

INNOVATION IN BAC NAM HA HYDRAULIC WORKS EXPLOITATION SINGLE-MEMBER LIMITED LIABILITY COMPANY

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Abstract: *Bac Nam Ha Hydraulic Works Exploitation single-member limited liability company has managed and exploited one of the largest hydraulic work systems in the Red River Delta region. In recent years, the company has boldly innovated the way of project management and exploitation, water management and financial management. Subsequently, it effectively serves agricultural production, people's lives and the environment deserving to be the industry leader.*

Keywords: *Bac Nam Ha, Six large pumping stations, hydraulic works exploitation, management innovation.*

1. INTRODUCTION

Bac Nam Ha hydraulic work system belongs to the two provinces of Nam Dinh and Ha Nam, including 8 administrative units (Ly Nhan, Binh Luc, Thanh Liem districts and Phu Ly city of Ha Nam province; Y Yen, Vu Ban, My Loc districts and Nam Dinh city of Nam Dinh province). The system is surrounded by level I and level II river dikes of four large rivers (Red River, Dao River, Day River and Chau River). The system has basin terrain with elevation from 0.5 to 1.5 m making it a low-lying area. In the past, such area could only plan spring-season crop with low productivity and unstable conditions. During the rainy season, inundation used to be occurred in the fields, villages and roads influencing on traffic, people's lives and socio-economic development.

From 1960 to 1972, the government of Vietnam invested in building a electric hydraulic work system for irrigation and drainage purposes, with an initial scale of 6 large electric pumping stations arranged along the great dykes. The system of irrigation canals and drainage canals and drainage basin is divided by regulating

culverts. After many years of development, the system is now basically complete from the head works to the field including 5 irrigation areas and 8 drainage areas. The key head works managed by Bac Nam Ha Company include 8 large electric pumping stations (Huu Bi, Nhan Hoa, Coc Thanh, Vinh Tri I, Vinh Tri II, Co Dam, Song Chanh, Kinh Thanh II), 4 medium electric pumping stations (Nham Trang, Nhu Trac, Quy Do, Kinh Thanh I), 08 main drainage canals over 120 km long; 01 main irrigation canal at Huu Be pumping station over 8.5 km long, 21 culverts and locks under level I and II river dikes; 08 regulating culverts divide the drainage basin of the system (Vinh Tru, 3-2, La Cho, An Bai, My Do, Canh Ga, Vua, Cau Geo).

The hydraulic work system is responsible for irrigation of 50,000 hectares with frequency $P = 85\%$, drainage of 100,261 hectares with frequency $P=10\%$, water supply of over 1.3 million people, flow maintenance on the main canals in the system contributing to reducing pollution, water resource depletion and improving the ecological environment.

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In addition to the main tasks, the company also carries out a number of business lines such as topographic survey consulting, design consultancy; supervision of construction of hydraulic works, mechanical and electrical works and civil construction; construction of hydraulic works, rural transportation, civil works, low voltage lines and electrical transformer stations with capacity equal to and less than 35KV; processing, installation and repair of civil electrical and mechanical equipment; repair and installation of engines and pumps with capacity equal to or less than 32,000 m³/h; conduction of experiments and calibration of secondary circuits with voltages equal to and less than 6KV; production and trading of construction materials, small and medium-sized precast concrete with a volume of less than 2 m³; dredging, digging and filling irrigation canals and level I drainage canals; ground filling; diving to survey and repair underwater structures.

The company's organizational structure includes a Chairman, a Director, Deputy Directors, a Controller, a Chief Accountant. Besides, there are 5 functional departments (Organization - Administration, Planning, Engineering, Finance - Accounting and Water and Construction Management), 9 affiliated units (7 electric pumping station branches, 1 irrigation project construction consulting enterprise and 1 project construction and repair enterprise). The current total employees of the company are 374 people.

2. DIFFICULTIES AND CHALLENGES

2.1. Regarding policy mechanisms and law enforcement on hydraulic work

The work of building, promulgating, amending and supplementing guiding documents and policy mechanisms in the hydraulic work sector in some aspects is still not timely and not close to reality; lack of strong enough sanctions to create a deterrent preventing violations of the

hydraulic works.

The hydraulic works managed by the company are located in the two provinces of Nam Dinh and Ha Nam, the different regulations on the surrounding areas to protect the hydraulic works between such two provinces making it difficult to handle violations.

The price frame for public hydraulic work services issued by the Ministry of Finance (MOF) according to the 2012 cost level is not consistent with reality. The company has based on economic and technical norms and legal regulations to build and submit to 2 ministries (MARD and MOF) for approval of prices for public hydraulic work services since 2018, but MOF approved prices according to the price framework issued in their Decision No. 1050a and Decision No. 1477 that does not regulate price subsidies. If the ordering method is applied and not distributed by payment order, it will be very difficult for hydraulic work system exploitation companies.

According to the provisions of Decree No. 129 and the Law on Management and Use of state capital invested in production and business at enterprises, the procedures and authority to hand over capital and hydraulic work infrastructure assets are very complicated and difficult to implement. Currently, the company has been assigned by MARD to manage and exploit the Kinh Thanh II pumping station but has not been approved by the competent authority to supplement its charter capital.

