D. Ismail, K. anayet, N. Indra, M. Dina M, M. Ahmed, A. Rosnazri [3]in 2006 have published paper describes the design guidelines of an AC induction motors based on recycling. This explains the details description of the induction motor or machine parts how to reuse. The design guidelines applied to induction motors and investigated in this manner should have; higher reliability and availability, lower initial and operating costs, smaller losses and environmental advantages.

Mehmet cunkas and Ramazan Akkaya in 2006 [4] have used an optimal design method to optimize the induction motor in manufacturing process. The optimally designed motor is compared with an existing motor having the same rating. The Genetic algorithm is used for optimization and three objective functions namely torque, efficiency and cost are considered. The motor design procedure consists of a system of non linear equations which imposes induction motor characteristics, motor performance, also computer simulation results are given to show the effectiveness of the roposed design process .

S. Subramanian and R. Bhuvaneswari [5] in 2007 have used particle swarm optimization (PSO) technique for optimum design of single- phase induction motor (SPIM) on the basis of maximizing the efficiency of the motor simultaneously satisfying a set of performance constraints.

METHODOLOGY OF RESEARCH

In the present research, the new design empirical formulas which correlated between the motor horse power P or Q in VA and the motor geometrical dimensions (stator length L_s , rotor peripheral length La $=2\pi D$.) and added new third dimension Lt represents the inner peripheral length of the stator slot tooth.

The practical Data that were accumulated from many of single phase induction motors and handled by using mathematical model that is called pseudo inverse.

INDUCTION MOTOR SOFTWARE PROGRAMS AND MATHEMATICAL MODEL

1- The software programs in this research are MATLAB program in design and implementation the mathematical models
2- Dr. Vienott, [6] has developed recently 'VICA-42I' software for single phase motors design on a computer, the program can also handle problems involving only circuit constants and treat with the complete magnetic design.
3- Mathematical model -pseudo inverse[7].

As known, the inverse matrix is defined for square matrices only; it is used in the solution of sets of linear equations of the form AX=Y in which the number of equations is equal to the number of unknowns. For non square matrices used to describe systems of equations where the number of equations does not equal the number of unknowns, the mathematic model is the pseudo inverse.

BRIEF RESULTS AND DISCUSSION

Bellow, all the correlations were obtained from the Tables (1-3) sequentially.

$$P\max = 0.151 \times L_s - 0.1098 \times L_a + 0.8863 \times L_t \quad \text{....} \quad (1)$$

This correlation from Table(1) for the range of motors power from 0.5 h.p. to 2.0 h.p. with the same number of slots(24), speed (nearly 3000 r.p.m.) and poles(2P=2). Add another motors will expand in scope and improve this correlation horizontally to cover greater range and vertically to be more accurate.

$$P\max = -0.0063 \times L_s + 0.0615 \times L_a - 0.0188 \times L_t \quad \text{......}(2)$$

This correlation from Table(2) gives the relation between the maximum power of motors (1 h.p.) and their engineering dimensions (L_s,L_a,L_t), all the specifications of the motors in this table have the same number of slots(24), speed (nearly 3000 r.p.m.) and poles(2P=2).

$$P\max = -0.0678 \times L_s + 0.1247 \times L_a - 0.0270 \times L_t \quad \text{.....} \quad (3)$$

This correlation from Table(3) gives the relation between the maximum power of motors (2 h.p.) and their engineering dimensions (L_s,L_a,L_t), all the specifications of the motors in this table have the same number of slots(24), speed (nearly 3000 r.p.m.) and poles(2P=2).

CONCLUSIONS

1- From the last estimated correlations , there is new method enable us hastily to notify the power of single phase induction motor squirrel cage until its name plate not present, without needed to the complicated equations[7].
2- If the power and dimensions of any single phase motor are known، the information of cage wire and number of winding easily get from specialist tables.
3- The control in dimensions of motor enable us to make compatibility with the dimensions of the place which we As the recommendation, the future work will set up program using

4- As the recommendation, the future work will set up program using MATLAB to merge this new correlations and previous design correlations, for three phase induction motor.

Note(1): All the values (Pmax, L_s, L_a, and L_t) were mentioned in the Tables below are standard (practical) and recorded directly from the motors.

Note(2): In the Table (1), the maximum power values were varied and taken for different motors, the proposing to set mathematical formula connect between different maximum power value and range of dimensions L_a, L_s and L_t.

In Tables (2&3), for one fixed value of maximum power, many motors were made which has different dimensions L_s, L_a, and L_t.

Table (1): Single phase motors have different power with speed nearly 3000 r.p.m., slots no. equal 24 and 2P=2.

Ls	La	Lt	Pmax
4.0	15	2.3	0.5
4.5	15	2.0	0.5
7.5	18	2.0	0.55
7.0	18	2.0	1.0
7.0	20.5	3.0	1.5
7.0	22	3.0	2.0

Table (2): Single phase motors (1 h.p.) with speed nearly 300 r.p.m. , slots no. equal 24 and 2P=2.

Ls	La	Lt	Pmax
8.0	17.5	2.3	1.0
8.0	18.5	2.4	1.0
8.0	17.5	2.0	1.0
6.5	17.5	2.5	1.0

Table (3):single phase motors (2 h.p.) with speed nearly 3000 r.p.m. , slots no. equal 24 and 2P=2.

