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Aspects of Modern Energy Saving Block Technology in House Building Sector of Uzbekistan

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ABSTRACT: Today there is a colossal competition in the market of building materials in the world. Therefore, by making a small detour of the main points of purchase, building materials such as a hypermarket, a bazaar or a warehouse, it will not be difficult to find the most reasonable price. But various materials are significantly different price for any building projects. Is there any solution for getting your own cheap and quality home? Of course have! And this decision is to build a house with our own hands on time and on budget in a particular restricted time of period. It is clear that the innovative construction is for the near future the only way to build a house is inexpensive for the majority of householders.

KEYWORDS: Gypsum block, thermal, energy saving, gypsum block features, heat transfer, cheap house, architecture of thermal building**.**

I. INTRODUCTION

Modern house building architecture is enriched by the uneven heating of Earth's surface from solar radiation, and an example of convection, specifically atmospheric convection. Thermodynamic and mechanical heat transfer is calculated with the heat transfer coefficient, the proportionality between the heat and the thermodynamic driving energy. Beside the previously mentioned benefits, and considering that the final energy use in domestic buildings is dominated by thermal energy thermal energy storage, or heat storage, can play a major role in reducing the primary energy consumption in buildings and in the future energy grid [1].We would like to examine some of the most affordable building materials that can be used to build an inexpensive home. Today, it can be found in wide applications: *tween blocks*, *monolith*, *ceramicstone*,*thermal blocks* and etc. Among these materials can be called *foam concrete* and *aerated concrete*. As a rule, foam concrete is used for construction of suburban residential buildings.

The final design is reliable, durable and more durable, and the cost of construction will be quite budgetary. Foam concrete is known for its relative cheapness in comparison with other building materials. Its ability to keep heat, allows the use of material to build houses in places with an unstable climate. Ideal for self-building houses technology of non-autoclave gypsum foam block is especially true for our equipment, which you do not get "bare metal" - you get a full-fledged business for building even in huge planning houses. The structure of our resource, in addition to directly technological documents, includes recommendations and drawings for building your own house. The thermal mass of a building can absorb the cold when the indoor temperature is lower, and release the cold when the in- door temperature rises, thus decreasing or shifting the peak demand of air-conditioning systems[2].

II. METHODS AND MATERIALS

In this paper work we used for our research question ground theory, secondary data analysis / archival study, comparative analyses, experiments and some statistical analysis. The literature includes a large number of articles on energy performance of the residential and commercial buildings. Many researchers have examined porous materials as affordable and promising means of improving the energy efficiency of buildings houses. However, currently, there is some review article exclusively focused on heat transfer mechanism for the building energy technologies.
AAC was perfected in the mid-1920s by the Swedish architect and inventor Dr. Johan Axel Eriksson, working with

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Professor HenrikKreüger at the Royal Institute of Technology. It went into production in Sweden in 1929 in a factory in Hällabrottet and quickly became very popular. Siporex was established in Sweden in 1939 and presently licenses and owns plants in 35 locations around the world. In the 1940s, the trademark Ytong was introduced, and was often referred to as "blue concrete" in Sweden due to its blue performance. This version of Ytong was produced from alum shale, whose combustible carbon content made it beneficial to use in the production process [3].

III. RESULTS

Discussing the main outcomes with reference on thermal energy storage can be divided into three main categories according to the storage mechanism: sensible, latent, and sorption heat storage. Having built house as cheaply as possible in the future you will receive a ready-made, very necessary right now, business for the construction' of cheap and high-quality houses already applied in most of the foreign countries in various types of brands. In accordance with the modern engineering of the science world architecture under a major cheap and quick house building projects already proved its effective and efficient factors almost all regions of the world countries.