2.2. Regarding hydraulic work management and protection

The hydraulic work system is scattered across a wide area, the drainage canals run through many residential areas, towns and cities making them difficult to inspect and detect encroachment violations. People have not seriously complied with the Law on Hydraulic Works and related documents.

Some local authorities have not fulfilled their responsibilities well and avoided handling violations according to their authority. The situation of violations within the protection scope of hydraulic works managed by the company is mainly on irrigation and drainage canals. It is very difficult to determine the actual protection boundaries of the works. On the other hand, many local households have been granted certificate of land use rights within the scope of the hydraulic work protection making extremely difficult in inspection, detection and handling.

2.3. The hydraulic work system has been exploited for many years

Bac Nam Ha hydraulic work system has been built and put into use for over 50 years. MARD has invested to repair and upgrade main pumping stations gradually restoring the project's capacity according to design tasks, ensuring safety during operation. However, some medium pumping stations such as Song Chanh, Quy Do, Kinh Thanh I have not been repaired and upgraded so their service capacity is still limited and ineffective.

On-farm hydraulic works at level I and II managed by local companies and localities in the hydraulic work system of Bac Nam Ha company have not been invested in dredging, repairing, and upgrading in sync with the main works making the capacity service limited and investment capital has not been effectively promoted.

2.4. Climate Change

The meteorological and hydrological weather situation in the region has many adverse effects on agricultural production such as drought, water shortage in the Winter-Spring crop, heavy rain and flooding in the Summer crop. The extreme weather phenomena such as heavy rain, storms and floods are going to occur more frequently with great intensity, irregularly; subsequently, the water in the system during the

events need to be drained increases over its drainage ability.

2.5. Change in land use structure and farming methods

The economic structure of localities in the system has undergone a strong shift with the increase in the proportion of industry, services and constructions. The development of industrial zones, clusters, urban areas results in the increase in population, the decrease in pond area, water surface, and agricultural area. Subsequently, the drainage coefficient is reduced and drainage flow of the system is exceeded the construction capacity.

The farming method shifting from rice transplanting to direct sowing is increasing (direct sowing area accounts for about 70% of the total sowing area), so the requirement for the number of system operations increases leading to increased production costs.

2.6. Transport infrastructure development

Along with the process of socio-economic development, transportation infrastructure in the Bac Nam Ha area has also been invested and developed. The large roads have divided and changed the irrigation and drainage areas of pumping stations according to the system planning.

2.7. Water pollution in the system

In recent years, the process of industrialization and urbanization is making increase in violations of the law in the management, exploitation and protection of the hydraulic works. The discharge of untreated wastewater to the channels in the Bac Nam Ha system tends to increase by year in both scope and level.

3. INNOVATION OF THE WAY OPERATING AND EXPLOITING THE HYDRAULIC WORK SYSTEM

In the context of restructuring the economy and

agricultural sector, hydraulic work management is required to be fundamentally innovated, financially sustainable, and maximize the potential and advantages of the hydraulic works to meet the requirements of production, people's livelihood and sustainable development. In common difficulties, Bac Nam Ha Company boldly innovated.

3.1. Innovation and application of information technology in operations

The company has deployed information technology applications in system management and operation since 2014. Operating information and updated data to serve operating activities has been publicized on the company's website (<http://bacnamha.com>).

Currently, the company is hiring a unit providing services to automatically monitor water levels at 40 points and rainfall at 17 points to support the hydraulic work system operation for agricultural production and natural disaster prevention, ensuring technical and accurate requirements serve well in administrative work. The monitoring data is updated continuously and accurately on the website supporting timely and effective management decisions. There are 8 in 12 major electric pumping stations installed with a SCADA system to monitor, warn and support the detection, timely handling and remediation of unexpected damage to machinery and equipment during the operation of the supply pump stations for irrigation and water drainage.

3.2. Innovation in hydraulic work management

Carrying out the tasks assigned by MARD, the company organizes the management and operation of the hydraulic work system according to procedures and technical regulations. Operating procedures for each pumping station and each culvert under the dyke were built. The company periodically organizes training and checks the

implementation of the procedures and technical regulations for workers; thereby, gradually improving their expertise and vocational skills.

The company issued regulations on handling and coordinating the handling of violations of hydraulic works in 2012. Contracts for pumping station units and workers to directly manage drainage and irrigation canals are implemented. Subsequently, the company organizes inspection and evaluation of the results of implementing the contract assignment plan each quarter, promptly coordinates with local authorities in handling violations of irrigation works.

The company always focuses on repair and maintenance of works to ensure safe equipment and facilities, ready to operate for production. It has completed the maintenance procedures for 12 electric pumping stations which are bases for preparing and submitting to the MARD for approval plans and organizing annual maintenance of works, machinery and equipment to ensure quality, progress, and techniques for agricultural production and natural disaster prevention.

