



Nafta College
Online Knowledge

Regulations for Participants PetroCup Student Olympics

www.petrocup.com

Date: 31 May - 1 June 2023

Venue: online

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1. Overview

PetroCup sessions are based around the fields which are in production for many years and do not meet the target indicators set by the operating company. Your role is to analyse the available data, come up with the new FDP and optimize the current development aiming to maximize the EBITDA over a period of five-years. You can perform drilling, workovers and manage surface facilities.

The Tournament consists of 5 batches of production optimisation activities (called "Shots"). Each "Shot" can only be placed once within 1 synthetic year.

The teams are challenged to analyse the available data and perform optimisation activities.

It is required to have at least two laptops per team. Each laptop must have one of the following internet browsers installed with the latest updates: Microsoft Edge, Yandex Browser, Google Chrome. Each laptop must have an access to the internet through a local WI-FI network.

Chats groups (Telegram) are generated to allow online communication and to notify about the progress of the tournament.

The following users will join the chat group:

- moderator bot,
- team captain,
- your personal moderator from Nafta College,
- lead tournament moderator,
- tournament coordinator from Nafta College.

Chats will be active as soon as they are created.

Each team captain will receive an email containing the tournament schedule, links to **PolyPlan** portal, Dataroom and an field review.

Each team members will receive an email with the tournament schedule, links to Dataroom and an field review.

Furthermore, each team is given a private username and password, which are the same for both the portal and Dataroom. The portal can only be accessed from one device at a time.

The **PetroCup** session can be accessed on-line through a web-interface where teams can find primary data on the field and its production, implement new redevelopment activities and monitor field response.

All **PetroCup** session are monitored by Nafta College **PetroCup** moderators remotely or face-to-face.

Each captain takes full responsibility for interaction with **PetroCup** Server and **PetroCup** Moderator. If the team joins remotely, we recommend that all communication between team members be conducted via the communication means of their choice.

By default, each team will be randomly assigned its name from the geologic time scale.

2. Field Complications

PetroCup field data is highly realistic and is partially based on the real field data. The data is generated using **PolyPlan software**, which realistically simulates:

1	Typical reservoir inhomogeneity	<ul style="list-style-type: none"> • Multi-layer formations • Multifacies formation • Different depositional patterns • Pinch outs • Natural Faults and Fractures
2	Typical uncertainties in surface flow metering	<ul style="list-style-type: none"> • Poor reallocation of production and injection for commingled wells and selective metering at surface
3	Typical OH and PLT logging tool inaccuracy	GR, CNL, IDL, T, P, FBS, FlowDens, FlowCap, FlowRes, PNN/PNG
4	Well integrity failures	<ul style="list-style-type: none"> • Cement bond failure under high delta pressure and thief production/injection
5	Reservoir flow complications	<ul style="list-style-type: none"> • Near reservoir-zone clogging and stimulation • Water Coning • Fault / Fracture flow • Fixed and dynamic hydraulic fractures, including auto-induced fracture

3. Teams

Even though team size is unrestricted, we advise that you have at least 7 members who will take on their respective roles as:

#	Position	Responsibilities
1	Asset manager	Decision making process management
2	Reservoir Engineer	Redevelopment planning and production targets
3	Simulation Engineer	Current reserves structure analysis
4	Geologist	Initial reserves structure analysis
5	Petrophysicist	Core and Open Hole data log analysis
6	Well & Log Analyst	Production Log analysis
7	Well Test Engineer	Production History and Well Tests data analysis

Team members can interact with one another either remotely or in face-to-face.

In the latter case, the team must ensure that it has a dedicated room for 2 working days.

4. Session Structure

A **PetroCup** session lasts for 2 working days with a fixed schedule. For those who are new to **PetroCup**, it is highly recommended to read the brochure in fair advance. Beyond that, all users must familiarize themselves with rules and regulations which are specific to the current **PetroCup** Session. It is recommended that you go through the rules and regulations, even if you participated in **PetroCup** before.

