

## **Employing the simulation program ANSYS fluent in graphic design**

**Rasha Shafi Abdul Sada**  
Alexandria University Faculty of Arts

### **Abstract:**

This abstract introduces a novel application of the ANSYS Fluent simulation program in the realm of graphic design, expanding the traditional boundaries of its use in engineering and physics simulations. ANSYS Fluent, renowned for its prowess in fluid dynamics and heat transfer simulations, is leveraged here for its computational capabilities to simulate and optimize complex graphic design processes. Graphic design often involves intricate fluid-like elements, such as the flow of colors, textures, and shapes, that contribute to the visual appeal of a final product. ANSYS Fluent's powerful simulation engine can be adapted to model and analyze these dynamic design elements, offering designers a unique toolset for creative exploration and optimization. This study explores the integration of ANSYS Fluent into the graphic design workflow, showcasing its potential to enhance visual aesthetics and functionality. By applying fluid dynamics principles to the design process, the program allows designers to simulate the movement and interaction of design elements, providing valuable insights into how different visual components can harmonize or conflict.

Furthermore, the abstract highlights the potential for ANSYS Fluent to optimize graphic design projects by automating iterative processes. Designers can set parameters, run simulations, and receive data-driven recommendations for adjustments that enhance the overall design. This iterative approach not only accelerates the design process but also opens up new avenues for creative experimentation.

The abstract concludes by emphasizing the transformative impact of employing ANSYS Fluent in graphic design, noting that this innovative approach can lead to the creation of visually stunning and functionally optimized designs. As technology continues to intersect with various

disciplines, this research provides a glimpse into the potential cross-disciplinary applications of simulation programs in traditionally non-engineering domains.

**Keywords: graphic design– environment– Esophageal dimension**

**Introduction:**

The environment is the store of forms in which human activity roams, since its inception, it has been working hard to make natural materials suitable for human needs. Man not only works, but dreams of controlling evidence and being able to change things and shape them into a new image that serves him. Man did not rely only on his senses to perceive the natural elements around him, but he invented means to make him see more, using magnifying glasses, optical microscopes and telescopes, where he was able to record with pictures facts about nature above the level of the ability of his senses and to reveal its secrets and the aesthetic elements that man is unable to create, the artist always takes the environment as an important source of inspiration because it is full of constructive systems and the contemporary designer has been able to observe systems Rhythm, balance, texture, proportion and other design basics in many elements of nature, whether by normal or microscopic vision.

However, with the discovery of the electron microscope at the end of the first half of the twentieth century and its enormous ability to magnify, which is estimated at millions of times, as well as the discovery of many physical phenomena (heat, pressure and density) at the end of the twentieth century, which opened the way for more tremendous knowledge of natural elements and synthetic materials that have unknown physical and chemical properties, as these forms showed the emergence of forms Different constructivists with enormous color and aesthetic values can be a new source of inspiration, innovation and the current study of physical phenomena and the study of their structural systems and their aesthetic values and can be employed in the creation of modern graphic designs for computer-printed pendants , and the general-purpose computational fluid dynamics (CFD) program (CFD) called Ansys Fluent to simulate fluid flow, heat and mass transfer, chemical processes, and more. Fluent provides a sophisticated, accessible user interface that simplifies the CFD process from preprocessing to

post-processing within a single window workflow.

The idea of using physical variables such as pressure and temperature, which are depicted in a different form, produces a beautiful form in drawing and design programs. This is because the program reflects the results in forms of aesthetic value and beautiful color gradation.

The research problem The research problem lies in the following questions

1. Physical phenomena are structural forms with aesthetic values, can they be a source of inspiration or innovation for the designer and artist?
2. The extent of color contrast in their structural forms from their natural elements can give an added value to the standards of graphic designs aesthetically and functionally?

**Significance: - Importance of research:**

1. Highlighting the linear and color variation in structural systems forms and physical phenomena than in the visible natural elements.
2. The design of commercial billboards is inspired by the physical phenomena of the elements of natural and synthetic materials with aesthetic values and represents a communication between the designer and scientific progress.

**Research Objectives:**

1. Maximizing the use of modern technological means, such as benefiting from the use of computational fluid dynamics program, which develops knowledge of the structural foundations in the design of commercial billboards for them and reveals the limitless formations they contain that can be a source of inspiration for the Jaraki designer.
2. Lallais not the visual and emotional pleasure of seeing good designs in visualization, but also achieving communication with the target and communication and thinking by marrying design with science.
3. Search limits

Temporal (2000 - 2010).

Spatial (Iraq).

Objectivity (optical commercials).

Methodology Research Methodology

The researcher follows the experimental descriptive approach.

