MULTIPHASE BOOSTING TECHNOLOGY IN THE ECUADORIAN NATIONAL RESERVE PAÑACOCHA

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1. INTRODUCTION.

Pañacocha project is located in a National Reserve Zone called "Bosque Protector Pañacocha" (Pañacocha protected forest). This forest lies deep the Ecuadorian jungle on the border of wild life reserve Cuyabeno, the name comes from Pañacocha Kichwa language and it means "Piranhas' Lake".

The petroleum reserves of the Pañacocha field are estimated to be 42.4 MMBO, with a specific average gravity 23° API and a maximum petroleum production of 23 MBOPD, it represents a net present value of $ 906 MMUSD and has a non discounted cash flow of $ 2,036 MMUSD which benefit the Ecuadorian country.

In this document we will explain how the multiphase boosting technology has influenced the analysis for taking the right decision of the oilfield production for Pañacocha project and the basis of why we decided to use this technology.

2. PRODUCTION OPTIONS.

So many options for developing Pañacocha oilfield were set out, but the mainly three ones are analyzed and explained in this document.

2.1 OPTION 1 – CENTRAL PROCESS FACILITIES ON SITE.

This option was developed to flow the multiphase flow produced from the well platforms trough a gathering system and take it to a conventional central process facilities which will be located near the production area, it will separate all phases associated, and will manage them; an oil under transport specifications will be obtained and carried to a custody transfer facility; produced water will be injected to a proper reservoir to do so; the gas will be flared, a power generation and distribution center will be required; so on fire fighting systems, auxiliary systems, etc. (Figure 1)

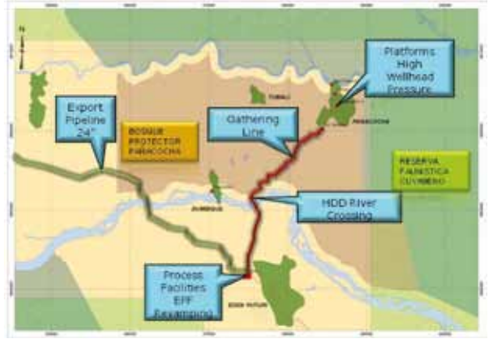

Figure - Option 1

2.2 OPTION 2 – ESP AND INSTALLED CAPACITY OPTIMIZATION.

Petroamazonas has an existing process facility located 35 Km from the production area called Eden Process Facility (EPF); the energy source required to reach this facility will be the electrosumergible pumps (ESP) as the primary artificial lifting method. It will permit to optimize the use of the entire installed processing facilities, the capacity of phase separation and power generation system will be optimized using existing infrastructure based on a traditional transport and processing scheme which is already installed on EPF (Figure 2).

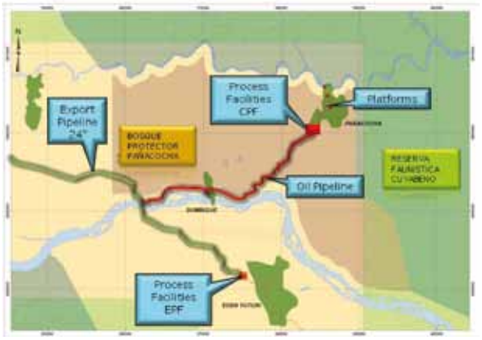

Figure 2 - Option 2

2.3 OPTION 3 - ESP, MBT AND INSTALLED CAPACITY OPTIMIZATION.

On this option, which remains the same than Option 2, a multiphase boosting facility is set out as an intermediate energy source to transport the produced fluid between the wells using ESPs and the EPF located 35 Km from the production area. Installed capacity for process and power generation will be optimized using existing infrastructure based on a traditional transport and processing scheme (Figure 3).