You can find **PetroCup** Rules and Regulations of each session on the official website <http://nafta.college.ru/etrocup/>

One or few days prior to the session, teams will be able to access the field review to get acquainted with the oilfield and prepare for the session.

Before **PetroCup** session begins, the moderator conducts a briefing for all participants via ZOOM describing session specifics, rules and features of PetroCup simulator, each team then must place a test "Shot" and ensure they have a stable online connection with the **PetroCup** server.

5. Online streaming

ZOOM meeting is used to livestream the event: it is used for the opening session / briefing, result summary session and tournament Debriefing at the end of the day. You can find the links in the schedule, or they are sent to the chat groups by the moderator.

6. Schedule

The **PetroCup** session is split into three chronological stages: introduction, tournament, debriefing. The night before the tournament, team captains will receive information on the asset. An approximate **PetroCup** tournament schedule is provided below. It varies depending on the session.

24.05.2023 – Demo session (Time UTC +3)

#	Time	Duration	Event
1	7:30-9:00	90 min.	Discussion of Shot #1
2	9:00		Shot #1
3	9:00-11:00	120 min.	Discussion of Shot #2
4	11:00		Shot #2
5	11:00-13:00	120 min.	Discussion of Shot #3
6	13:00		Shot #3

30.05.2023 – Briefing (Time UTC +3)

#	Time	Duration	Event
1	11:00 – 11:30	30 min.	Introductory presentation to PetroCup session
2	11:30 – 12:00	30 min.	Session specifics

31.05.2023 – Tournament (Time UTC +3)

#	Time	Duration	Event
1	09:00 – 09:40	40 min.	Opening ceremony
2	09:40 – 11:40	120 min.	Session begins. Discussion of Shot #1
3	11:40 – 12:40	60 min.	Lunch break
4	12:40 – 13:30	50 min.	Discussion of Shot #1
5	13:30		Shot #1
6	13:30 – 14:00	30 min.	Coffee break
7	14:00 – 16:30	150 min.	Discussion of Shot #2
8	16:30		Shot #2

1.06.2023 – Tournament - Debriefing (Time UTC +3)

#	Time	Duration	Event
1	09:00 – 09:10	10 min.	Opening ceremony
2	09:10 – 11:10	120 min.	Session begins. Discussion of Shot #3
3	11:10		Shot #3
4	11:10 – 12:10	60 min.	Lunch break
5	12:10 – 13:40	90 min.	Discussion of Shot #4
6	13:40		Shot #4
7	13:40 – 14:00	20 min.	Coffee break
8	14:00 – 15:30	90 min.	Discussion of Shot #5
9	15:30		Shot #5
10	15:30 – 16:30	60 min.	Coffee break
11	16:30 – 17:30	60 min.	CAS - Consolidated Activity Statistics
12	17:30 – 17:40	10 min.	Reviewing results and closing ceremony

7. Tournament

The **Tournament** consists of 5 batches of production optimisation activities (called "**Shots**") which run every 1 year.

The teams are challenged to maximize EBITDA for the next 5 years. The **Tournament** Standings will be updated after each **Shot** and will be available for all teams on-line. This table provides only full-field performance for each team and current position in the **Tournament**. The **Shot** details and well-by-well response during the **Tournament** are confidential and only available separately for each team.

These details will be revealed to all teams later after the **Tournament** at **Debriefing** stage. The **Tournament** starts with studying the **Field Review**. It usually takes a long time to become acquainted with the documents, therefore one day is given for this reason.

Normally, the **Captain** gives opportunity for team members to present their views on the field history, its peculiarities and probably start suggesting their opinion on the development strategy. After that the team starts discussing the first **Shot** and the **Captain** decides what exactly to place in the system.

Each **Shot** has a fixed time-out which is mentioned in **Session Schedule**. The regulations are strict on timing and if the **Shot** is not committed in time the field will continue producing as NFA till the next **Shot**.

After placing a **Shot** the **PetroCup Server** will take approximately 15 min to process the data and revert back with field response. This period is required for data processing.