Ansys Fluent

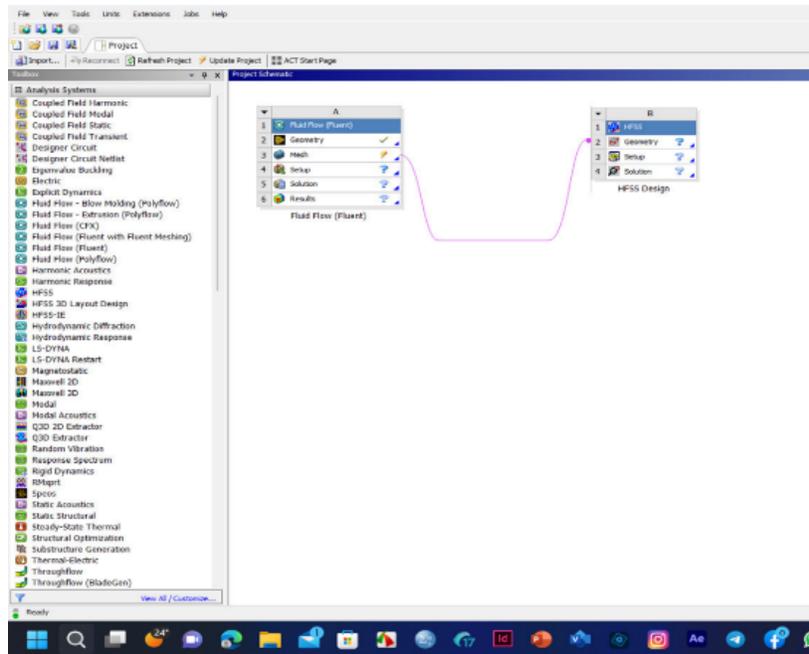


Figure (1) ANSYS Orientation

ANSYS, short for ANalysis SYStem is a programmer based on the finite element method, invented by Dr. <sup>[1]</sup> Jon Swanson. Since 1970, Swanson's SASI Corporation (Swanson Analysis Systems Inc) has been releasing its software versions up to 5.1 Version, and after the sale of the company in 1994, its name was changed to Ansys Inc. ANSYS program solves linear and nonlinear problems for structural mechanics, fluid mechanics, acoustics, thermodynamics, piezoelectricity, and conventional electromagnetism. The program contains a number of elements to solve one-dimensional, two-dimensional, and three-dimensional problems. There are currently two versions of the program: the first version (ANSYS Classic) and there is the graphical version (GUI) called ANSYS Workbench.

The program contains a number of elements for solving one-dimensional, two-dimensional and three-dimensional problems. There are currently two versions of the program: the first version (ANSYS Classic) and the graphical version (GUI) called ANSYS Workbench.

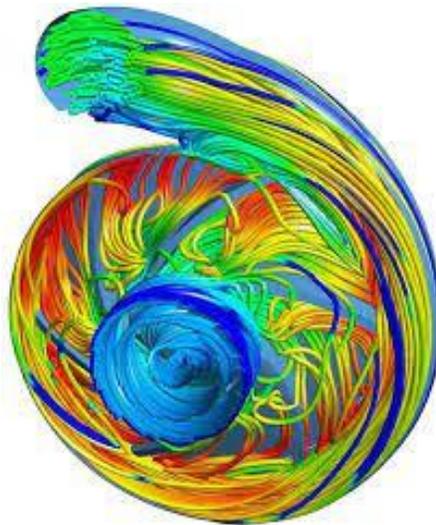


Figure (1) shows the distribution of air inside the pump

and computer-aided engineering software in computational fluid dynamics (CFD) for modeling fluid flow and heat transfer in complex geometric shapes. Fluent allows to completely change the grid and analyze the flow with unstructured grids for complex geometry. The types of networks that can be created and received by this software suite include grids with triangular elements, quadrilateral (for two-dimensional geometry), quadrilateral, hexagonal, pyramidal or wedge (for three-dimensional geometry).

Ensys Fluent also allows the user to optimize the network (for example, shrink or expand the network to the boundaries and locations required in the architecture). This optimization and networking solution provides the user with the ability to optimize results in areas with large vortices (e.g. boundary layer, etc.). These capabilities significantly reduce the time it takes to produce a good network compared to a built-in networking solution. This program is written in the C programming language and uses all the power and flexibility of this language. Enables

Fluent Dynamic memory utilization, well-organized data and information structure, flexible computational control.

