*.

f. If there is Spheroidality , curvature or angle, increase or reduce, as applicable, in, or for, RECTANGULAR FUEL TANK*.

IP.17. Another Dimension or Field - tactical type (3)

a. Add or remove physical dimensions or fields of action of RECTANGULAR FUEL TANK*.

b. Move RECTANGULAR FUEL TANK* to a new dimension in space or performance field.

c. Use for RECTANGULAR FUEL TANK* multi-story arrangement of objects instead of a single-story arrangement.

d. Tilt or re-orient RECTANGULAR FUEL TANK*; lay it on its side.

e. Use another side of a given dimension or field of RECTANGULAR FUEL TANK*.

IP.15. Dynamics - strategic type (4)

a. Allow (or design) the characteristics of RECTANGULAR FUEL TANK*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

b. Divide RECTANGULAR FUEL TANK* into parts that are capable of relative movement between each other.

c. If RECTANGULAR FUEL TANK* (or process) is rigid or inflexible, make it flexible or adaptive.

d. To enhance the dynamics of RECTANGULAR FUEL TANK* or the process, use feature(s) or object(s) available in the nearby environment.

N°2 Improve: (+) 4. Length of stationary object and Attenuate or Preserve: (+) 8. Volume of stationary object

IP.35. Transformation / Parameter Changes - strategic type (5)

a. Change RECTANGULAR FUEL TANK*'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 RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK*.

IP.8. Anti-Weight/ Compensation - tactical type (6)

a. To compensate for the heaviness/lightness or incidence of RECTANGULAR FUEL TANK*, 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 RECTANGULAR FUEL TANK*, make it interact with the environment.

IP.2. Taking out/ Adding - strategic type (7)

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

IP.14. Spheroidality - Curvature - Angle - tactical type (8)

a. For the interaction between RECTANGULAR FUEL TANK* and Object S2, instead of using rectilinear parts, surfaces, or shapes, use curvilinear, enveloping, or angled parts.

b. For the interaction between RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK* 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, RECTANGULAR FUEL TANK*.

e. Go from linear to rotary motion, use centrifugal forces in, or for, RECTANGULAR FUEL TANK*.

f. If there is Spheroidality , curvature or angle, increase or reduce, as applicable, in, or for, RECTANGULAR FUEL TANK*.

N°3 Improve: (+) 4. Length of stationary object and Attenuate or Preserve: (-) 35. Adaptability or versatility

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

a. Divide RECTANGULAR FUEL TANK* into existing and/or new parts, shapes, phases, states, or conditions.

b. Integrate different existing or new parts, forms, phases, states or conditions of RECTANGULAR FUEL TANK* in a single entity.

c. Make RECTANGULAR FUEL TANK* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of RECTANGULAR FUEL TANK*.

IP.35. Transformation / Parameter Changes - strategic type (10)

a. Change RECTANGULAR FUEL TANK*'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 RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK*.

N°4 Improve: (+) 32. Ease of achieving desired outcome and Attenuate or Preserve: (+) 8. Volume of stationary object

IP.35. Transformation / Parameter Changes - strategic type (11)

a. Change RECTANGULAR FUEL TANK*'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 RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK*.

N°5 Improve: (+) 4. Length of stationary object and Attenuate or Preserve: (+) 32. Ease of achieving desired outcome

IP.15. Dynamics - strategic type (12)

a. Allow (or design) the characteristics of RECTANGULAR FUEL TANK*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

b. Divide RECTANGULAR FUEL TANK* into parts that are capable of relative movement between each other.

c. If RECTANGULAR FUEL TANK* (or process) is rigid or inflexible, make it flexible or adaptive.

d. To enhance the dynamics of RECTANGULAR FUEL TANK* or the process, use feature(s) or object(s) available in the nearby environment.