Such as"Ytong"aerated gypsum block -USA, EDGE-India, and Hongfa-Germanyare suitable for all bearing and reinforcing walls. The low dimensional tolerance and the tongue and groove profiling enable rapid processing in the thin-bed method with a joint thickness of 1 mm. The result is a high-quality and homogeneous gypsum block with excellent thermal insulation. Due to the low weight, aerated these blocks are also suitable for internal walls to be retrofitted as well as for reconstruction and renovation measures. It is described at following picture. Foamed concrete is produced either by pre-foaming method or mixed foaming method. Pre-foaming method involves the separate production of a base mix cement slurry (cement paste or mortar) and a stably preformed aqueous (foam agent with water) and then the thorough blending of this foam into a base mix [4].

Fig1. New generation of Energy Nautical AAC building block [5]

These gypsum blocks are ecological and non-combustible material makes the construction materials extremely safe and allows their construction cost and time. Approximately, half of the construction costs is the payment for the work. When building a cheap house, it is more expedient to produce the maximum amount of work without attracting hired workers for maximizing efficiency and effectiveness at house building. If we would like to speak about structure of the block it is made of following elements which are available almost all regions [5].

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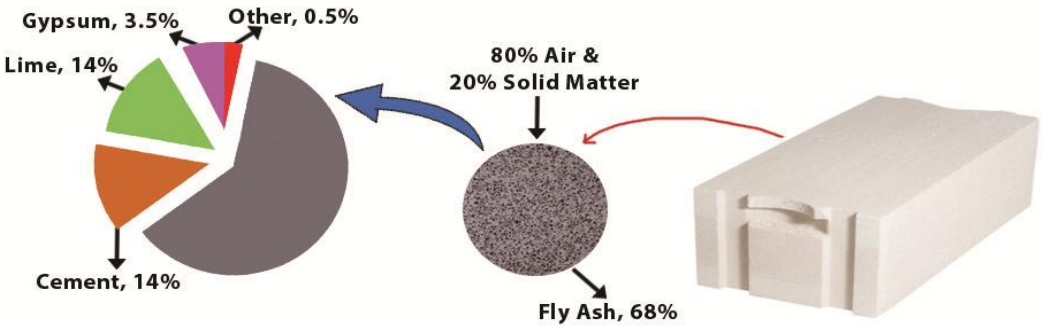

Fig2. Structure of the thermal building blocks

The price of the material deserves a separate conversation. But when choosing the material, it should be remembered that among the foam blocks, the price difference directly indicates the quality. Chemical composition of the block is gypsum, lime, cement, solid matter in 20% and most of the structure is fly ash which is 68% of the total mixture.