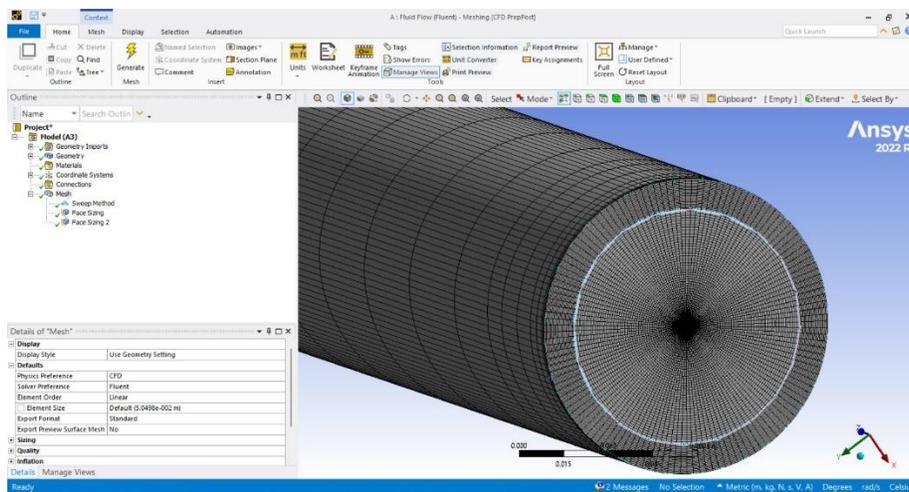
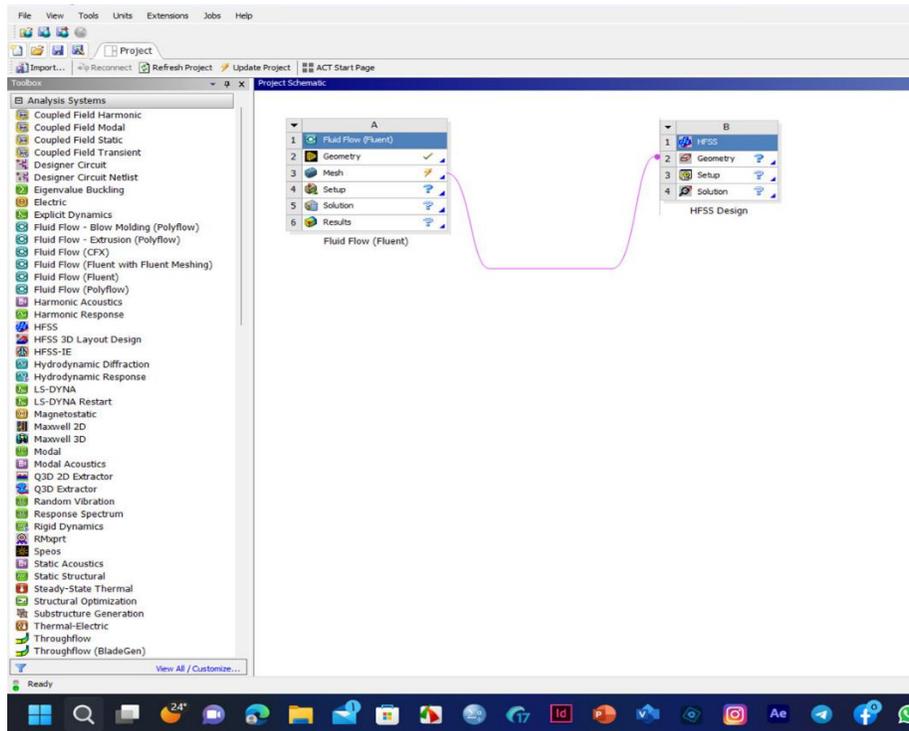


Figure (3) shows

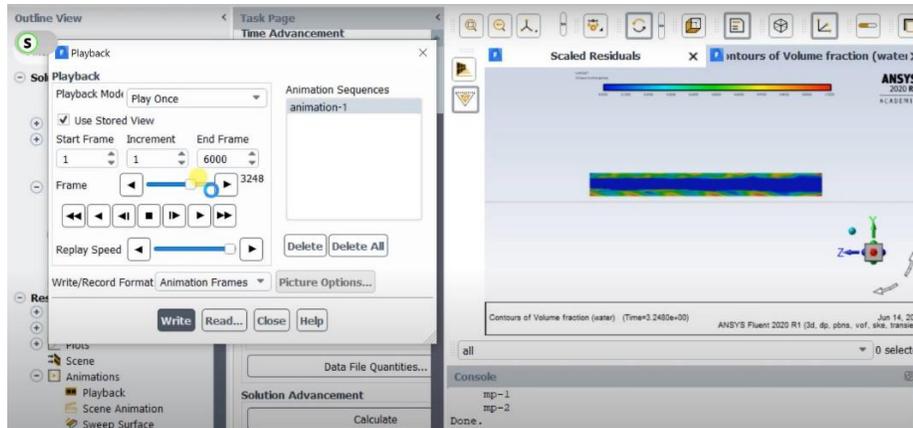
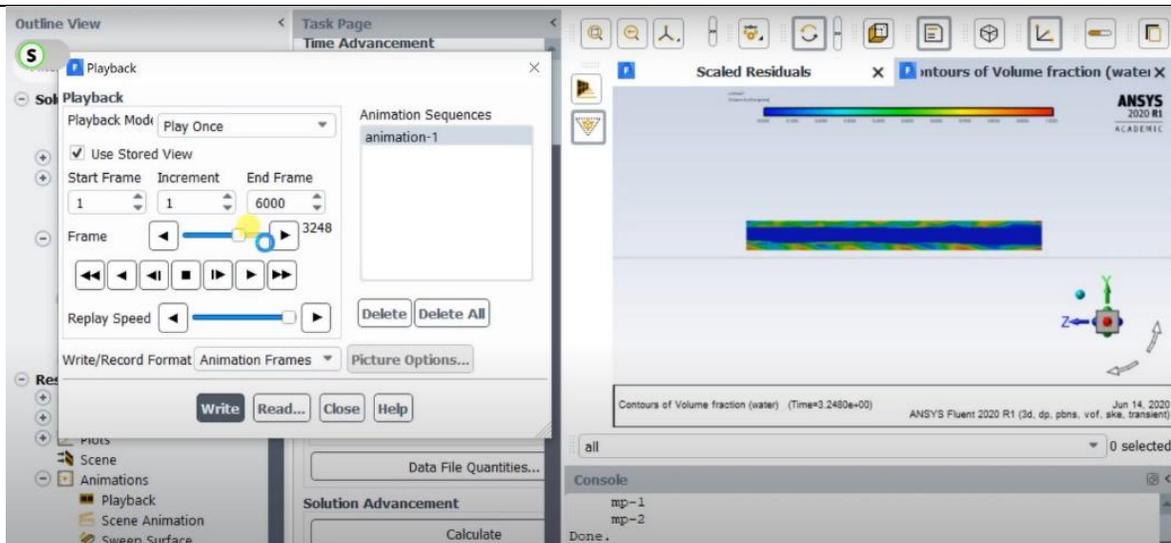
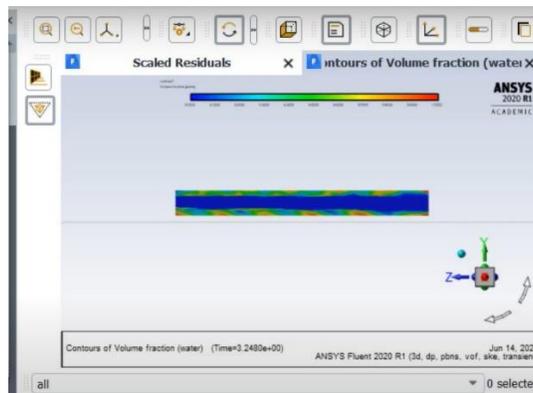


