САНКТ-ПЕТЕРБУРГ

LLC "ZAO AMT"

Automation of Oil and Gas Industry Technologies Monitoring

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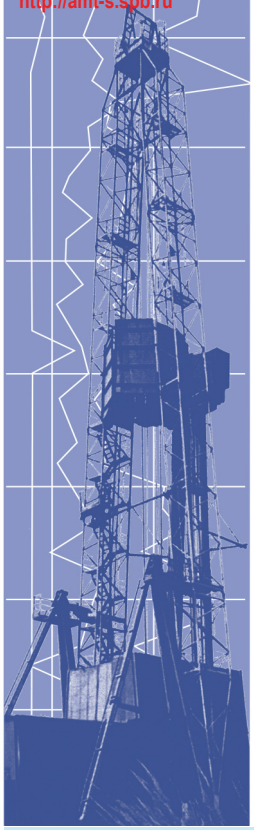

# AMT 601

## WELL DEVELOPMENT AND OPERATION SIMULATOR

*Well completion and operation simulator AMT-601 is a multifunctional and complete simulator for training operators and engineers from departaments of technology for oil and gas extraction (TOGE) of oil and gas producing and processing companies and for students of deposit development and operation in petroleum and gas engineering.*

The simulator helps to attain and improve practical skills of performance of main process operations and compliance with safety on production and injection wells, identification and prevention of complications and accidents, well surveillance.
The hardware and software of the system submerge the trainee in the situation of a real production and injection well creating required psychomotor reactions.

### Simulations in real-time and accelerated

- well output stabilization, well testing in stabilized and unstabilized state, operations in complicated conditions;
- response of equipment, tools, well (change of their condition) to actions performed by trainee using panels and equipment controls;
- emergence and development of complications and emergencies;
- outputs of instruments characterizing the condition of equipment, tools, wells;
- various (without limitations) geological and technical conditions in wells: reservoir, fluid, well design, jack pumps, electric submersible pumps;
- various types of lift: natural flow, ESP, SRP, gas lift, gas wells;
- injection well operation;
- operation with automated metering station, ESP and SRP control stations, level meter.

### Multi-user simulator AMT-601UKM

The multi-user version of this simulator AMT-601UKM allows to increase the effectiveness of training, to reduce it cost and to orient educational institution on the needs of the entreprises of the region. It also allows the creation of a virtual deposit to study the effects of interference between neighboring wells and reservoir simulation.

### Engineering Staff Training

Multiuser network version of the simulator (AMT-601UK) is designed for training in classroom with 15 and more computers.
It provide a full computer simulation of the well equipment control panels and the same training tasks as a AMT-601.

It provides:

- Individual and team aproach of training;
- Combination of a several computers to perform an one training task;
- Simultaneous control of performance of various training tasks from instructor's workplace.

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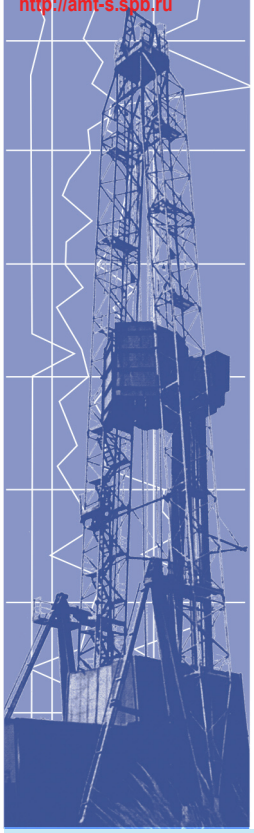

## Simulator components

1. Equipment control panels and stations:
   - Wellhead control station (gas and gas lift well)
   - ESP wellhead control station
   - SRP wellhead control station
   - Injection wellhead control station
   - Automated group metering station control
   - ESP Control Station panel
   - SRP Control Station panel
   - Jack pump control station
   - Gas lift and injection well control panel
   - Gas well control panel
   - Winch control station
   - Level meter mockup
   - Sample receptacle mockup
2. Instructor workplace:
   - Personal computer
   - Printer
   - Software for simulation of operational processes, process control, execution of tasks and methodological support of the training process
3. Sound support equipment
4. UPS