8. Shot Structure

Each **Shot** is performed: once a year on Jan 1. Any potential issues caused by changes in weather conditions will not be permitted during this **PetroCup** session. Each Shot can consists of the following field activities:

- Adjusting field gathering system and waterflood design
- Drilling New Wells
- Workovers
- Adjusting production targets
- Well Surveillance

The budget for each shot is fixed The cost of each activity is listed in the web-system. Workovers (Selective Water Shut Off, Selective Stimulation, Conversion, Perforation) can not be done without hoist operation.

Drilling New Wells

All drilling operations are assumed to have 100% success rate in operational terms It is possible to drill both vertical/inclined wells and horizontal wells. Drilling a new well consists of two stages: **Step 1** and **Step 2**.

Step 1.

To drill a well, you need to enter the well head coordinates, the T1 coordinate and the bottom hole coordinate. These three points split the well into two segments: if the angle between these segments is less than 120 degrees, then the well is regarded as horizontal; if the level is higher - vertical. You can position the cursor at the map and click on the screen to see the X and Y values at that location. The last part is to set the depth (Z coordinate).

Once the coordinates are transferred to **PetroCup** server it will take few minutes for the system to revert with the OH data logs on the newly drilled well.

Step 2.

Once the OH data logs on the new well is received, team should decide on perforation intervals and whether to put well in production or injection and at what flow rate. The Captain should input the appropriate information into the system.

This will join the inputs from other activities of the next **Shot**.

Workovers

All workovers are assumed 100% successful in operational terms.

The workover can be one of the three followings types:

Workover Activity	Well Category	Description
Stimulation	Producer or Injector	— selective stimulation by acidization
Conversion	Producer → Injector Injector → Producer	— conversion of the well to another category

Perforation

All perforations are assumed 100% successful in operational terms. Reperforating the existing interval may result in production increase if the previous perforations were partially plugged, but may also lead to cement failure which can reach water-bearing formations. Team should be taking great care in reperforations close to water contact.

Perforations which are performed as a part of workovers can only be done in the zones which were already drilled.

Well production targets

Team can vary liquid rates for all wells at each **Shot**.

Teams should take a great care in manipulating the liquid rates as this may cause premature water breakthrough. The field response depends on many factors:

- Reservoir factors– High drawdown in producers may cause water coning–High drawdown in producers may cause cement failure and behind-casing cross-flow resulting in high water cut from thief water production– High delta pressure in injectors may cause spontaneous hydraulic fracturing resulting in missing injection volumes and fast water transfer along the fracture– High delta pressure in injectors may cause cement failure and behind-casing cross-flow resulting in missing injection volumes

- Technical factors– Production rate is limited by – minimal bottom hole pressure – maximum production rate – maximum GOR– Injection rate is limited by – maximum pressure the wellhead can sustain – maximum total injection rate of the field pump station

- Economical factors– Producers will not be operated below critical oil production rate– Producers will not be operated above critical water cut

The field response is fully automated and provides the following information:

- production rate for all wells
- bottom hole pressure for all wells
- reservoir pressure for selected wells

Well Surveillance

There are two types of surveillance available in the session - Logging Survey and Production Logging
The team specifies the shut-in period for the surveillance. The production will be cut according to the shut-in period.

Debriefing

After the Tournament is completed, on the third day a **PetroCup Moderator** will start **Debriefing** on the tournament results and team performance. **PolyPlan** is automatically filling the **Shot Performance Report** which will help teams understand the efficiency of their activities at **Debriefing** stage.

Moderator will study the Shot results during the **Tournament** and will evaluate the performance of each team during **Debriefing** stage - **CAS** (Consolidated Activity Statistics) - a summary table illustrating the total number of different types of activities performed by teams in the current **PetroCup** session.

After the Tournament Is Over

After the tournament, the team leaders will receive links to the archived Dataroom via the e-mail address they provided during the registration. To access it, click on the link and sign in to the Nafta College official page, nafta.college/petrocup/. The archived Dataroom is available for 7 days after the tournament has ended.