Figure (4) shows the modeling results



**Color:**

It is a sensation reflected to us by the eye as a result of the analysis of white light, which is a characteristic and effect produced by the retina, so it analyzes the tricolor of those who watch it, whether it is a pigment or light color, which is a factor in appreciating things and adding contrast between them and the formal aesthetic. The choice of colors in the design of things is important, because colors do not only show the appearance, but also have other goals and meanings, colors cannot be chosen inappropriately because they affect negatively or positively according to their good choice, and the design will not succeed if inconsistent colors are chosen.

The link of colors to our lives Studies have shown that colors have a great impact on our lives, as they greatly affect our psychology and the way we feel, as they were used to interpret and study the human being and determine his tendencies and personality, and even were used in his treatment, so depressed people, for example, are advised to focus on wearing light colors, and avoid darks because of its great impact on modifying mood, and they also relied on them in the process of designing homes, there are colors that are preferred to be used in bedrooms, such as green because it symbolizes reproduction. And fertility, and red, which symbolizes vitality and love, and there are colors suitable for schools and work offices, such as blue, because it encourages creative thinking and creativity, and other colors, as has been relied on in television advertisements to attract the attention of the viewer, for example, product owners use purple to promote their new goods because it indicates change, strangeness and excellence. Colors have been associated with their impact on the positive and negative energy of people; doctors in the operating room wear green, and the bride on her wedding night wears white, hence the study of colors has become important and not just for the sake of infiltration Color is closely related to light, whether natural or artificial, so it was necessary and necessary for deafness to obtain color reverberations of purity from the use of correct and appropriate light outcomes, whether they are natural sources or It is possible to realize the color reverberations of the Loosa and sensory on Elements and units of design and interior furnishing with the help of natural light Day Light represented in daylight Visual, psychological and organic dimensions of the compositional appearance

**Esophageal dimension:**

The features of the formative appearance of the various materials and materials that make up the elements and design units of the design of commercial light advertisements in the form of ceiling coverings or treatments inside the space are closely related to the characteristics and features of the formal appearance of those materials where these materials appear in various and different visual forms, some of which appear in the form of linear forms represented in the treatment of some structural or architectural aspects inside or outside Shops, including what appears when formulating the mtechnical treatments for the design of commercial light advertisements in the form of ceiling coverings or color treatments This is the dimension of the materials in the form of volumetric forms represented in many elements and units of services and furnishing such as lighting units, furniture and other stereotypes that are characterized by containing the third dimension,

**(2) Psychological and organic dimensions:**

The negative and organic dimensions arising due to the diversity of color effects associated with different materials and raw materials that are involved in the manufacture and formation of interior design elements and units of commercial light advertising are closely related to both formal and expressive appearance. to advertise.

**Expressive Appearance Unit:**

"Color" is one of the vital and important design vocabulary and tools in expressing the functional and aesthetic meanings of the design elements and units of commercial light advertising.

Employing ANSYS Simulation Software Fluently in Medium Graphic (Optical Commercials) General-purpose computational fluid dynamics (CFD) software called Ansys Fluent is used to simulate fluid flow, heat and mass transfer, chemical processes, and more. Fluent provides a sophisticated and easily accessible user interface that simplifies the CFD process From preprocessing to post-processing within a single window workflow.