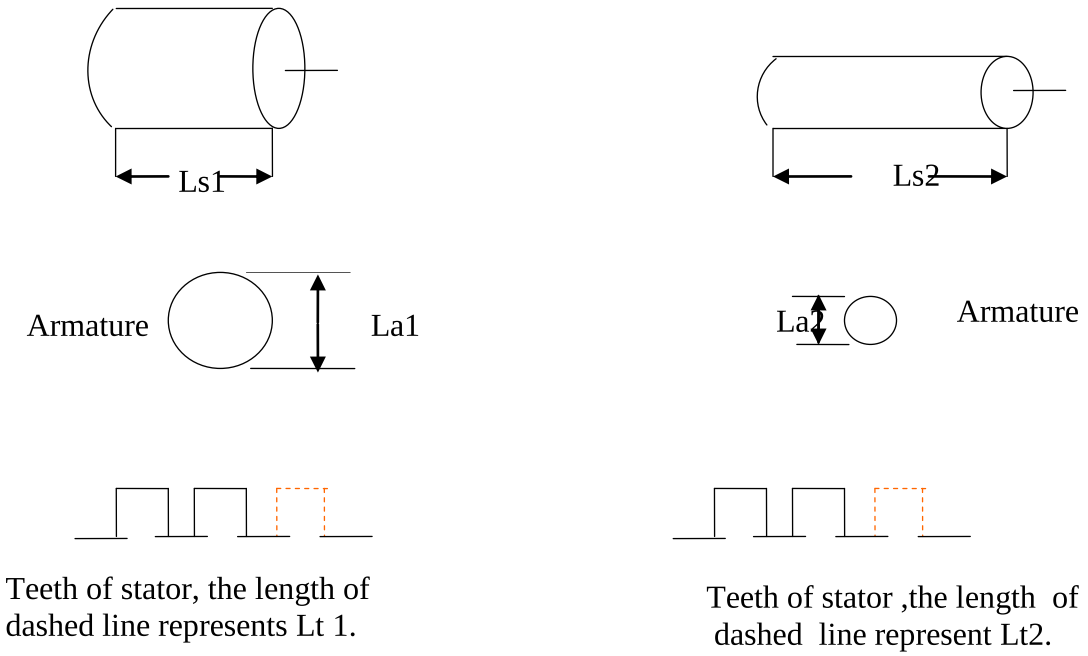
Ls	La	Lt	Pmax
6.5	20	2.5	2.0
7.0	20.5	3	2.0
7.0	20.5	2.5	2.0
10	22	2.5	2.0

REFERENCES

1. S.A. Mohammed, ”Design of Induction Motors”. Thesis University of Baghdad, Sept.
2. A.K. Sawhney, " A course in Electrical Machine Design" Professor and Head, Electrical and Electronic Engineering, Thapar institute of engineering and technology.
3. D. Ismail, K. anayet, N. Indra, M. Dina M, M. Ahmed, A. Rosnazri, " Design Guidelines For Recycling AC Induction Motors", American journal of Applied Science 3(10) 2054-2058, 2006.
4. Mehmet cunkas and Ramazan Akkaya, " Design Optimization of Induction Motor by Genetic Algorithm and Comparison with Existing Motor", mathematical and computational applications,Vol.11, No.3, pp 193-203, 2006
5. S. Subramanian and R. Bhuvaneswari, " Optimal Design of Single Phase Induction Motor using Particle Swarm Optimization" the international j for computation and mathematics in electrical and electronic engineering, volume 26,issue 26, page 818-430,2007.
6. Dr. Vienott, "VICA-42I, software for single phase motors design on a computer", www.acmotorcad.com/software.html.
7. R. Penrose, “A Generalized Inverse for Matrices”, Proc. Cambridge Phil. Soc., 51, 406-413.

NOMENCLATURE

SYMBOL	DESCRIPTION	UNITS
L_a	Peripheral length of armature	unit length (cm)
L_s	length of slot	unit length (cm)
L_t	Peripheral length of tooth	unit length (cm)
P_{max}	Maximum power	horse power



(a) Motor with its dimensions (Ls1,La1,Lt1)

(b) Motor with its dimensions (Ls2,La2,Lt2)

Fig.(1) : Comparison between two motors with their three dimensions (Ls,La,Lt).

صياغة معادلات تصميمية لمحرك حثي أحادي الطور ذو القفص السنجابي

خالد غضبان محمد السحاب

مدرس مساعد

كلية الهندسة . جامعة ديالى

الخلاصة

الهدف من أجراء هذا البحث هو أيجاد معادلات رياضية تصميمية لمدى من المحركات الحثية نوع القفص السنجابي أحادية الطور تمكننا من التحكم بسهولة ومرونة في اختيار الأبعاد الرئيسية للمحركات حسب القدرة المطلوبة. أيضا يمكننا وضع معادلات تجريبية تربط بين قدرة المحرك وإبعاده الهندسية لعدة مديات ومن ثم اختيار خصائص ملفات الستيتر بالرجوع إلى جداول الملفات ذات العلاقة بالأبعاد الهندسية للمحرك وقدرته. هذه المعادلات الرياضية تم التوصل إليها في هذا البحث والتي تربط بين بارامترات المحرك بالاعتماد على بيانات عملية أخذت من عشرات من المحركات الحثية أحادية الطور ذات القفص السنجابي ومن ثم الاستعانة بالنموذج الرياضي لتحقيق ذلك.