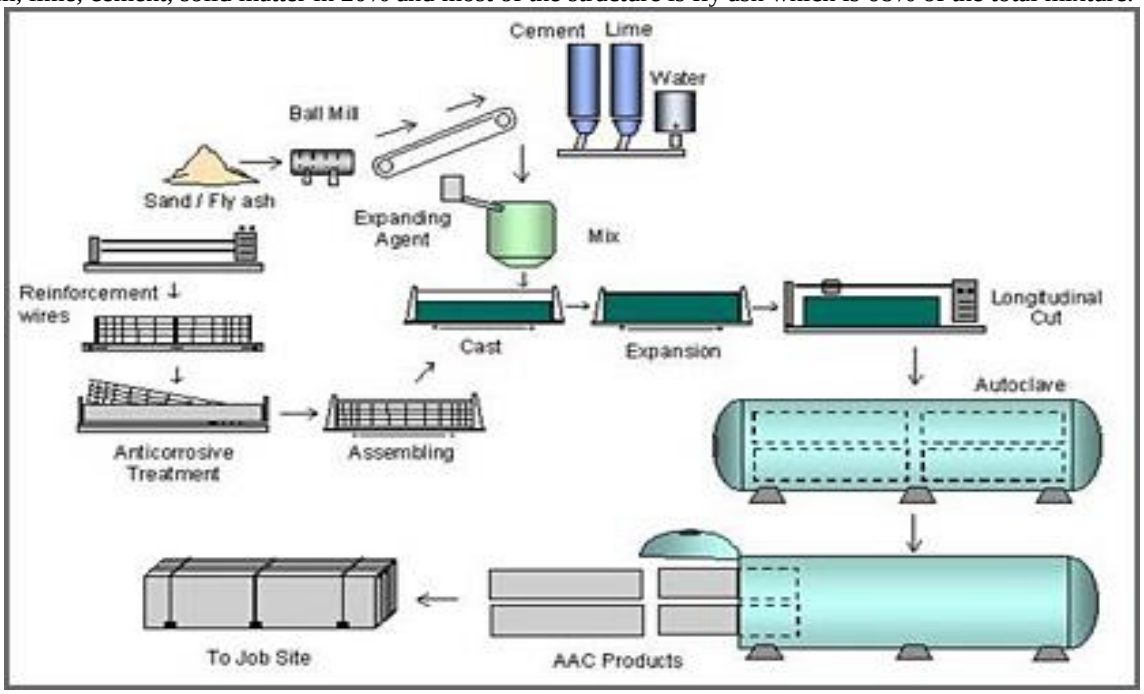

Fig3. Manufacturing process of the aerated concrete complex plant

In next section of our research we will describe complex production line in plants.

1) For the production of aerated concrete block, a safe raw material is used: cement (~ 20%), lime (~ 20%), quartz sand (~ 60%), aluminum (~ 1%) and water.

2) The basis of aerated concrete is sand, which must be pretreated.

3)Ball mills are used for mixture.

4) Inside the drum such balls that grind the sand before turning into dust.

5) After that, the feedstock enters the storage bins for storage.

6) Mixed components, water and a suspension of aluminum paste are added.

7) Aluminum paste reacts with lime, resulting in hydrogen. It forms in the raw mass of a huge number of pores ranging in size from 0.5 to 2 mm.

8) After a while (2-3 hours), the conveyor transfers the mold with the frozen mixture to the next stage only the bottom of the pan at the expense of the vacuum.

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9) Now the frozen form is cut into blocks of equal size. First in the lateral, and then in the longitudinal directions.Ata time can produce blocks of only one size.

10) Outer surface of the blocks is sanded and pressed against each other.

11) The crane grasps the pallet, transfers them to the next stage of production.

12) Immediately the new pallet is laid in the base for the next batch of blocks.

13) Blocks must be placed in the autoclave. Left side "raw", right "ready".

14) Autoclaving is important step for properties of aerated concrete blocks.

15) The cut blocks are placed in special autoclave chambers, where they are for 12 hours at an pressure of 12 kg / sq. saturated steam at a temperature of 190 ° C.

16) Each autoclave has a length of more than 30 meters. Increases the strength of aerated concrete blocks and reduces its subsequent shrinkage (less than 1 mm / m).

17) Each batch of blocks after autoclaving is sent to the laboratory to check for compliance with the specified characteristics.

18) And ready blocks are sent to the packaging line which added in 2 rows. The positioning of the rows of blocks is done manually.

19) Then they are turned on their side under already installed wooden pallets. After that, the blocks are sealed in a film and sent to the warehouse.

20) The main products of the plant are blocks of thickness from 50 to 500 mm with a density of 400 to 500 kg / m3 [6-7].

In this paper we propose among the advantages of building a house made of foam concrete, one can distinguish such qualities:

Table 1.Advantages of a house made of aerated gypsum block

1. High strength	6. Long lasting
2. Light weight	7. Fire proof
3. Cost saving	8. Thermal insulation
4. Accurate dimensions	9. Workability
5. Sound proof	10. Eco friendly

This paper has proposed for buying only modern construction material technology of its installation is designed for a simple average person .Construction does not require to have professional skills and will save money for building houses and apartments. As a work force, you can draw one assistant if you do not have free time to build a house with your own hands, chance for hire a team of two people with the appropriate qualifications, leaving behind the control of the work.