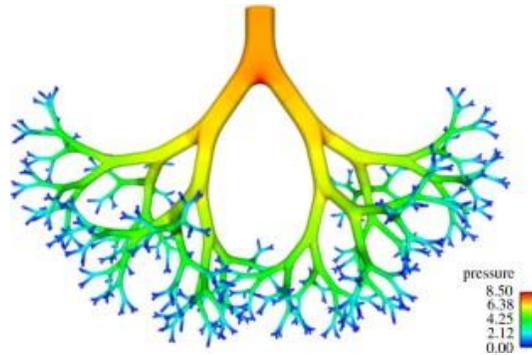


Figure (6) shows the pressure inside the inflamed lung

IN THE WORLD OF COMPUTATIONAL FLUID DYNAMICS, ANSYS FLUENT IS A HIGHLY KNOWN AND WIDELY USED PROGRAM (CFD). The Navier-Stokes equations and the continuity equation are generally solved using finite volume notation, which is primarily intended for numerical modeling of fluid flow. However, the program provides a much wider range of models covering equally important physical phenomena and processes, including turbulence models, multiphase flows with phase transitions, heat transfer, chemical reactions, etc., users can create complex boundary conditions, materials.

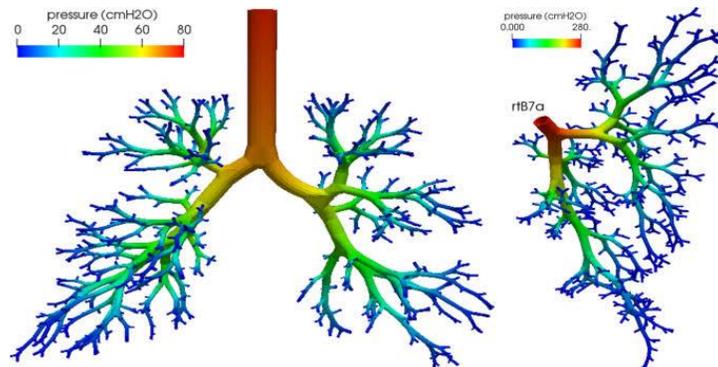


Figure (7) shows the distribution of inflammation within the lung

The idea of using physical variables such as pressure and temperature, which are depicted in a different form, produces a beautiful form in drawing and design programs. This is because the program reflects the results in forms of aesthetic value and beautiful color gradation.

Here are some of the shapes that can be used in graphic design as decorative elements derived from simulating a variety of mechanical systems, such as a flying wing flow or heat exchanger.

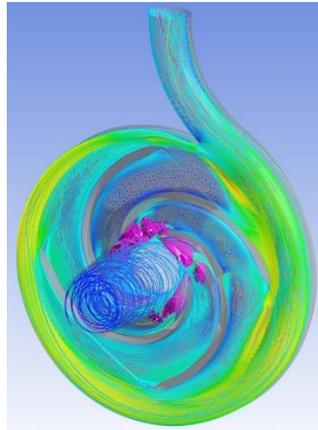


Figure (8) shows the pump

The advertising light image affects in a direct or indirect way in making the recipient adopt specific consumer behaviors and certain cultural patterns, and the advertising light image has succeeded through modern means of communication in bringing about radical changes in social behavior, based on the fact that advertising carries with it the culture of the advertiser and the culture of product sources. The student agrees with what was stated in the conclusion of this scientific paper, and that the advertising image has a direct impact on the behavior of the recipient and the emphasis on the important and objective elements in the advertisement, 1 / The interest in the relations of Alo in advertising and its use as it should inevitably have pleasant results for the eye and the mind together, and European and American magazines have confirmed that viewers who are attracted by color advertising images may exceed 95% (successor, 1996 who bites ads include images Something of deception to achieve its goals, infiltrate the minds of the targeted and make their decisions that will one day become part of his life and advertising contributes to the emergence of economic movement and this aspect carries with it some bad dimensions by spreading the consumption pattern in unproductive societies so people get used to consumption only, which negatively affects their moral levels