4. ACHIEVEMENTS

4.1. Hydraulic work system

Thanks to clear decentralization and management, the hydraulic work system management has clearly changed. Annually, the company develops plans and organizes construction maintenance according to procedures and technical regulations based on: technical and economic norms in the management and exploitation of hydraulic works, maintenance procedures for electric pumping stations approved by MARD, and inspection results of the works before and after the stormy season.

About 104 pump sets with flow from 4,000 ÷ 32,000 m³/h, medium voltage and low voltage

electrical equipment systems have been regularly inspected and maintained. Pump sets operating from 7,000 - 10,000 hours are always repaired periodically to ensure safe and stable operation.

The hydraulic works have been regularly inspected, monitored, maintained and periodically repaired according to maintenance procedures. When unexpected damage occurs,



Sluice of Vinh Tri pumping station was deteriorated

The company regularly inspects, detects and coordinates with local authorities to resolutely handle violations within the scope of protection of the hydraulic works along with clearing the flow, water hyacinth, trash, obstructions and trees on irrigation canals.

4.2. Serving high quality production

At the beginning of each crop season, based on the water supply schedule from hydroelectric reservoirs and predicted tide, the company operates the culverts under the dyke 2-3 times to take maximum water stored into the hydraulic system creating sources for pumping stations to operate irrigation.

Based on the irrigation registration time of local companies in the system, the company operates irrigation water pumping stations to serve land preparation 2-3 times, irrigate rice 4-5 times and maintain water level according to the

the company makes timely repair.

The company has basically completed the work of placing markers demarcating the scope of protection of head works and MARD approved the plan to protect head works of 12 electric pumping stations. Currently, the company is developing a plan to plant markers on the main drainage canals to submit to the Provincial People's Committee for approval.



Sluice of Vinh Tri pumping station has been upgraded

process during the transplanting, post-planting, tillering and end-of-season stages, ensuring enough water for rice plants to grow and develop according to the seasonal frame.

Under normal weather conditions, the water level at the suction tank of the main pumping stations is maintained at a level of $+0.90 \div 1.00\text{m}$ during the land preparation phase, from $+0.60 \div 0.70\text{m}$ during the transplanting phase and after transplanting, from $+0.80 \div 0.90\text{m}$ during the rice tillering period and at the end of the season. The water level at on-farm measuring points is maintained at $+0.70 \div 0.90\text{m}$ to best serve local production.

In case moderate to heavy rain is forecasted, the company operates drainage pumping stations, ensuring the water level at the pumping stations' suction tanks is maintained at a level of $+0.30\text{m}$ to $+0.50\text{m}$. In case tropical depressions or storms are forecasted

to directly affect the area, pumping stations will be operated to drain the buffer water, ensuring the water level at the pumping stations' suction tanks is maintained at -0.30m to +0.00m.

4.3. Managing a green, clean and beautiful environment

The company has coordinated with The Institute of Water Resource Planning to regularly sample and analyze water quality at 20 locations in the system. Based on monitoring results, the company proactively regulates water sources from large rivers to dilute and minimize water pollution in the fields.



Blockage of water hyacinth and garbage on the Sat River drainage canal

Therefore, the water source quality is always qualified to supply irrigation water for agricultural production and raw water source for daily life.

Thanks to the innovation in management pumping station units proactively and active management and protection of the hydraulic works, the head works managed by the company are now spacious, green, clean and beautiful as a park enhancing the general landscape beauty of the Red River Delta. The canals are clear and no longer stagnation of water hyacinth and garbage blocking the flow and reducing water transport as before.



Sat River canal is free of trash

4.4. Economic management

Major expenses include expenses for operating approximately (salaries and allowances, shift meals, social insurance; raw materials and materials to operate the project and electricity for irrigation pumps; labor safety protection) and others; maintenance costs for basic irrigation works meet regulations and actual requirements. Besides, fixed asset depreciation costs; enterprise cost management; other expenses directly related to the provision of irrigation products and services such as project protection, natural disaster prevention, fire prevention... are implemented by the company in accordance with regulations and with

maximum efficiency. The implementation of regimes and policies for employees is also always of concern to the company.



The head work of Vinh Tri pumping station is spacious, clean and beautiful

The company has initially built a "museum of pumps" at Huu Bi pumping station so that

people, pupils, and water engineering students can visit and broaden their knowledge about the pump projects that have transformed the land "six months on foot, six months on hand" into a rich, lovely land.



Museum of pumps at Huu Bi pumping station

5. CONCLUSION

Bac Nam Ha Company is a state-owned enterprise holding 100% of charter capital under MARD, performing the tasks of

producing and providing public irrigation products and services which has been making innovations consistent with the industry's development strategy. In order to safely manage and effectively exploit the assigned infrastructure system, in the coming time, the company needs to continue to review and promote multi-target, multi-value exploitation and services of the irrigation infrastructure asset system assigned to manage in order to increase non-public revenue sources. In addition to this, to build strategies and long-term plans to develop the company to adapt to market mechanisms, the extreme impacts of climate change as well as respond well to the requirements of rapid and sustainable development of industries and society. It is completely trusted that the company will continue to complete its current and future plans and has stronger and more effective next steps./.

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