REVERSE ENGINEERING:

AN EMERGING AND CONTENTIOUS TECHNIQUE IN I.P.R

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INTRODUCTION

With the advent of industrialisation and the increasing use of machineries, the technique of reverse engineering is no more an alien concept. This technique traces its origin from the ancient Egyptian period and it proved to be a highly beneficial technique in the modern era in the arena of defence, aerospace, mechanical engineering, pharmaceutical and computer programing. This technique gained popularity during the industrial revolution and is reliable technique to decipher or to extract information. In India, Reverse engineering had predominant importance in the pharmaceutical sector. Even today, this technique is considered to be the most lucrative and beneficial process by many. The legality of reverse engineering is a highly debated topic among the intellectual property lawyers and academicians.

MEANING AND DEFINITION OF REVERSE ENGINEERING

Reverse engineering may be defined as "*Analysing a subject system to identify its current components and their dependencies and to extract to create system abstractions and design information."*[1]

The technique of reverse engineering has been defined by the US Supreme Court in ***Kewanee Oil Co.*** v. ***Bicron Corp***. [2] as "starting with the known product and working backward to divine the process which aided in its development or manufacture."

Engineering may be categorised into two – Forward and Reverse engineering. Forward engineering is a process through which designs, abstractions, drawings are converted into physical product.[3] As the name suggests, Reverse engineering is a process through which the final product or the end result is analysed and through that end product the methods and process involved in the physical implementation of such product is examined.[4]

[1] E. Chikofsky & J Cross, "*Reverse Engineering & design Discovery: A Taxonomy*, EEE Software 13-17 Jan 1990.

[2] 416 US 470

[3] Vineesh Raja, Kiran J Fernandes, "*Reverse Engineering - An industrial Perspective" ,* Pg. no.1- 3, 2008.

[4] Reverse engineering is also defined as, *"method of analysing a technology which (as opposed to starting from scratch) begins with an existing product and works backward to figure out how it does what it does. When the product's basic principle or core concept is determined, the next step is to reproduce the same results by employing different mechanisms to avoid any (legally forbidden) patent infringement. A common practice worldwide, reverse*

In other words, Reverse engineering may be defined as a process to decipher the know-how or the technology involved in the device or object by scrutinizing the structure or function or the **human artefact** thereby giving birth to a **new product**, with the aid of such deciphered technique or the same product with a better function or the same product with the same function. A human made artefact denotes that the technical know-how already exists as a prior art or is a part of public domain. [5]

The common misconception prevailing among the academicians is that, the end product obtained by employing or utilising the technique of Reverse engineering often results in duplication of the original product which in turn would infringe the right holder of the original product.[6] It is not necessary that such products would always turn out to be an imitation of an existing product. The reverse engineering technique in majority of the cases provides with **significant advancement** of the respective product thereby improving the quality and function of that particular product.[7] Reverse engineering is an essential part of innovation[8] and its fundamental purpose is discovery albeit of path already taken. [9]

REVERSE ENGINEERING AND ITS USES –

Reverse engineering is a long accepted practice.[10] Due to various legislations, reverse engineering during early 1970's had been under siege.[11] The importance of Reverse engineering and its benefits were demonstrated by three annual conferences.[12] These conferences to a certain extent had changed the perception prevailed in the minds of academicians, manufacturers and industrialist and it helped in shaping the concept of Reverse engineering.[13] Of late, its use has been recognised across the world and is considered to be one of the most beneficial business methods. Reverse engineering enhances the design, creates a new product and provides with a better technique thereby stimulating compatibility and interoperability in the market. [14]

Reverse engineering is often opted for learning, changing or repairing a product, providing related service, developing compatible product, creating a clone of the product and improving the product. [15]

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engineering is responsible for the ubiquitous 'IBM Compatible' computers, and is called emulation in software industry."

[5] Pamela Samuelson and Suzanne Scotchmer, "*The Law and Economics of Reverse Engineering*", Vol. 111,The Yale Law Journal, pp. 1575-1663, 2002.

[6] Tonya M. Evans, "*Reverse Engineering IP*", 17 Marq. Intell. Prop. L. Rev. 61 2013.

[7] *Bonito Boats Inc*. v. *Thunder Craft Boats Inc*. 489 US 141,160 (1989).