IP.17. Another Dimension or Field - tactical type (13)

a. Add or remove physical dimensions or fields of action of RECTANGULAR FUEL TANK*.

b. Move RECTANGULAR FUEL TANK* to a new dimension in space or performance field.

c. Use for RECTANGULAR FUEL TANK* multi-story arrangement of objects instead of a single-story arrangement.

d. Tilt or re-orient RECTANGULAR FUEL TANK*; lay it on its side.

e. Use another side of a given dimension or field of RECTANGULAR FUEL TANK*.

IP.27. Cheap Short-Living Objects - strategic type (14)

a. Replace or divide (either fully or partially) RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK* (e.g., the degree of participation, complexity, or lifetime), with no loss of functionality, to achieve the desired objective.

N°6 Improve: 32. Ease of achieving desired outcome and Preserve: 33. Ease of operation

IP.2. Taking out/ Adding - strategic type (15)

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

IP.5. Merging/ Separating - operative type (16)

a. Bring RECTANGULAR FUEL TANK* closer or merge with other objects with similar or identical operations or functions.

b. Bring RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK*.

d. If there are objects fused to RECTANGULAR FUEL TANK, and if necessary, apply a separation action.

IP.13. Reverse or Indirect Action - strategic type (17)

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

b. Make moving parts of RECTANGULAR FUEL TANK* (or the external environment) fixed, and fixed parts moving.

c. Turn RECTANGULAR FUEL TANK* (or process) 'upside down', 'change the position', 'change the condition'.

IP.16. Partial or Excessive Actions - operative type (18)

a. If the objective of RECTANGULAR FUEL TANK* in its interaction with CONTAINED FUEL is difficult to fully achieve using a given solution, then use 'a little less' or 'a little more' of the same solution.

N°7 Improve: 32. Ease of achieving desired outcome and Preserve: 20. Use of energy by stationary object

IP.1. Segmenting/ Integrating - strategic type (19)

a. Divide RECTANGULAR FUEL TANK* into existing and/or new parts, shapes, phases, states, or conditions.

b. Integrate different existing or new parts, forms, phases, states or conditions of RECTANGULAR FUEL TANK* in a single entity.

c. Make RECTANGULAR FUEL TANK* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of RECTANGULAR FUEL TANK*.

IP.4. Asymmetry/ Symmetry - operative type (20)

a. Change the shape of RECTANGULAR FUEL TANK* from symmetrical to asymmetrical, permanent, or variable in time, or vice versa.

b. If RECTANGULAR FUEL TANK* is asymmetrical, increase its degree of asymmetry, or vice versa.

N°8 Improve: and Preserve:

Relevant inventive principles from Table II not included in Recommended Solution

IP.3. Local Quality (Pos.(7) - strategic type (21)

a. Improve quality in a localized way, for parts, components, or conditions of RECTANGULAR FUEL TANK*.

b. Change the structure, action, or procedure of RECTANGULAR FUEL TANK* from uniform to non-uniform, or vice versa.

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

d. Make each part of RECTANGULAR FUEL TANK* function in the conditions that are most suitablx for its operation.

e. Make each part of RECTANGULAR FUEL TANK* fulfill a different and useful function.

IP.11. Beforehand Cushioning (Pos.(8) - tactical type (22)

a. Prepare emergency means, beforehand, to compensate for the relatively low reliability of RECTANGULAR FUEL TANK*.

IP.32. Perception/ Appearance/ Color Changes (Pos.(12) - strategic type (23)

a. Change how is perceived, the appearance or shape of RECTANGULAR FUEL TANK* in relation to the object S2 with which it interacts.

b. Change the color, or appearance, of RECTANGULAR FUEL TANK* or its external environment.

c. Change the transparency of RECTANGULAR FUEL TANK* or its external environment.