Fig4. Aerated gypsum blocks are in construction process

This paper is a modest contribution to the ongoing discussions about living in own home has much more advantages than even in the most luxurious apartment. A private home is a place where you are free to do whatever you want. Here you will not be disturbed by noisy neighbors who would like to do repairs from early morning or late. Many are used to believe that buying a plot, and even more so building a house on it - is fabulous money. However, with the

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development of modern technologies in construction, the cheapest construction technology of the house has become several times more affordable.

Table 2.Typical aerated gypsum blocks

Variables	Ultra-light density	Low density	High density
Compressive strength (N/mm^3)	0,5-2	3-8	5-10
Density (kg/ m^3)	110-300	300-500	500-800
Thermal conductivity (W/mK)	0,044-0,07	0,07-0,11	0,12-0,16

It was the main purpose of the paper to draw attention above the table whichdescribed physical parameters of the construction blocks. It is seen that weather factor are really influence with air density. Thermal energy is stable thanks for the strong physical states of the elements[8].

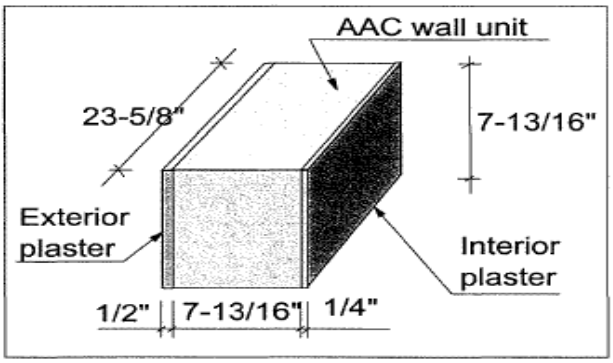

Fig 6. Aerated wall unit of the finished layers

Particular attention is paid to normally, the wall covered with light weight stucco on the outside and plaster on the inside as a shown in the picture. An unfinished wall was used for the hot box tested at particular Building Technology Centre. In accordance with the geographic factor coat technology should be applicable under the similar weather conditions like Eastern European countries. Due to quality building materials and technology optimization in construction industry can be implement such building materials for covering concrete construction elements during cheap house building system in Uzbekistan.

Fig 7. Cheap flat architecture in usage of aerated gypsum blocks

We have addressed not only the main principle of planning solutions for all residential buildings is based on the minimum ratio of the total area to useful but also modern and comfortable for living, simply speaking, from the total area need to get the most out of comfort. We can see the almost fulfilled construction project of the residential houses in follows.

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Fig 8.Common cheap flats for living

We have also considered the consequences of the actual blocks are pretty popular in market leading builders and architects. Most firms that have well learned and technically updated teams of planning engineers and execution engineers are using the modern blocks wherever possible. It is probably the common and not so updated team of engineers, architects and builders who are keeping away from using AAC/ CLC blocks. The fact that all major cement companies like Ultra tech, JK etc.

Our paper presents innovative offer architecture of 6 room flat building project. The width of the house is clean - 6 m which is quite normal for the flooring and does not require the construction of an additional capital wall. The cost of building a house directly depends on the total area, so despite the small size of the house (6 x 9 m), it houses three living rooms, and the living room (in which we spend most of the time) is 25.75 square meters. The planning decision of the united living room according to the generally accepted traditional world standardsallows saving on the absence of partitions and doors between the kitchen of the dining room and the hall. The width of the walls of the house is 30 cm (heat resistance, depending on the climatic zone, is regulated when facing "siding" the thickness of the additional insulation), respectively, reduces the width of the basement to 25 cm. The originality of our solution lies in the fact that all the partitions in the house are plasterboard, which does not require additional foundations for them, and they are made using simplified technology (more details in the working draft).