[8] *Ibid.*

[9] James Pooley, "*Trade Secret Law*", 5.02 @ 5-119 (1997)

[10] Supra 5.

[11] Supra 5.

[12] a) The Working Conference On Reverse Engineering (WCRE), b) The International Working On Program Comprehension (IWPC) and Workshop On Program Analysis For Software Tools And Engineering. (WPSTE).

[13] Piers Blewett, "Reverse Engineering", 5 Juta's Bus. L. 33 1997.

[14] Wego Wang, "*Reverse Engineering Technology of Reinvention*", Pg. no.1-6, 2010.

[15] James Pooley, "Trade Secret Law", 1997.

THE LEGITIMACY OF REVERSE ENGINEERING

The legality of reverse engineering has stirred controversies in the arena of intellectual property rights. Over the years, the misconception that prevailed regarding reverse engineering is that, it is a copy paste of an invention that belongs to another person which in turn violates his rights. What academicians and Lawyers fail to understand is that, Reverse engineering technology is **beyond dissembling, extracting information and copying**. As stated earlier, the end product of reverse engineering need not be an imitation of the originally manufactured product. The reverse engineering technology enhances competition and provides the public with cheap and best technology. [16]

The Intellectual property law in the context of Reverse engineering mainly deals with two questions. Firstly, whether reverse engineering aids in infringement of IP rights? And secondly, the end product resulting from such technique is an imitation of the original product?

The different regimes of IPR treat reverse engineering differently. However from the definition of reverse engineer it is evident that, the extracted function or technique provides a new product or the technique used in the earlier product would be enhanced which may or may not result in a new product. But an exact imitation or copy of the originally manufactured product would amount to infringement. In the case of substantial improvement to the structure and function would not infringe the exclusive rights conferred to the right holder.

The process of reverse engineering is expensive as well as time consuming.[17] In the manufacturing industry favours the reverse engineering technique.[18] Since reverse engineering a product is as difficult as innovating and manufacturing an original product. Reverse engineering technique may continue to be lawful as long as the original product has been acquired by a fair and honest means. [19]

Reverse engineering a software product is considered to be illegal under the Copyright Act.[20] While reverse engineering the software, the software should be dissembled and the original program should be copied in the system. Making of such copies during the de compilation process is known as "Intermediate copies". Making of intermediate copies shall result in the technical infringement of copyright.[21]

The Unites States Copyright Act permits reverse engineering although there is no express provision dealing with the same. Reverse engineering is covered under the **Fair Use**[22] and **Adaptation Rights doctrine**[23]. RE can be invoked

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[16] Barak D. Jolisht, "*Rescuing Reverse Engineering",* 14 Santa Clara Computer & High Tech. L. J. 509 1998.

[17] Kumar A, Jain P.K. & Pathak P.M., "*Reverse Engineering in Product Manufacturing: An overview*", Chapter 39, DAAAM International Scientific Book 2013.

[18] Supra 16.

[19] Terry Ludlow, "*Judicial Support for Semi -Conductor Reverse Engineering",* 25 IPL Newsl. 1 2006-2007.

[20] *Weir Pumps* v. *CML Pumps* (1984) FSR 33;

[21] Saptarishi Bandopadhyay,*"Justifying the backstep: Establishing the foothold of Reverse engineering within indigenous ethical parameters of software copyright.",* Vol. – 8, JIPR, 2003, pp. 191- 204.

[22] *17 U.S.C. § 107 "Notwithstanding the provisions of sections 17 U.S.C. § 106 and 17 U.S.C. § 106A, the fair use of a copyrighted work, including such use by reproduction in copies or phonorecords or by any other means specified by that section, for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include: the purpose and character of the use, including whether such use is of a commercial nature or is for non profit educational purposes; the nature of the copyrighted work; the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and the effect of the use upon the potential market for or value of the copyrighted work."*

[23] 17 U.S. Code § 117 Limitations on exclusive rights: Computer programs (Adaptation).

with the help of these doctrines. In ***Valut*** v. ***Quaid***[24], the legality of reverse engineering was upheld and de compilation for the purpose of reverse engineering was also considered to be legal.[25] The DMCA[26] provides protection for lawfully obtained computer programs which gives a strong legal back up for the technique of software reverse engineering. The European Union also expressly provides for Reverse engineering. The Directive On Legal Protection of Computer Program[27] adopted by EU permits reverse engineering. [28] The position of India in relation to software Reverse engineering is considered to be the weakest. Although India provides legal back up for de compilation the position on reverse engineering is not precise. [29]