TABLE VI. RESULTS OF SENSITIVITY ANALYSIS FOR THE EVALUATED OBJECT RECTANGULAR FUEL TANK

CHALLENGE: Improve design of large-volume rectangular tank for fuel storage affected by resistance 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 (%)
#	4	8	14	35	32. Ease of achieving desired outcome	94.67	33.4	79.35

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

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	4	8	12	14	32. Ease of achieving desired outcome	91.12	100	93.34
II.a	12	14	35	0	32. Ease of achieving desired outcome	90.23	100	92.67
III.a	8	12	14	35	34. Ease of change, repair or maintain	88.26	100	91.2
IV.a	4	8	12	14	34. Ease of change, repair or maintain	85.07	100	88.8

Order	Par.1	Par.2	Par.3	Par.4	Par.5			
V.a	4	8	12	35	32. Ease of achieving desired outcome	84.91	100	88.68

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	4	8	14	35	32. Ease of achieving desired outcome **(E)**	94.67	33.4	79.35	-
II.b	4	12	14	35	32. Ease of achieving desired outcome	93.78	23.16	76.13	-
III.b	4	8	12	14	32. Ease of achieving desired outcome	91.12	100	93.34	I.a
IV.b	8	12	14	35	32. Ease of achieving desired outcome	91.12	14.17	71.88	-
V.b	12	14	35	0	32. Ease of achieving desired outcome	90.23	100	92.67	II.a

TABLE VII ESSENTIAL CONTRADICTIONS MATRIX FOR NEEDS TO SATISFY (NS) FOR THE SAME UNDESIRABLE EFFECTS EVALUATED OF: RECTANGULAR FUEL TANK

CHALLENGE: Improve design of large-volume rectangular tank for fuel storage affected by resistance difficulties

Evaluated need to satisfy in this report: **32. Ease of achieving desired outcome**

UDEs: (+) 4. Length of stationary object// (+) 8. Volume of stationary object// (-)14. Strength / Resistance// (-) 35. Adaptability or versatility

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	(+) 34. Ease of change, repair or maintain	(-)14. Strength / Resistance	[11,1,2,9]	83.77	100	87.83
33. Ease of operation	(+) 4. Length of stationary object	(+) 8. Volume of stationary object	[35,8,2,14]	83.46	76.16	81.64

32. Ease of achieving desired outcome	(-)14. Strength / Resistance	(+) 8. Volume of stationary object	[9,14,17,15]	94.67	33.4	79.35
16. Duration of action by stationary object	(+) 4. Length of stationary object	(+) 8. Volume of stationary object	[35,8,2,14]	78.92	76.16	78.23
38. Extent of automation/ autonomy	(+) 38. Extent of automation/ autonomy	(-) 35. Adaptability or versatility	[27,4,1,35]	68.63	79.78	71.42
27. Reliability	(+) 8. Volume of stationary object	(+) 4. Length of stationary object	[35,8,2,14]	63.8	76.16	66.89
13. Stability	(-)14. Strength / Resistance	(+) 8. Volume of stationary object	[9,14,17,15]	75.4	33.4	64.9
35. Adaptability or versatility	(+) 8. Volume of stationary object	(-)14. Strength / Resistance	[9,14,17,15]	74.05	33.4	63.89
39. Productivity	(+) 39. Productivity	(-) 35. Adaptability or versatility	[1,35,28,37]	78.29	14.14	62.26
20. Use of energy by stationary object	(-)14. Strength / Resistance	(+) 8. Volume of stationary object	[9,14,17,15]	51.53	33.4	47

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: 32. Ease of achieving desired outcome.