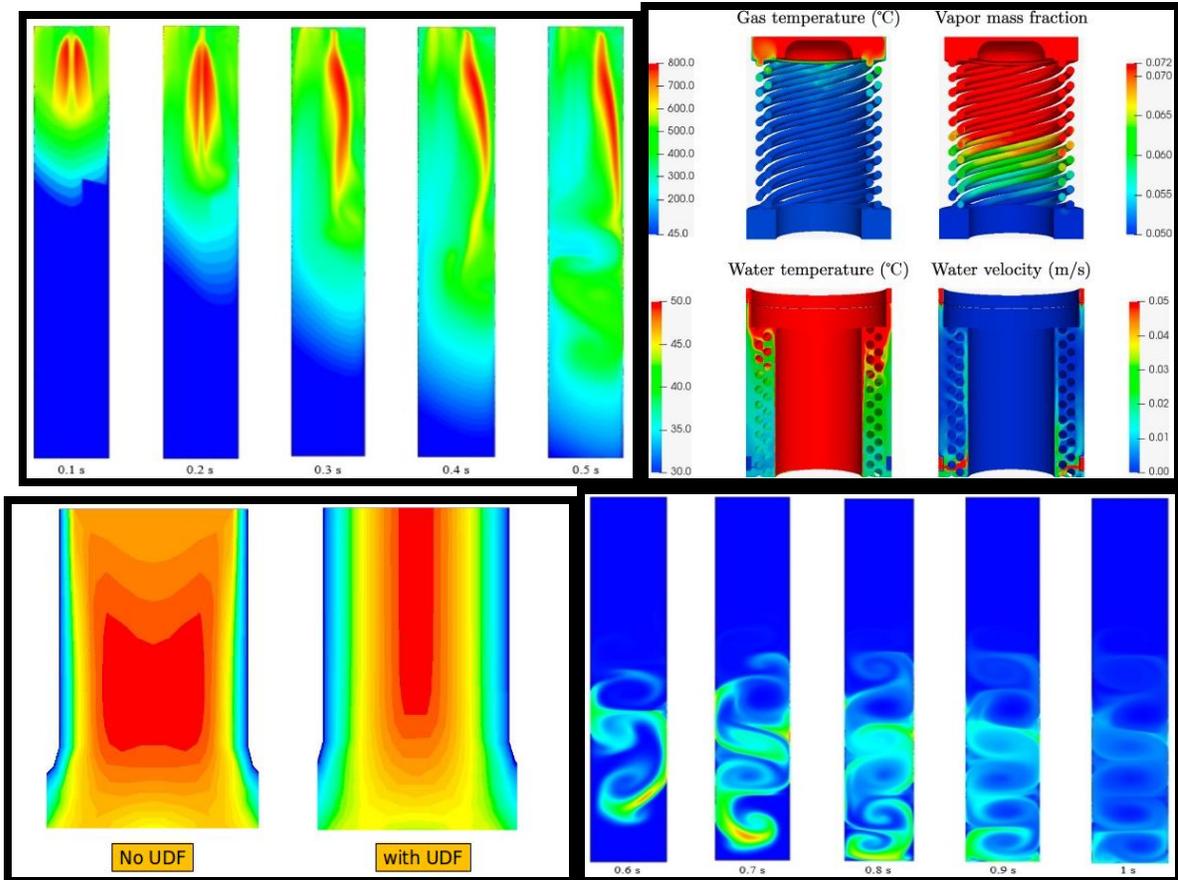


Figure (9) shows the temperatures

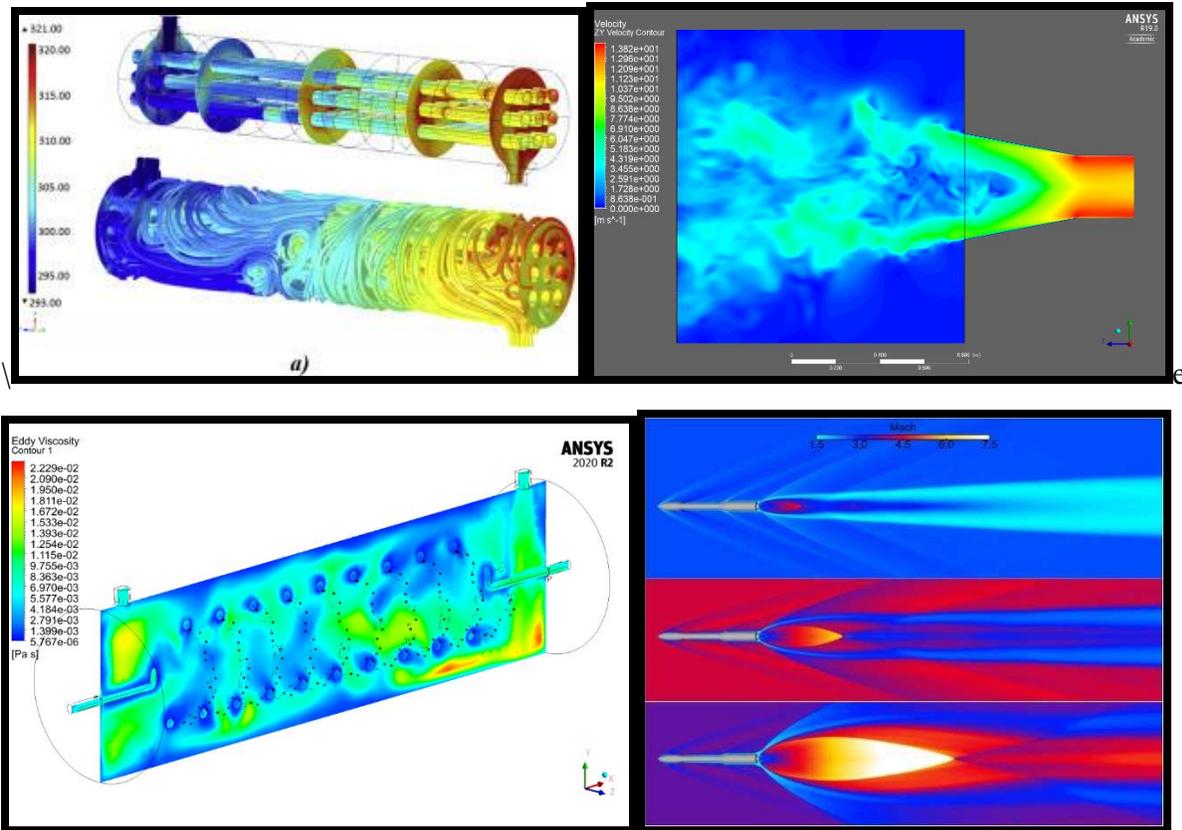
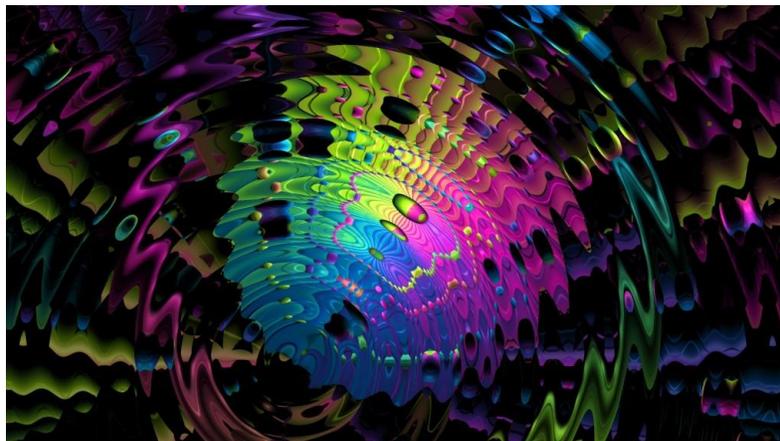