## Main characteristics of the simulator

| | |
|---|---|
| Number of panels and stations | 16 |
| Number of simulated tasks: | 14 |
| Number of simulated parameters characterizing process, well condition and equipment | over 100 |
| Number of emergency and error alerts | over 120 |
| Number of time charts of parameters simultaneously displayed on the screen:<br>• natural flow<br>• ESP<br>• SRP<br>• gas lift<br>• gas well<br>• injector | minimum<br><br>11<br>29<br>13<br>15<br>10<br>10 |
| Simulated condition sampling rate | adjustable |
| AC power supply | 220 V/50 Hz |
| Simulated condition sampling rate | up to 800 W |
| Footprint | at least 55 $m^2$ |
| Weight | not more than 1,000 kg |
| Ambient temperature | from +15o to +35° C |
| Ambient humidity | max 90% |
| Continuous operation time | not limited |
| Service life | minimum 6 years |

## Equipment control panels and stations

Equipment control panels and stations of the simulator which are almost identical to the real ones allows for submerging trainees into the condition of a real production well developing required psychomotor control skills bringing the technology to finger tips.

The simulator allows of successful training for performing standard well operations in a safe and controlled conditions.

Training for critical and expensive operations before the trainee faces them in practice helps to save human lives, equipment and well from possible results of the mistakes in real conditions.

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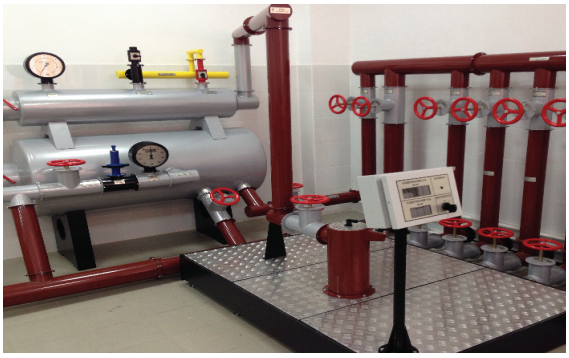


## Instructor workplace

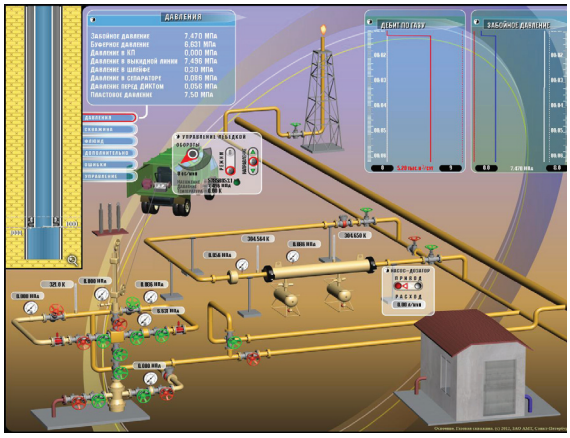
The simulator software includes training task (training scenario) design tools with any geological and engineering conditions and non-standard situations. The instructor may create complications and emergencies while the trainee is performing the task, in addition to pre-planned complications and emergencies in the training task scenario.

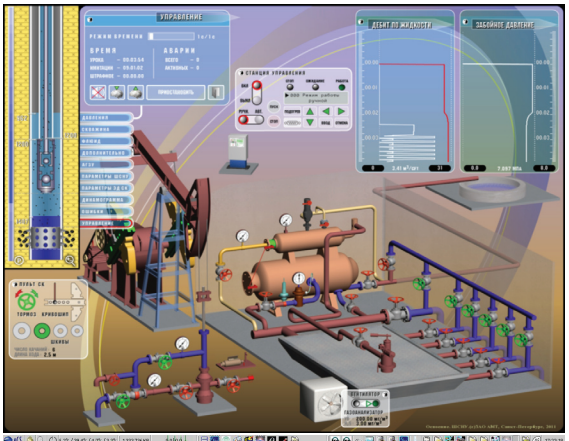
It is possible to stop and restart the technological process simulation in any place, to repeat the situation and conditions of the training task performance.