TABLE VIII. ORDER OF INCIDENCE OF INVENTIVE PRINCIPLES (POS.n)
CHALLENGE: Improve design of large-volume rectangular tank for fuel storage affected by resistance difficulties
Participation analysis of inventive principles in TABLE II SPECIFIC CONTRADICTION MATRIX.
Evaluated parameters for Object RECTANGULAR FUEL TANK:
Par. UDEs:
(+) 4. Length of stationary object

(+) 8. Volume of stationary object
(-)14. Strength / Resistance
(-) 35. Adaptability or versatility
Par. NS: (+) 32. Ease of achieving desired outcome

***: 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.35. Transformation / Parameter Changes (Pos.1)	IP. Str.	II / III / IV	[Par.8][Par.4][IP(s) : 35,8,2,14] - [Par.35][Par.4][IP(s) : 1,35,16,0] - [Par.4][Par.8][IP(s) : 35,8,2,14] - [Par.32][Par.8][IP(s) : 35,0,0,0] - [Par.35][Par.14][IP(s) : 35,3,32,6] - [Par.4][Par.35][IP(s) : 1,35,0,0] - [Par.8][Par.32][IP(s) : 35,0,0,0] -
IP.15. Dynamics (Pos.2)	IP. Str.	II / III / IV	[Par.14][Par.4][IP(s) : 15,14,28,26] - [Par.32][Par.4][IP(s) : 15,17,27,0] - [Par.14][Par.8][IP(s) : 9,14,17,15] - [Par.4][Par.14][IP(s) : 15,14,28,26] - [Par.8][Par.14][IP(s) : 9,14,17,15] - [Par.14][Par.35][IP(s) : 15,3,32,0] - [Par.32][Par.35][IP(s) : 2,13,15,0] - [Par.4][Par.32][IP(s) : 15,17,27,0] -
IP.1. Segmenting/ Integrating (Pos.3)	IP. Str.	II / III / IV	[Par.35][Par.4][IP(s) : 1,35,16,0] - [Par.32][Par.14][IP(s) : 1,3,10,32] - [Par.4][Par.35][IP(s) : 1,35,0,0] - [Par.35][Par.32][IP(s) : 1,13,31,0] -
IP.9. Preliminary Anti-action (Pos.4)	**IP. Oper.**	II / III / IV	[Par.14][Par.8][IP(s) : 9,14,17,15] - [Par.8][Par.14][IP(s) : 9,14,17,15] -
IP.14. Spheroidality - Curvature - Angle (Pos.5)	IP. Tac.	II / III /	[Par.8][Par.4][IP(s) : 35,8,2,14] - [Par.14][Par.4][IP(s) : 15,14,28,26] - [Par.4][Par.8][IP(s) : 35,8,2,14] - [Par.14][Par.8][IP(s) : 9,14,17,15] - [Par.4][Par.14][IP(s) : 15,14,28,26] - [Par.8][Par.14][IP(s) : 9,14,17,15] -
IP.2. Taking out/ Adding (Pos.6)	IP. Str.	II / III / IV	[Par.8][Par.4][IP(s) : 35,8,2,14] - [Par.4][Par.8][IP(s) : 35,8,2,14] - [Par.32][Par.35][IP(s) : 2,13,15,0] -
IP.3. Local Quality (Pos.7) ***	IP. Str.	II /	[Par.35][Par.14][IP(s) : 35,3,32,6] - [Par.32][Par.14][IP(s) : 1,3,10,32] - [Par.14][Par.35][IP(s) : 15,3,32,0] - [Par.14][Par.32][IP(s) : 11,3,10,32] -
IP.11. Beforehand Cushioning (Pos.8) ***	IP. Tac.	II / IV	[Par.14][Par.32][IP(s) : 11,3,10,32] -
IP.17. Another Dimension or Field (Pos.9)	IP. Tac.	II / III /	[Par.32][Par.4][IP(s) : 15,17,27,0] - [Par.14][Par.8][IP(s) : 9,14,17,15] - [Par.8][Par.14][IP(s) : 9,14,17,15] - [Par.4][Par.32][IP(s) : 15,17,27,0] -