The Patent law so far does not recognise the right of reverse engineering. However the law does not expressly prohibit reverse engineering. A patent infringement does not arise when the significant modification or improvement satisfies the triple test of patentability requirement. [30]

Under the Trade Secrets Law, reverse engineering is considered to be a lawful method for obtaining trade secrets.[31] California Trade Secrecy law provides an express provision for reverse engineering. The US Courts consider reverse engineering as an important factor in maintaining **equilibrium** in IPR Laws. [32]

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[24] 847 F 2d 255 (5th CIR), 1988.

[25] *Sega* v. *Accolade* 977 F.2d 1510; *Atari* v. *Nintendo* 975 F.2d 832; *Sony Computer Entertainment Inc*. v. *Connectix Corp*., 203 F.3d 596 (9th Cir. 2000); *Lexmark International* v. *Static Control Components Inc*. 253 F. Supp. 2d 943; *Chamberlain Group* v. *Skylink Technologies* 292 F. Supp. 2d 1040.

[26] *17 USC 1201 f. "Reverse Engineering.— (1) Notwithstanding the provisions of subsection (a)(1)(A), a person who has lawfully obtained the right to use a copy of a computer program may circumvent a technological measure that effectively controls access to a particular portion of that program for the sole purpose of identifying and analyzing those elements of the program that are necessary to achieve interoperability of an independently created computer program with other programs, and that have not previously been readily available to the person engaging in the circumvention, to the extent any such acts of identification and analysis do not constitute infringement under this title.*
(2) Notwithstanding the provisions of subsections (a)(2) and (b), a person may develop and employ technological means to circumvent a technological measure, or to circumvent protection afforded by a technological measure, in order to enable the identification and analysis under paragraph (1), or for the purpose of enabling interoperability of an independently created computer program with other programs, if such means are necessary to achieve such interoperability, to the extent that doing so does not constitute infringement under this title.(3) The information acquired through the acts permitted under paragraph (1), and the means permitted under paragraph (2), may be made available to others if the person referred to in paragraph (1) or (2), as the case may be, provides such information or means solely for the purpose of enabling interoperability of an independently created computer program with other programs, and to the extent that doing so does not constitute infringement under this title or violate applicable law other than this section.(4) For purposes of this subsection, the term "interoperability" means the ability of computer programs to exchange information, and of such programs mutually to use the information which has been exchanged."

[27] The Directive on the legal protection of computer programs (91/250/EEC) was the first copyright measure to be adopted following the publication of the White Paper on completing the Single Market by 1992. The objective of the Directive is to harmonize Member States' legislation regarding the protection of computer programmes which will afford a degree of security against unauthorized reproduction of such programmes.

[28] Art. 5,6 & 9.

[29] K.M. Gopa Kumar, "*The Scope of Reverse Engineering Of Computer Software Under The Copyright (Amendment) Act, 1999: A Critique*", Vol -6, JIPR, 2001 PP 94-108.

[30] Ibid at pg. no.3.

REENGINEERING AND REVERSE ENGINEERING –

While discussing about reverse engineering, it is essential to analyse the concept of **reengineering**. Often the concepts of reverse engineering and reengineering are used synonymously. Re engineering denotes the process of re designing or making improvements to the existing product. Re engineering denotes **mere workshop improvements**. The technique of re-engineering is used during the process of reverse engineering to make radical changes to the originally manufactured products. Unlike reverse engineering, re-engineering is only re designing the product and apart from making minor improvements it does not contribute to any new product or a new function which would enhance the efficacy of that product.

REVERSE ENGINEERING IN THE CONTEXT OF INDIAN PATENT ACT, 1970

The precedents and legislations discussed above affirm that reverse engineering is a reputed method for obtaining information from an object. Apart from extraction of information it helps in gaining technical competitive intelligence and patent intelligence. However while dealing with reverse engineering in the background of Patent rights poses several questions in the minds IP Lawyers and academicians. Firstly, whether the technique of reverse engineering has contributed to a **substantial improvement** in the product? Secondly, whether **patent can be conferred to the end product** resulting from reverse engineering technology which has different structure, function and composition in comparison to the originally manufactured product? Also the Patent laws do not recognise the technique of reverse engineering and however the patent laws around the world have not expressly denied the reverse engineering technology.[33]

In order to confer patent to an invention, it must satisfy the **Triple test** of **Novelty**, **Inventive step** or **non-obviousness**, **industrial application** and it must fall within the ambit of **Patentable subject matter**. Apart from this, In India the invention should be excluded from S.3[34] & 4[35] of The Indian Patent Act, 1970.