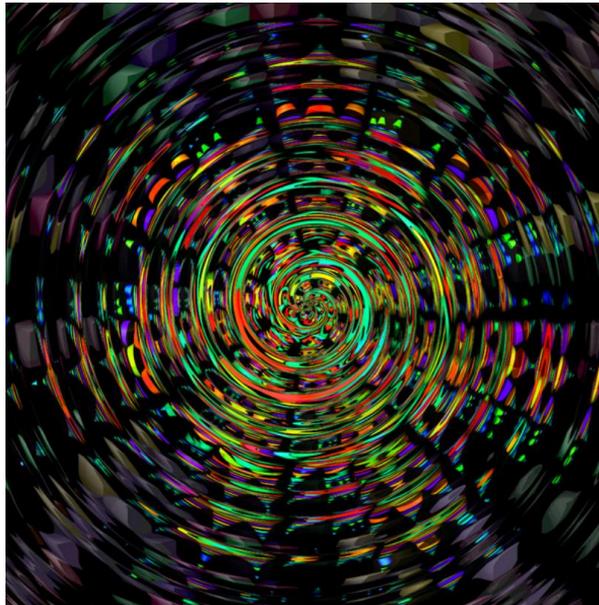
Figure (10) shows the speed distribution

### Sample Analysis Model (1)



The use of the blue color, which dominated most of the poster, and the red color came as an effective attraction for the company's logo, and the written tape at the bottom of the poster came to emphasize the need for the product in all seasons and atmospheres, achieved directionality through the succession of direction starting from the center of gravity of the painting at the bottom, where the bottle in front of the panel gave it sovereignty and directionality to the top parallel to the direction of the advertisement. To the top to move the recipient's eye to read the sequential visual dialogue to pull us the color of the red logo again to the bottom of the painting to be a balance of shape starting from the product itself and ending with the company logo.

**Model (2):**



Put the logo in the right corner of the recipient so that the recipient's attention is directed to the path of searching for the product until it reaches the recipient's view of the opposite angle at the bottom of the poster and confirmed the directivity through the movement directed to the yellow color between the logo and the product to show a clear sovereignty that emerges through the use of the blue color that dominated most of the poster and the white color came as an effective attraction for the company logo and the product

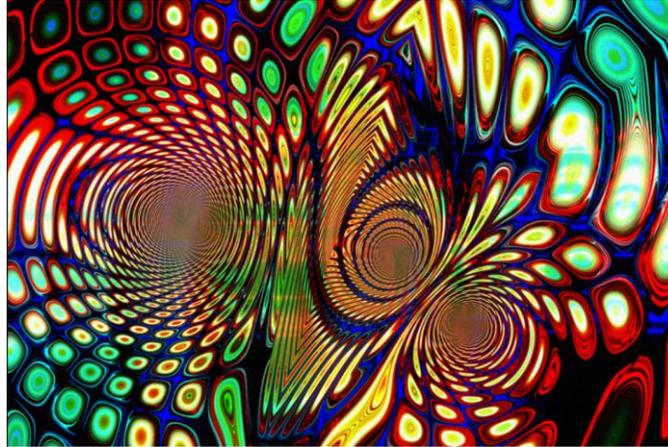
**Model (3):**



He used formal exaggeration in showing the company's brand using the white value clearly legible and took a large area of the label, which gave the center of attraction and at the same time has achieved a complete balance of the poster and employed the directivity read by the recipient from the top of the label and directed to the bottom to reach the main shape, which is the product box, as well as the directivity was employed to emphasize the direction of the recipient's eye towards the product, which supported the center of sovereignty and attracted attention to the product

The distinctive red color of the company was employed at the top of the poster used to achieve color balance at the top and bottom of the poster, which conveyed the meaning directly and the absurdity of employing part of the original painting and adding the product to it was inserted into the modern product on a panel of masterpieces or replacing the meaning of creation and life in this product.

**Model (4):**



The use of the yellow color, which dominated most of the poster, and the red color came as an effective attraction for the company's logo, and the written strip at the bottom of the poster came to confirm the need for the product in all seasons and atmospheres, our progressivity was achieved through the succession of direction, starting from the center of gravity of the painting at the bottom , where the bottle in front of the painting gave it sovereignty and directionality to the top parallel to the direction of the advertisement To the top to move the recipient's eye to read the sequential visual dialogue to pull us the color of the red logo again to the bottom of the painting to be a balance of shape starting from the product itself and ending with the company logo.