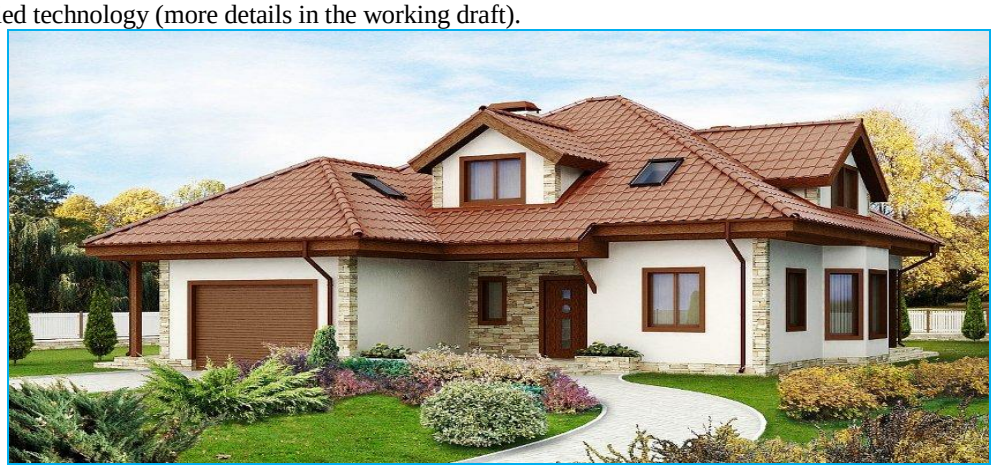

Fig 9. Planning schedule of construction works (team of 3 people)

The most interesting finding was that representing daily calendar schedule of the flat building construction project. In this picture we can see small and comfortable house with fascinated landscape and outdoor finished construction project. And at following table it is indicated daily planned working sphere and period in days. Due to it’s clear identification planning and design project fulfilled in a small period of time.

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Table3.Strategic planning of the building project

1) Foundation installation - 3 days	9) Partition device - 2 days
2) Erection of basement floors - 3 days.	10) Filler joints - 1 day
3) Masonry of external walls - 5days.	11) Pasting with wallpaper -2days
4) Manufacture, installation of trusses, the device of a roof - 3 days	12) Installation of door blocks - 1 day
5) Installation of door and window units in exterior walls - 1 day	13) Installation of engineering networks and sanitary equipment - 3 days
6) Siding - 3days	14) The device of floors - 3 days
7)Installation of electrical wiring - 1 day	15)Total project period is 32 work days
8) Facing of bearing walls and filing of the ceiling with gypsum boards - 2 days	16) Taking into account unforeseen work the construction period is 36 days.

When laying foam blocks the level is controlled all the time if necessary, more glue or mortar is added, if necessary, you can use the alternative methods. Leave the defects for later is not recommended, all defects are eliminated immediately. Every five to six rows the reinforcement is laid along the perimeter of the entire structure. When finished building a flat the next outdoor tasks start. Especially, tiling and grass landing gives to territory fantastic panama of elite design.

Disadvantage of aerated gypsum blocks

In the current study, comparing gypsum blocks with concrete construction material showed that the mean degree of house building from high demand and the decisive factor of the construction cost. As for the longevity of the material, the question is ambiguous, although in Europe there are still houses made of aerated concrete built 70 years ago, and nothing terrible has happened to them even humidity is very high level in this countries.

There some following recommendations decide to stop our choice on aerated blocks in our house building.

- take care of sheltering the material from moisture during construction;
- provide good waterproofing after erection;
- internal and external furnish it is better to proceed at once to protect aerated block while plastering from a moisture;
- decoration, hiding all the cracks for a long time, will be fiberglass;
- due to the great hygroscopicity of the material, it is recommended to prime the surface twice, the first time - with a diluted primer;
- as plaster is better to use materials based on gypsum.

IV. RESULTS

Based on the results, it can be proposed that energy saving block technology and heat transfer mechanism for thermal research have been very successful project in Uzbekistan. Under the initiative and the leadership of First President of the Republic of Uzbekistan Islam Karimov council housing based on model projects have radically changed the appearance of villages and contribute to the well-being of the population of the almost all regions of the country. At the same time, the construction of various modern infrastructure facilities and highways creates great conveniences for the population. From the outcome of our investigation it is possible to implement that Decree of the President of the Republic of Uzbekistan about the State Program of Construction of Cheap Housing on renewable projects in rural areas in 2017-2021 is mainly directed support social sector of the country.