IP.13. Reverse or Indirect Action (Pos.10)	IP. Str.	II / IV	[Par.32][Par.35][IP(s) : 2,13,15,0] - [Par.35][Par.32][IP(s) : 1,13,31,0] -
IP.8. Anti-Weight/ Compensation (Pos.11)	IP. Tac.	II / III / IV	[Par.8][Par.4][IP(s) : 35,8,2,14] - [Par.4][Par.8][IP(s) : 35,8,2,14] -
IP.32. Perception/ Appearance/ Color Changes (Pos.12) ***	IP. Str.	II /	[Par.35][Par.14][IP(s) : 35,3,32,6] - [Par.32][Par.14][IP(s) : 1,3,10,32] - [Par.14][Par.35][IP(s) : 15,3,32,0] - [Par.14][Par.32][IP(s) : 11,3,10,32] -
IP.28. Mechanics Substitution (Pos.13) ***	IP. Str.	II / IV	[Par.14][Par.4][IP(s) : 15,14,28,26] - [Par.4][Par.14][IP(s) : 15,14,28,26] -
IP.27. Cheap Short-Living Objects (Pos.14)	IP. Str.	II / III /	[Par.32][Par.4][IP(s) : 15,17,27,0] - [Par.4][Par.32][IP(s) : 15,17,27,0] -
IP.10. Preliminary Action (Pos.15) ***	IP. Str.	II / IV	[Par.32][Par.14][IP(s) : 1,3,10,32] - [Par.14][Par.32][IP(s) : 11,3,10,32] -
IP.31. Using/ Removing Unused Parts (Pos.16) ***	**IP. Oper.**	II /	[Par.35][Par.32][IP(s) : 1,13,31,0] -
IP.16. Partial or Excessive Actions (Pos.17)	**IP. Oper.**	II / IV	[Par.35][Par.4][IP(s) : 1,35,16,0] -
IP.26. Copying/ Replicating (Pos.18) ***	IP. Str.	II /	[Par.14][Par.4][IP(s) : 15,14,28,26] - [Par.4][Par.14][IP(s) : 15,14,28,26] -
IP.6. Universality (Pos.19) ***	IP. Tac.	II /	[Par.35][Par.14][IP(s) : 35,3,32,6] -

TABLE IX. RECOMMENDED SOLUTION ACCORDING TO THE MOST RELEVANT CONTRADICTIONS IDENTIFIED FOR THE EVALUATED OBJECT: RECTANGULAR FUEL TANK
CHALLENGE: Improve design of large-volume rectangular tank for fuel storage affected by resistance 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 RECTANGULAR FUEL TANK when it interacts with CONTAINED FUEL and there is an affected function: design of large-volume rectangular tank for fuel

storage affected by resistance difficulties, in a specific space and time. RECTANGULAR FUEL TANK 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 RECTANGULAR FUEL TANK with an asterisk. Do not read the name of the evaluated object literally; associate it with a possible solution for RECTANGULAR FUEL TANK*.

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 RECTANGULAR FUEL TANK, 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 RECTANGULAR FUEL TANK NEED TO SATISFY: 32. Ease of achieving desired outcome

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: (-) 14. Strength / Resistance
TO IMPROVE (UDE): RECTANGULAR FUEL TANK has Less Strength or resistance interacting with S2
Parameter to attenuate or preserve: (+) 8. Volume of stationary object
TO ATTENUATE OR PRESERVE (UDE): RECTANGULAR FUEL TANK has More Own physical volume or accumulated quantitative volume or three-dimensional scope interacting with S2
Inventive principles IP(s) : [9,14,17,15]
9. Preliminary Anti-action, Oper. IP (Pos.4):
a. If RECTANGULAR FUEL TANK* needs to perform an action with harmful and useful effects, this action should be replaced with anti-actions to control harmful effect.
b. Create beforehand actions in RECTANGULAR FUEL TANK* that will oppose known undesirable

working stresses later.

