



NEXT GENERATION  
**THERMO-  
CHEMICAL  
CAPSULE**



2018

ASPHALTENS/WAX/  
PARAFFIN REMOVAL/  
GAS HYDRATES REMOVAL/  
FLOW STIMULATION/



sustainable &  
innovative

# THERMALBEAST CAPSULE SERIES

**innovative**  
for cost reduction



**strong**  
cutting-edge chemistry

Through the years of a research our expert team has performed thousands hours of laboratory testing and tested the product in more than 200 wells. Our target was to create the product that could be reliable and conductive but at the same time very competitive and simple in operation.

ThermalBeast may surprise you with simplicity in operation but there are a lot of innovative solutions behind. We are proud of ThermalBeast capsules and believe that they are the strongest solution available on the market that so effectively fights with the asphaltens and the wax.

- Modern product based on an old formula developed 50 years ago by Soviet scientists
- Alkali capsules produced by special method and know-how
- Continuous quality control for every capsule
- Proven efficiency
- Used for tubing cleaning and protection against corrosion or reservoir flow stimulation
- Quick execution
- Low costs
- Guaranteed effect



# APPLICATIONS



## Tubing cleaning from asphalten, wax and paraffin deposits

Natural flow wells or wells equipped with pumps, except ROD pumps



## Tubing cleaning from gas hydrates

Gas, gas condensate wells and gaslift oil wells



## Preventive well maintenance

Extension of the overhaul life of wells and equipment, stabilizing the production rate



## Recovery of completely blocked wells

Wells blocked with asphalten, wax or paraffin deposits



## Reservoir flow stimulation

Restoring the permeability of layer zones of sandstone or carbonate formations



## First stage of flow stimulation operations

Used before ultrasonic or impulse stimulations



## Water Injectors

Reservoir cleaning in order to increase intake capacity

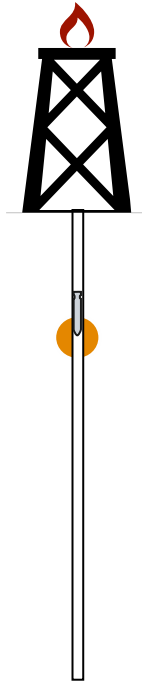


## Offshore rigs

Due to the simplicity of operations, capsules are ideal for offshore rigs

# TUBING CLEANING

ThermalBeast capsules provide an intensive removal of the hard wall adherent asphaltene deposits - the centres of the paraffin plug formations



- operational intervals: from the wellhead down through plugged interval
- process based on the principles of self-regulatory reaction and capsule self-descending fall under the own weight
- short operational downtime
- service can be done with limited quantity of HCL acid
- the standard treatment time approx. 5-7 hours
- treatment of completely blocked wells takes approx. 20-30 hours
- average capsule consumption per well: from 10 to 30 kg

 **DESIGN**

Simple and suitable for any tubing size

We design and produce ThermalBeast capsules for any tubing size taking into consideration well parameters

 **CUTTING-EDGE CHEMISTRY**

Know-how and a lot of testing behind

Our team has spent several years in laboratory and at the wells testing capsules and components to find the best recipe

 **NO OPERATIONAL RISK**

Capsules totally dissolve

Capsules actively react with HCL acid and completely dissolve with no residues left after the operation

 **SIMPLICITY OF OPERATIONS**

Self-regulatory reaction without workover rig

During tubing cleaning operations we use only lubricator, acid pump, limited amount of HCL acid and the capsules

 **PRODUCTION QUALITY**

Quality control and testing at every stage of production

Own in-house production and laboratory testing facility ensures product performance and effectiveness

 **PHENOMENAL EFFICIENCY**

No magic, only well-designed thermo-chemical reaction

We specially target the hard wall adherent ASPHALTENE deposits (the centres of the paraffin plug formations)



Blue capsule

### 1. Initial capsule group

- **water knock out from the tubing**



Red capsule

### 2. Operating capsule group:

- **thermal effect** (95-120 degrees Celsius, breaking deposits inside the tubing)
- **surfactant release** (tubing wash up)
- **hydrogen release and strong Gas lift** (lifting up products of reaction)