Figure 3 - Option 3

3. OPTIONS FEASIBILITY ANALYSIS.

To analyze the feasibility of the production options, a qualitative and semiquantitative method was used to get a proper comparison among the options. This analysis was done on the pre-conceptual design of the project, so a development oilfield proposal was submitted and approved in the planning processes of the project, then a final recommendation was given. A real evaluation was done and the option with the better feasibility level combined with economical benefits was choose. This helped to have a clear idea of what the scope of the project would be, and was the base to develop the rest of the planning processes considered in the Project Management Plan.

A matrix was created to classify variables affecting the project in many areas; each one was qualified according with its influence to the project and as a product with its relation with other variables. According with its characteristics, it was classified into Weak (W), Intermediate (I) and Adequate (A). This activity was conducted on multidisciplinary team workshops which studied and qualified each variable according with its severity and impact. This conducts us to have a final scenario to make proper selection of the best production option to develop Pañacocha field (Figure 4).

4. FINAL EVALUATION OF PRODUCTION OPTIONS.

Regarding the results obtained from the evaluation matrix, Option 1 is discarded as a production option due to its poor global feasibility result. A complementary analysis between options 2 and 3 will be conducted, and a final decision will be taken based on project economics.

VARIABLE		OPTION 1	OPTION 2	OPTION 3
TECHNICAL (30%)	AREA	W	A	A
	EXECUTION TIME	W	A	I
	INSTALLED POWER	W	I	A
	WELL LIFE TIME	A	W	A
	PAM TECH KNOWLEDGE	A	A	W
	GAS OPTIMIZATION	W	A	A
	INSTALLED CAPACITY OPTIMIZATION	W	A	A
ENVIROMENTAL AND COMMUNITIES (25%)	ENVIROMENTAL IMPACT	W	A	A
	COMMUNITY RELATIONS	W	A	A
ECONOMICS (30%)	FINANCING	W	A	A
	PROJECT BENEFITS	I	W	I
	CAPEX	I	A	I
	OPEX	W	W	A
LEGAL (10%)	REGULATIONS	A	A	A
	PERMITS	W	I	A
MANAGEMENT (5%)	ORGANIZATIONAL	I	I	I
	MANAGEMENT	W	A	I
FEASIBILITY INDICATOR		47%	79%	91%

Analyzing Option 2, we found that well life time is meaningfully reduced due to the high wellhead pressure required to gather produced fluid to the Central Process Facility, EPF; it has an essentially impact on project life cycle, investments and operational costs which are reflected on global project economics related to this option. This gives to Option 3 the highest global feasibility considering technical, economical and external variable analysis.

Option 3, represents a production scenario which is sensitive to project external variables that gives it much more feasibility than others.

The reduction of the deforested area, permits a better project socialization with surrounding Communities, reduction on environmental impact in the production area, optimization and make the best use of existing infrastructure for process and transportation, taking far from the sensitive area the activities of the project with higher impact, for example, reduction of CO_2 emissions by the substitution of fuel consumption with gas power generation optimization avoiding to flare all gas produced, this means 500,000 Ton of CO_2 non realeased to the atmosphere in a 15 years life cycle project

The use of multiphase boosting technology gives the chance to produce wells with medium to low wellhead pressure which permits an adequate reservoir management for Pañacocha oilfield; this development concept gives technical and economical feasibility to other projects to produce minor reserves in Pañacocha surroundings.

Some of the impact that external variables would have on project are mitigated thanks to all characteristics mentioned for this option; it do not happen on the other options due to the critical environment in which this project is developed and its impact on Pañacocha protected forest. Mitigation of external variables improve the environment for financial entities to find on this option of multiphase boosting technology application, a low risk investment one, that gives great benefits to all project stakeholders

5. PETROAMAZONAS EXPECTATIONS

Due to this project is still under construction phase, and that project start up will be by the end of

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2010, Petroamazonas has great expectations on the near future by creating a knowledge base and experienced teams thanks to this project. This will ratify production options for new unproduced reserves, many of them associated with sensitive areas, protected and non protected ones, using multiphase boosting technology, which base its analysis on environmental impact reduction, technical and economical benefits, and external variables mitigation.