During simulation the following data are displayed: numerical characteristics of geological and engineering conditions, graphs of the most important controlled technological parameters and animation displaying real-time operation of the equipment and condition of the well.

The software keeps a training process log for each trainee, forms a training report, enables to assess the trainee's actions using time graphs of technological parameters after the training session and prints these graphs.

We help to develop training scenarios meeting the geological and engineering conditions of the customers.





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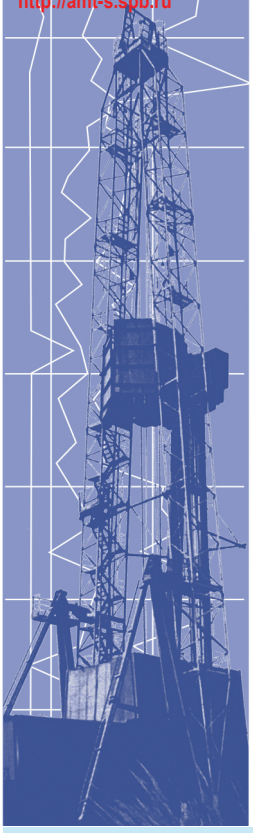

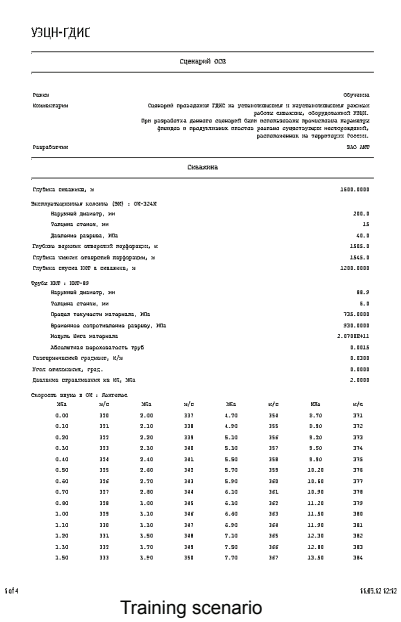

УЗЦН-ГДИС

Сценарий ОСВ

| | |
|---|---|
| Режим | Обучение |
| Комментарии | Сценарий проведения ГДИС на установившемся и неустановившемся режиме работы скважины, оборудованной УЭЦН. При разработке данного сценария были использованы промысловые параметры фонтана и продуктивных пластов реальных существующих месторождений, расположенных на территории России. |
| Разработчик | ЗАО АМТ |

Скважина

| | |
|---|---|
| Глубина скважины, м | 3600.0000 |
| Эксплуатационная колонна (ЭК) : ОТ-324Х | |
| Наружный диаметр, мм | 288.9 |
| Толщина стенки, мм | 10 |
| Давление разрыва, МПа | 48.9 |
| Глубина верхних отверстий перфорации, м | 1666.9 |
| Глубина нижних отверстий перфорации, м | 1845.9 |
| Глубина спуска НКТ в скважину, м | 1200.0000 |
| Трубы НКТ : НКМ-89 | |
| Наружный диаметр, мм | 88.9 |
| Толщина стенки, мм | 6.5 |
| Предел текучести материала, МПа | 725.0000 |
| Временное сопротивление разрыву, МПа | 930.0000 |
| Вязкость бака материала | 2.0700E+11 |
| Абсолютная шероховатость труб | 0.0018 |
| Геотермический градиент, К/м | 0.0200 |
| Угол отклонения, град. | 0.0000 |
| Давление страгивания на НКТ, МПа | 2.0000 |