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Fig 10. Cheap Complex Housing Architecture (Tashkent region, 2015-2018)

This research was concerned with large-scale work has been done to build individual houses in rural areas for model projects, however, the results should be applicable for cost reduction and decreasing construction project time. Advantages of this model is applied in the period from 2009 to 2016, 69,557 comfortable houses with a total area of 9,573 square meters were built in 1308 residential areas in rural areas. Living conditions of more than 83.5 thousand families in rural areas have improved.

The family home plays a central role in life in Uzbekistan. The findings suggest that this approach could also be useful for a place for celebrations, for hosting friends, and where several generations live together under one roof. But many houses in rural areas are of poor quality when compared to those in cities. Since independence from the Soviet Union in 1991, the pace of building houses in rural areas has failed to match the rate of population growth, with only 60,000 houses coming onto the market each year. Together with limited employment opportunities, this has caused many people to relocate to urban areas in search of work and a suitable place to live.

The findings are of direct practical relevance of cheap building wall envelopes Development (HIRD) program on Government Housing for Integrated Rural of Uzbekistan launched in 2009, which aimed to build 93,000 high-quality rural houses, along with infrastructure such as schools and sports facilities. In 2014, the Islamic Development Bank (IDB) agreed to help finance the ambitious program. Following this, thousands of houses have been built in rural areas near the cities of Fergana, Samarkand and Tashkent – and many people are now enjoying the benefits of their modern homes. Government of Uzbekistan allocated families land to build houses. However, people often lacked the resources to complete the work, or switched to cheaper, lower-quality materials. Many rural houses were built from mud bricks rather than ceramic bricks, but these often only lasted for around 30 years, meaning each generation had to rebuild the family home.

Further study of the issue is still required traditional mud-brick houses often needed rebuilding by every generation, the modern houses are designed to last for 200 years, providing a sound investment for families. “We used to live in a village close by, in an old-fashioned house,” says AbdullajonNazarov, a retired food trader who now lives in the Beshkurgandistrict near Fergana. Here families were very keen to move, largely due to the better quality of the new envelope homes. Six other families from their village moved at the same time, keeping social ties intact. We have to be serious about building a modern generation of construction contractors and builders. For this purpose, the program of innovative development of the construction industry till 2030 will be developed. In this regard, we create all the necessary conditions for attraction of qualified specialists from abroad and training of local specialists abroad. Next year, we will continue to work on further improving the architectural image of our cities and villages [9].

V. DISCUSSIONS

To our knowledge, this is the first study to deal with cheap modern building material production in Uzbekistan helps to examine modern technologies on structure of the building materials, investigate innovative engineering approaches by studying western world experiences. This paper presents clear answer to find the to following development plan:

An efficient process: Housing with one design will be cost effective and will help develop the skills of the contractor. Government-supported schemes, such as large-scale economies, are economically more cost-effective when importing

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tax incentives and supplies.

Strong project management: QQI, the Project Implementation Unit, is staffed by a combination of experienced coordinators and young employees who bring fresh ideas and impetus. Rising effectiveness of the construction projects should be promoted by skilled and highly qualified Health and Safety Inspection monitoring at building sites under international standards and regulations.

Rural economy benefits: House building stimulates local economic growth by creating jobs and supporting businesses. This has a circular effect, as stronger rural economies mean more people can afford to buy new houses.

Building materials localization: Innovative approaches on construction industry manufacturing process should be upgraded with modern science and technology produce competitive materials, such as gypsum blocks and under the specialization of rural potentials will be cost cutting logistic expenses advantage. In the next section it is directed to export oriented construction materials for regional and international markets.