**Results**

- 1- The artist always takes the environment as an important source of inspiration because it is full of constructive systems and the contemporary designer has been able to observe the rhythm systems, balance, texture, proportion and other basics of design in many elements of nature, whether normal or microscopic vision.
- 2- Choosing colors inappropriately because they affect negatively or positively according to their good choice, and the design will not succeed if inconsistent colors are chosen.
- 3- Studies have shown that colors have a great impact on our lives, as they greatly affect our psychology and the way we feel.
- 4- The idea of using physical variables such as pressure and temperature, which are depicted in

a different form, produces a beautiful form in drawing and design programs. This is because the program reflects the results in forms of aesthetic value and beautiful color gradation.

### **Recommendations**

1. Further studies towards understanding the relationship between building mechanisms in physical variables and the external and structural appearance of phenomena in their natural state to benefit from them for graphic designs.
2. The need to pay attention to the advertising image as the best contemporary and most effective means of promoting and introducing the producer and products. 2
3. Paying attention to visual advertising in general and based on the optical image in particular, and bearing its high cost and using experts to qualify and train working cadres and develop their capabilities to advance this field in Iraq. 3
4. . Urging producers to conduct periodic measurements to know the effectiveness of their image-based advertising

### **propositions**

Conducting a study using physical phenomena of graphic designs in interior decorations.

### **References**

- Robert Gillam Scott: "The Teeth of Design", translated by Dr. Abdel Baqi Ibrahim, Mohamed Mahmoud Youssef, Dar Nahdet Misr, 1974
- Magdy Mohamed Amin (Dr.): "The environmental heritage roll and the extent of its compatibility on the elements of the internal bathing of the machine", research scattered, Faculty of Arts. Second Scientific Conference
- Magdy Mohamed Amin (Dr.): "Applied, Seventh Scientific Conference, November Yahya Hammoudeh (Dr.): "Architectural Formation", Dar Al-Maaref, 197 0
- Yahya Hammoudeh (Dr.): "The Theory of Color", Dar Al-Arif, 197 0
- Architectural (Digest - the international magazine of fine interior design, July, 1984.
- Homes & Gardens, London, Oct., 1990.
- interior Design, Hotel & Restaurant Giants, Paris, Oct. 1987.

- Mary Gillett, Making the most of Living Rooms & Halls, Orchis Publishing, Bedford bury (London, We2).
- Shadi Sadat Tayebi, the effectiveness of design elements like picture, text and color in aesthetic products advertisement, (Comparing advertisement in two countries of Iran and Sweden), Master Thesis, Jonkoping University, Sweden, 2010. 54.
- Lou Jacobs Jr, Professional Commercial Photography, Techniques and Images from Master Digital Photographers Technique, Amherst Media Inc, Publisher of Photography Books, USA, 2010. 55.
- Xin-Jing Wang, Mo Yu, Lei Zhang, and Wei-Ying Ma, Advertising Based on Users' Photos, Microsoft Research Asia, Harbin Institute of Technology, Beijing, China, 2009. 56.
- Keith Dewar, Charles H. Davis, Photographic Images, Culture, and Perception in Tourism Advertising: a Q methodology Study of Canadian and Chinese University Students, Faculty of Business, University of New Brunswick – Saint John, Canada, 2004. 57.
- Sibila Perenyi Arbutin and Jelena Kovacevic Voguing, Demand for/ Consumption of Culture Advertising Photography, The Higher Technical School of Professional Education, Proceedings of Informing Science & IT Education Conference (InSITE), Novi Sad, Serbia, 2010. 58.
- Linda M. Scott, Images in advertising: the need for a theory of visual rhetoric, journal of consumer research, University of Chicago press, USA, 2008. 59.
- Brisoux. J. E & Darmon Laroche, advertising management. Mc Graw Chris, Marketing Communication. 2nd. Ed. Prentice Hall. Europe. 1999. 105 60.
- Loke Hon Leong, Effectiveness of Commercial Photography in Advertising Field, Bachelor of Communication (Hons). A study of the Faculty of Arts and Social Science, University Tunku Abdul Rahman. Malaysia. May 2011. 61.
- Christopher D.B. Burt & K. Strongman, Use of Images in Charity Advertising Improving Donations and Compliance Rates, Department of Psychology, University of Canterbury, Christchurch, International Journal of Organizational Behaviors, New Zealand 2000. 62.

- Jung Meitsen, Use of Images in Charity Advertising Improving Donation and Increasing the Self Image for the Mentally Disabled, National Kaohsiung Normal University, Jungmei, 5@Hotmail.Com, Taiwan, 2012. 63.
- Monia Rupert, Advertising Photography Transcend Commercial Concern and be Viewed as an Art from, National Diploma Photography. Visual Communication 111, 2004204,
- Wells, August 2007. 64.
- Sasi Rekha V. Advertisement Pressure and its Impact on Body and Body Image Perception of Women in India, Articles Global Media Journal – Indian Edition, Sponsored by the University of Calcutta, June 2012