A patent would be granted on satisfying the above mentioned criteria. The failure to satisfy any one of the conditions would make the invention ineligible for patent grant.

WHAT IS AN INVENTION?

Before analysing the patentability criteria it is necessary to know what an invention is. In ***Genentech*** v. ***wellcome***[36], the Court of Appeal stated that, "*an essential requirement which must be satisfied before a patent can properly be granted … that the applicant had made an invention*." An invention may mean anything which has not existed before or the combination of existing elements which altogether results in a new product or a process. In other words, it means unveiling something which is not known to public or which has not been discovered by anybody else[37] and does not form part of the public domain or state of art.

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[31] Thomas Duston and Thomas Ross Marshakk, "*Intellectual Property Protection For trade Secrets and Know How",* Vol -15, North Carolina Journal of Law & Tech.,2014.

[32] *Chicago Lock* v. *Fanberg* 676 F.2d 400 (9th Cir. 1982).

[33] Ibid at pg. no. 4.

[34] S.3 of The Indian Patent Act, 1970 lays down a list of invention which cannot be patented and it includes various grounds which includes Ordre Public & morality, method of medical treatment of human beings, animals etc.

[35] S.4 of The Indian Patent Act, 1970 reads as follows, "Inventions relating to atomic energy not patentable.—No patent shall be granted in respect of an invention relating to atomic energy falling within sub section (1) of section 20 of the Atomic Energy Act, 1962 (33 of 1962)."

[36] (1989) RPC 147,262.

[37] *Pope Appliance Corpn*. v. *Spanish River Pulp and Paper Mills Ltd*. AIR 1929 PC 38.

S. 2 (1) (j) of The Indian Patent Act defines an Invention. [38] As per the definition provided under the Act, an invention means any new product or process involving inventive step and industrial application. The term invention was defined by the Hon'ble Court in ***Raj Parkash*** v. ***Mangat Ram Choudhary***[39]. The court held that, "*invention is to find out or discover something not found or discovered by anyone before and it is not necessary that the invention should be anything complicated and the essential thing is that the inventor was the first one to adopt it and the principle therefore is that every simple invention that is claimed, so long as it is something novel or new, would be an invention and the claims and the specifications have to be read in that light and a new invention may consist of a new combination of all integers so as to produce a new or important result or may consist of altogether new integers and the claims for anticipation by the defendant has to be either by prior user or by prior publication*"

Anything which is a part of state of art or within the public domain lacks novelty. An invention need not be complicated. A simple innovation satisfying the patentability criteria can also be an invention.

Reverse engineering an object is not a mere improvement or is not an imitation either. From the definition of reverse engineering it is clear that the end product may vary from the original product or the process used to produce such products would be enhanced to provide better results. Hence it is evident that mere improvements would only amount to re -engineering and not reverse engineering. Further reverse engineering involves significant improvement to a product which will also deem to be an invention under S. 2 (1) (j) of The Indian Patent Act, 1970.[40]

In order to constitute an invention it is essential to examine that such improvements or the newly innovated product resulting from reverse engineering satisfies the patentability criteria or the Triple test.

a) THE TEST OF NOVELTY

An invention is said to satisfy the criteria of novelty, if it is **not known to the public** or if such inventions haven't formed part of the **existing state of art**.[41] However we cannot deny the fact that, the original products which are reverse engineered are already a part of the public domain. But the end product resulting from reverse engineering would not lack novelty. Firstly, such innovation resulting from reverse engineering is not an imitation or a mere improvement of the original product and secondly, it does not contain the whole of original invention as such.[42] The **significant advancement** changes the structure, composition and function of the product. Therefore it may be established that such invention is novel.

b) INVENTIVE STEP

The invention will consist of an inventive step if the said invention has technical and economic advance and is not obvious to a person who is skilled in art.[43] Reverse engineering is more than a workshop improvement. Mere re

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[38] S. 2 (1) (j) of The Patents Act, 1970 "invention" means a new product or process involving an inventive step and capable of industrial application."