Separation principle for RECTANGULAR FUEL TANK* : Separation in time

Solution strategy for RECTANGULAR FUEL TANK* : Improving performance

14. Spheroidality – Curvature - Angle, Tac. IP (Pos.5):

a. For the interaction between RECTANGULAR FUEL TANK* and S2 Object, instead of using rectilinear parts, surfaces, or shapes, use curvilinear, enveloping, or angled parts.

b. For the interaction between RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK* 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, RECTANGULAR FUEL TANK*.

e. Go from linear to rotary motion, use centrifugal forces in, or for, RECTANGULAR FUEL TANK*.

f. If there is Spheroidality , curvature or angle, increase or reduce, as applicable, in, or for, RECTANGULAR FUEL TANK*.

Separation principle for RECTANGULAR FUEL TANK* : Separation alternative

Solution strategy for RECTANGULAR FUEL TANK* : Improving attributes; Improving if a solution has not yet emerged

17. Another Dimension or Field, Tac. IP (Pos.9):

a. Add or remove physical dimensions or fields of action of RECTANGULAR FUEL TANK*.

b. Move RECTANGULAR FUEL TANK* to a new dimension in space or performance field.

c. Use for RECTANGULAR FUEL TANK* multi-story arrangement of objects instead of a single-story arrangement.

d. Tilt or re-orient RECTANGULAR FUEL TANK*; lay it on its side.

e. Use another side of a given dimension or field of RECTANGULAR FUEL TANK*.

Separation principle for RECTANGULAR FUEL TANK* : Separation in space

Solution strategy for RECTANGULAR FUEL TANK* : 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 RECTANGULAR FUEL TANK*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

b. Divide RECTANGULAR FUEL TANK* into parts that are capable of relative movement between each other.

c. If RECTANGULAR FUEL TANK* (or process) is rigid or inflexible, make it flexible or adaptive.

d. To enhance the dynamics of RECTANGULAR FUEL TANK* or the process, use feature(s) or object(s) available in the nearby environment.

Separation principle for RECTANGULAR FUEL TANK* : Separation in time

Solution strategy for RECTANGULAR FUEL TANK* : 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: (+) 4. Length of stationary object

TO IMPROVE (UDE): RECTANGULAR FUEL TANK has More Own length or relative distance, whether physical or figurative interacting with S2

Parameter to attenuate or preserve: (+) 8. Volume of stationary object

TO ATTENUATE OR PRESERVE (UDE): RECTANGULAR FUEL TANK has More Own physical volume or accumulated quantitative volume or three-dimensional scope interacting with S2

Inventive principles IP(s) : [35,8,2,14]

35. Transformation/ Parameter Changes, Str. IP (Pos.1):

a. Change RECTANGULAR FUEL TANK*'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 RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK*.

Separation principle for RECTANGULAR FUEL TANK* : Separation by condition / Separation alternative

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

8. Anti-weight/ Compensation, Tac. IP (Pos.11):

a. To compensate for the heaviness/lightness or incidence of RECTANGULAR FUEL TANK*, 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 RECTANGULAR FUEL TANK*, make it interact with the environment.

For example, compensate for the heaviness of RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK* : Separation alternative

Solution strategy for RECTANGULAR FUEL TANK* : Improving attributes

2. Taking Out/ Adding, Str. IP (Pos.6):

a. Separate an interfering part or a property from RECTANGULAR FUEL TANK*, or single out the only necessary part (or property) of RECTANGULAR FUEL TANK*.

b. Add new parts or properties to RECTANGULAR FUEL TANK*.

Separation principle for RECTANGULAR FUEL TANK* : Separation in space

Solution strategy for RECTANGULAR FUEL TANK* : Improving attributes

14. Spheroidality – Curvature - Angle, Tac. IP (Pos.5):

a. For the interaction between RECTANGULAR FUEL TANK* and S2 Object, instead of using rectilinear parts, surfaces, or shapes, use curvilinear, enveloping, or angled parts.

b. For the interaction between RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK* 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, RECTANGULAR FUEL TANK*.

e. Go from linear to rotary motion, use centrifugal forces in, or for, RECTANGULAR FUEL TANK*.

f. If there is Spheroidality , curvature or angle, increase or reduce, as applicable, in, or for, RECTANGULAR FUEL TANK*.