High-quality construction: The procedures applied by construction companies, and the skills they developed have raised the overall standard of rural house building. The new houses are of better quality than many in urban areas, which gives people an incentive to stay.

A variety of options: Providing a mix of three, four and five room houses met the population's diverse needs. In future phases, four designs will be used to meet requests for more variety. In behalf of consumers house project should be optional by cost, volume and area from conformability of client desire.

Sustainability: Reforms on energy saving construction materials for cheap house building program, and strong engagement between all contractors, will contribute to the overall stability of the rural construction sector [10].Reduction of external weather conditions influence local construction building materials appliance is also supported. It helps being stability of house usage period of all seasons.

VI. CONCLUSIONS

The findings of our research are quite convincing, and thus the following conclusions can be drawn, in modern innovation technology at field of construction is widely used and already tested in continents of the world. In spite of the economic development country tries establish cost and time budget housing projects are really actual. At the age of science and technology civil and mechanical engineering developed day by day. Due to the demographic problems all over the world pushes scientists invite new products almost all sectors even in construction sphere such as building houses, flat, offices, council accommodations. Modern approaches to save time, cost, and to provide an alternative to lightweight gypsum blocks in construction projects is to reduce the number of installed insulations on precast wall and to improve the properties of normal weight respectively. This paper has clearly shown that Hi-tech entrepreneurs have entered into thermal and construction blocks manufacturing shows that they see a vast market in the near future in Uzbekistan. Such kind of innovation technologies are still remaining unsolved while various types of economic preferences by the government increasing investment attractiveness of the country. State Program on Cheap Housing of Uzbekistan will enrich it's expansions via thermal gypsum and concrete block which eco-friendly rest of the regions of the country. And we believe developing prospective modern urbanization architecture of the cites will prove time, quality, and budget factors in construction once again in Uzbekistan.

REFERENCES

[1] Luca Scapinoa, Herbert A. Zondagb, Johan Van Baela, Jan Dirikena, Camilo C.M. Rindt, Energy density and storage capacity cost comparison of conceptual solid and liquid sorption seasonal heat storage systems for low-temperature space heating, Department of Mechanical Engineering, P.O. Box 513 5600MB Eindhoven, The Netherlands.
[2] WeilinLi, LiuYang, YingJi, PengXu, Estimating demand response potential under coupled thermal inertia of building and air-conditioning system, Energy & Buildings1 82(2019) 19–2.
[3] Mallampalli.Ch.,G.Subash1,V.S.V.Satyannarayana, Jangasrinivas. aerated autoclaved concrete (aac) blocks: a revolution building material in construction industry, International Journal of Science Technology and Management. February, 2016, ISSN 2394-1537.
[4] Ali J. Hamad,Materials, Production, Properties and Application of Aerated Lightweight Concrete: Review, International Journal of Materials Science and Engineering Vol. 2, No. 2 December 2014.
[5] H+H International and Xella Nederland.

ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

Vol. 6, Issue 3, March 2019

[6] Wherhahn,The intelligent choice, Autoclaved aerated concrete production plants, Report, Germany, 2017.
[7] Folker h. Witfmann, Advances in Autoclaved Aerated Concrete,Swiss Federal Institute of Technolog, Zurich.Rotterdam /Brookfield, 1992.
[8] https://www.thebalancesmb.com/what-is-autoclaved-aerated-concrete-844759.
[9] President's Appeal to the OliyMajlis of the Republic of Uzbekistan ShavkatMirziyoevon December 28, 2018.
[10] A Place to Call Home: Modern Housing Across Rural Uzbekistan, Sector
[11] Housing Construction, 2017-05-01. https://www.isdb.org/project/a-place-to-call-home-modern-housing-across-rural-uzbekistan.
[12] AL kulabiAhmeda, HakobAvetisyan, Reducing Time and Cost ofConstruction Projects by improving the Properties of Precast Normal-Weight Wall Panels, Procedia Engineering 145 (2016) 1066 – 1073.