[39] AIR 1989 Del 1.

[40] *Bishwanath Prasad Radhey Shyam* v. *Hindustan Metal Industries* AIR 1982 SC 1444.

[41] S. 2 (l) of The Patents Act states that ""*new invention" means any invention or technology which has not been anticipated by publication in any document or used in the country or elsewhere in the world before the date of filing of patent application with complete specification, i.e., the subject matter has not fallen in public domain or that it does not form part of the state of the art."*

[42] *Farbewerke Hoechst Aktiengesellschaft Vormals Meister Lucius Bruning Corp.* v. *Unichem Lab And Ors* 282 U.S. 819 (1930).

[43] S.2 (ja) of The Patents Act, 1970 ""*inventive step" means a feature of an invention that involves technical advance as compared to the existing knowledge or having economic significance or both and that makes the invention not obvious to a person skilled in the art."*

arrangement of a product is something which every person who is skilled in art is aware of. But reverse engineering does not end with dissembling the products and analysing the process involved in it. To innovate a new product with the same function or to contribute a significant change which would enhance the function involves exercising inventive faculty or imagination which makes this technique non obvious for a person who is skilled in art. [44]

c) INDUSTRIAL APPLICATION

Industrial application[45] of an invention refers to the **utility** of the invention.[46] It is evident that the reverse engineered goods have great utility in the industrial arena and the end products in majority of the cases provide better results or enhanced function than the original product thereby making it as a valuable invention. [47]

From the above conclusion, it is evident that, the end product of reverse engineering can be accorded as an "invention" under S.2 (1) (j) of The Indian Patents Act, 1970 as it satisfies the triple test of novelty, inventive step and industrial application. To confer patent to such products resulting from this technology it is essential to analyse if such inventions fall within the purview of S. 3 Of the Patents Act, 1970, which provides for non-patentable subject matter.

IMPLICATION OF S.3 (D) ON REVERSE ENGINEERING

S. 3 (d)[48] of the Patent Act deals with the enhanced efficacy of a product. The exception provided under this section is not absolute by nature but is only conditional. It states that **mere discovery** of a **known substance** or a **process** cannot be eligible for patent.[49] However this section provides that, if such known substance or product **enhances the efficacy** of a product or use of such process results in a new product, it shall be eligible for Patent. Therefore S. 3 (d) clearly specifies that patent shall be conferred to a **new form of an already known substance** if it satisfies the triple test. Although S.3 (d) bars workshop improvements it provides for patents for improvements. A new product or a process would be a result of an improvement. However such improvements have to **qualify the patentability criteria.** [50] Hence it is evident that S.3 (d) shall not have any implication on reverse engineered products if the improvements exercised over an already existing product results in a new product or a new process.

CONCLUSION

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[44] *PLG Research* v. *Ardon International* [1995] RPC 287.

[45] S. 2 (ac) of The Patents Act, 1970, "'*capable of industrial application", in relation to an invention, means that the invention is capable of being made or used in an industry;"*

[46] Supra footnote 40.

[47] *Halliburton Energy Services Inc*. v. *Smith International (North Sea) Ltd*. (2006) RPC 2.

[48] S. 3 (d) "*the mere discovery of a new form of a known substance which does not result in the enhancement of the known efficacy of that substance or the mere discovery of any new property or new use for a known substance or of the mere use of a known process, machine or apparatus unless such known process results in a new product or employs at least one new reactant. Explanation.—For the purposes of this clause, salts, esters, ethers, polymorphs, metabolites, pure form, particle size, isomers, mixtures of isomers, complexes, combinations and other derivatives of known substance shall be considered to be the same substance, unless they differ significantly in properties with regard to efficacy;"*

[49] *Novartis AG* v. *Union Of India* (2007) 4 MLJ 1153.

[50] Shamnad Basheer & Prashant Reddy, "*Ducking TRIPS In India: A Saga Involving Novartis and The Legality of S. 3 (D)*", Vol. 20 (2), National Law School Of India Review, 2008.

Although there is no express provision that provides for reverse engineering, resorting to this technology shall not constitute patent infringement. As stated above, the products resulting from such technology shall pass the triple test and as debated, S. 3 (d) cannot be invoke against RE as long as it involves an enhanced efficacy resulting in a new product or a process.

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