Separation principle for RECTANGULAR FUEL TANK* : Separation alternative

Solution strategy for RECTANGULAR FUEL TANK* : Improving attributes; Improving if a solution has not

yet emerged

COMPLEMENTARY CONTRADICTION 2
Contradiction order wt.5

Parameter to improve: (+) 4. Length of stationary object
TO IMPROVE (UDE): RECTANGULAR FUEL TANK has More Own length or relative distance, whether physical or figurative interacting with S2
Parameter to attenuate or preserve: (-) 35. Adaptability or versatility
TO ATTENUATE OR PRESERVE (UDE): RECTANGULAR FUEL TANK has Less Adaptability or versatility to interaction variability of S2
Inventive principles IP(s) : [1,35,0,0]
1. Segmenting/ Integrating, Str. IP (Pos.3):
a. Divide RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK* into a single entity..
c. Make RECTANGULAR FUEL TANK* easy to disassemble or assemble.
d. Increase or reduce the degree of fragmentation or segmentation of RECTANGULAR FUEL TANK*.
Separation principle for RECTANGULAR FUEL TANK* : Separation in space / Separation in subsystem
Solution strategy for RECTANGULAR FUEL TANK* : 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.1):
a. Change RECTANGULAR FUEL TANK*'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 RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK*.
Separation principle for RECTANGULAR FUEL TANK* : Separation by condition / Separation alternative
Solution strategy for RECTANGULAR FUEL TANK* : Improving attributes; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

COMPLEMENTARY CONTRADICTION 3
Contradiction order wt.6

Parameter to improve: (+) 32. Ease of achieving desired outcome
TO IMPROVE (DE): RECTANGULAR FUEL TANK has More Ease of achieving desired outcome interacting with S2
Parameter to attenuate or preserve: (+) 8. Volume of stationary object
TO ATTENUATE OR PRESERVE (UDE): RECTANGULAR FUEL TANK has More Own physical volume or accumulated quantitative volume or three-dimensional scope interacting with S2
Inventive principles IP(s) : [35,0,0,0]
35. Transformation/ Parameter Changes, Str. IP (Pos.1):

a. Change RECTANGULAR FUEL TANK*'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 RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK*.

Separation principle for RECTANGULAR FUEL TANK* : Separation by condition / Separation alternative

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

COMPLEMENTARY CONTRADICTION 4
Contradiction order wt.12

Parameter to improve: (+) 4. Length of stationary object

TO IMPROVE (UDE): RECTANGULAR FUEL TANK has More Own length or relative distance, whether physical or figurative interacting with S2

Parameter to attenuate or preserve: (+) 32. Ease of achieving desired outcome

TO PRESERVE (DE): RECTANGULAR FUEL TANK has More Ease of achieving desired outcome interacting with S2

Inventive principles IP(s) : [15,17,27,0]

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

a. Allow (or design) the characteristics of RECTANGULAR FUEL TANK*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

b. Divide RECTANGULAR FUEL TANK* into parts that are capable of relative movement between each other.

c. If RECTANGULAR FUEL TANK* (or process) is rigid or inflexible, make it flexible or adaptive.

d. To enhance the dynamics of RECTANGULAR FUEL TANK* or the process, use feature(s) or object(s) available in the nearby environment.

Separation principle for RECTANGULAR FUEL TANK* : Separation in time

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

17. Another Dimension or Field, Tac. IP (Pos.9):

a. Add or remove physical dimensions or fields of action of RECTANGULAR FUEL TANK*.

b. Move RECTANGULAR FUEL TANK* to a new dimension in space or performance field.

c. Use for RECTANGULAR FUEL TANK* multi-story arrangement of objects instead of a single-story arrangement.

d. Tilt or re-orient RECTANGULAR FUEL TANK*; lay it on its side.

e. Use another side of a given dimension or field of RECTANGULAR FUEL TANK*.