Скорость звука в ОК : Литология

| МПа | м/с | МПа | м/с | МПа | м/с | МПа | м/с |
|---|---|---|---|---|---|---|---|
| 0.00 | 330 | 2.00 | 337 | 4.70 | 354 | 8.70 | 371 |
| 0.10 | 331 | 2.10 | 338 | 4.80 | 355 | 8.80 | 372 |
| 0.20 | 332 | 2.20 | 339 | 4.90 | 356 | 8.90 | 373 |
| 0.30 | 333 | 2.30 | 340 | 5.00 | 357 | 9.00 | 374 |
| 0.40 | 334 | 2.40 | 341 | 5.60 | 358 | 9.60 | 375 |
| 0.50 | 335 | 2.60 | 342 | 5.70 | 359 | 10.20 | 376 |
| 0.60 | 336 | 2.70 | 343 | 5.90 | 360 | 10.60 | 377 |
| 0.70 | 337 | 2.80 | 344 | 6.30 | 361 | 10.90 | 378 |
| 0.90 | 338 | 3.00 | 345 | 6.50 | 362 | 11.20 | 379 |
| 1.00 | 339 | 3.10 | 346 | 6.80 | 363 | 11.50 | 380 |
| 1.10 | 330 | 3.30 | 347 | 6.90 | 364 | 11.90 | 381 |
| 1.30 | 331 | 3.50 | 348 | 7.30 | 365 | 12.30 | 382 |
| 1.50 | 333 | 3.70 | 349 | 7.90 | 366 | 12.80 | 383 |
| 1.90 | 333 | 3.90 | 350 | 7.70 | 367 | 13.50 | 384 |

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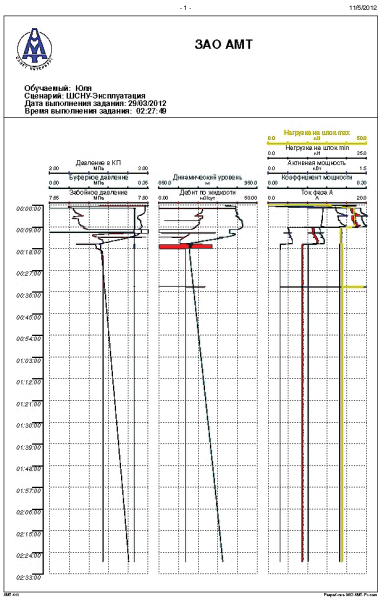
Training scenario



ЗАО АМТ

Обучаемый: Юля
Сценарий: ЦНПУ-Эксплуатация
Дата выполнения задания: 29/03/2012
Время выполнения задания: 02:27:49

Training report

## Supply package

| Pos. | Designation of simulator components | Quantity, pcs |
|---|---|---|
| **Simulator** | | |
| 1 | Complex of panels and stations for control of well drilling equipment: | |
| 1.1 | Driller's operation station: | |
| | • Natural flow well wellhead control station | 1 |
| | • ESP wellhead control station | 1 |
| | • SRP wellhead control station | 1 |
| | • Injector wellhead control station | 1 |
| | • Automated group metering station control | 1 |
| | • ESP Control Station panel | 1 |
| | • SRP Control Station panel | 1 |
| | • Jack pump control panel | 1 |
| | • Gas lift and injection well control panel (GRP, VRP and NA) | 1 |
| | • Gas well control panel | 1 |
| | • Winch control panel | 1 |
| | • Level meter mockup | 1 |
| | • Sample receptacle mockup | 4 |
| 1.2 | 19" LCD monitor (connected) | 3 |
| 1.3 | Industrial 19" LCD monitor | 1 |
| 1.4 | Industrial embedded computer | 1 |
| 1.5 | Set of audio speakers | 1 |
| 1.6 | Licensed software of MS Windows 7 multitasking operating system | set |
| 2 | Instructor workplace | |
| | • Personal computer | set |
| | • Software of simulation and training tasks for AMT-601 simulator | set |
| | • Licensed software of eComstation 2+ or compatible | set |
| 3 | Data and power cables, self-adhesive cable ducts | set |
| 4 | Operational documentation | set |
| **Classroom** | | |
| 1 | Instructor-trainer operation station | |
| | • Personal computer | set |
| | • Software of simulation, training and monitoring tasks for AMT-601 simulator | set |
| | • Licensed software of eComstation 2+ or compatible | set |
| 2 | Operational documentation | set |

We supply our equipment, provide training and warranty support.
We support software during entire service life.
We continuously improve our products.
Thousands of oil & gas specialists in Russia and CIS were trained on our simulators.