Separation principle for RECTANGULAR FUEL TANK* : Separation in space

Solution strategy for RECTANGULAR FUEL TANK* : 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.14):

a. Replace or divide (either fully or partially) RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK* (e.g., the degree of participation, complexity, or lifetime), with no loss of functionality, to achieve the desired objective.

Separation principle for RECTANGULAR FUEL TANK* : Separation in subsystem

Solution strategy for RECTANGULAR FUEL TANK* : 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 32. Ease of achieving desired outcome

MEJORAR > RECTANGULAR FUEL TANK tiene More Ease of achieving desired outcome interacting with S2

Parameter to preserve 33. Ease of operation

PRESERVAR > RECTANGULAR FUEL TANK tiene más efecto deseable por párametro 33. Ease of operation

Inventive principles IP(s) : [2,5,13,16]

2. Taking Out/ Adding, Str. IP (Pos.6):

a. Separate an interfering part or a property from RECTANGULAR FUEL TANK*, or single out the only necessary part (or property) of RECTANGULAR FUEL TANK*.

b. Add new parts or properties to RECTANGULAR FUEL TANK*.

Separation principle for RECTANGULAR FUEL TANK* : Separation in space

Solution strategy for RECTANGULAR FUEL TANK* : Improving attributes

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

a. Bring RECTANGULAR FUEL TANK* closer or merge with other objects with similar or identical operations or functions.

b. Bring RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK*, and if necessary, apply a separation action.

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

Separation principle for RECTANGULAR FUEL TANK* : Integration in supersystem

Solution strategy for RECTANGULAR FUEL TANK* : Improving attributes

13. Inverse or Indirect Action, Str. IP (Pos.10):

a. Inverse the applied action or apply an indirect action to perform the current function of RECTANGULAR FUEL TANK* to interact with object (S2)

It should be identified how RECTANGULAR FUEL TANK* currently performs an action with S2 Object and from there evaluate an inverse or indirect action.

b. Make moving parts of RECTANGULAR FUEL TANK* (or the external environment) fixed, and fixed parts moving.

c. Turn RECTANGULAR FUEL TANK* (or process) "upside down", "change the position", "change the condition".

Separation principle for RECTANGULAR FUEL TANK* : Separation in space / Separation inverse

Solution strategy for RECTANGULAR FUEL TANK* : 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 RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK* : Separation in time
Solution strategy for RECTANGULAR FUEL TANK* : Improving performance

CONTRADICTION BETWEEN NEEDS TO SATISFY N° 2

Parameter to improve 32. Ease of achieving desired outcome

MEJORAR > RECTANGULAR FUEL TANK tiene More Ease of achieving desired outcome interacting with S2

Parameter to preserve 20. Use of energy by stationary object

PRESERVAR > RECTANGULAR FUEL TANK tiene más efecto deseable por párametro 20. Use of energy by stationary object

Inventive principles IP(s) : [1,4,0,0]

1. Segmenting/ Integrating, Str. IP (Pos.3):

a. Divide RECTANGULAR FUEL TANK* 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 RECTANGULAR FUEL TANK* into a single entity..

c. Make RECTANGULAR FUEL TANK* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of RECTANGULAR FUEL TANK*.

Separation principle for RECTANGULAR FUEL TANK* : Separation in space / Separation in subsystem
Solution strategy for RECTANGULAR FUEL TANK* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

4. Asymmetry/ Symmetry, Str. IP (Pos.):

a. Change the shape of RECTANGULAR FUEL TANK* from symmetrical to asymmetrical, permanent, or variable in time, or vice versa.

b. If RECTANGULAR FUEL TANK* is asymmetrical, increase its degree of asymmetry, or vice versa.

Separation principle for RECTANGULAR FUEL TANK* : Separation in space
Solution strategy for RECTANGULAR FUEL TANK* : 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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