Green capsule

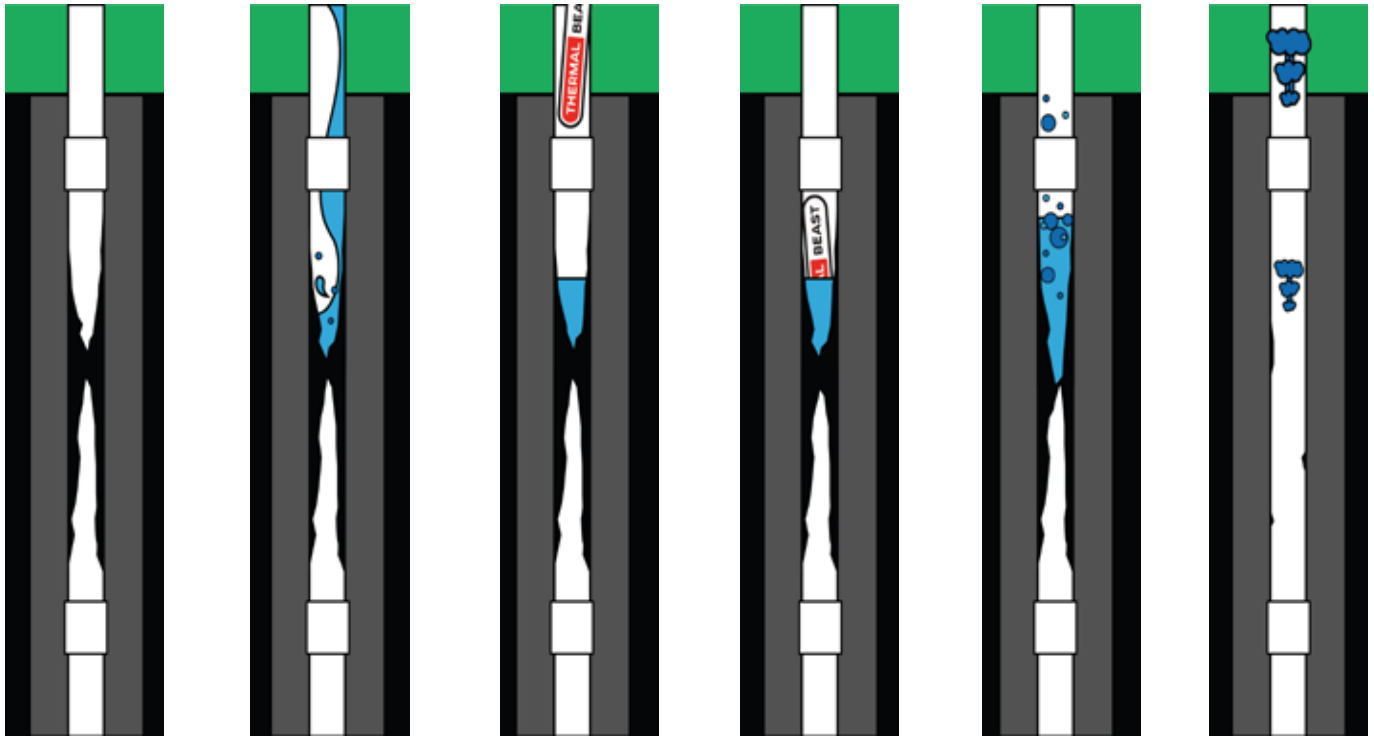
### 3. Coating capsule group

- **tubing coating** (inside)

Tubing surface coating with ALUMINIUM OXIDE film layer, leading to a significant decrease of pipe corrosion and lowering deposits forming on the tubing surface. As a result tubing coating reduces oxidation of tubing surface, reduces tubing surface roughness, increases flow, the production rate and overhaul life of tubing.



# OPERATIONS



- choose operational tubing interval (targeted depth)
- fill HCL acid by small dozes (approx. 0,5 - 1 m3 per well)
- insert ThermalBeast capsules into the tubing by one via a standard lubricator manually or mechanically (free drop of capsules starting from "0" depth)
- interaction of ThermalBeast capsule composition with certain components in tubing ignites a thermochemical reaction
- thermochemical reaction results in a release of a large amount of heat, hot liquid and gas chemical components
- chemical reagents ejaculate from a capsule and wash asphalt, scale, resin and paraffin deposits from tubing walls as well as the centers of their crystallization
- the chemicals react gradually and fall down under their own weight
- washed out liquid mixture flows up into the operating line carried by a powerful gas lift produced by released hydrogen
- aluminum compounds of capsules formed during the reaction interact with the iron oxide of tubing and coat tubing surface with aluminum oxide
- after the completion of the tubing cleaning (the drift mandrel falls down freely) switch a well to operation on the flowline

# EXAMPLES

Cluster / Well	Cleaning depth m	Planned production m <sup>3</sup> /day	Original production m <sup>3</sup> /day	Production after treatment m <sup>3</sup> /day	MTBF, days Before / after	Efficiency coefficient %
365/2349	669	60	40	80	14/26	85,7
526/4516	-	45	0 «blind»	60	-	
383/2776	-	60	32	60,3	18/32	77,8
540/3912	560	32	16	54,9	16/31	93,7
443/5582	900	26	31	33,8	19/36	89,4
443/5578	900	43	24	46	17/32	88,2
427/3836	900	13	34	46	15/26	73,3
439/4138	900	31	24	37	16/30	87,5
604/5338	900	47	34	46,8	17/29	70,5
380/2752	600	55	33	54	16/30	87,5
372/2174	100	53	32	57	18/34	88,8
458/4372	220	30	12	43	17/31	82,3
464/4249	-	46	28	62	19/33	73,6
682/6366	-	30	24	38	18/33	83,3

TUBING CLEANING

**200+ wells**

**64% minimum efficiency**

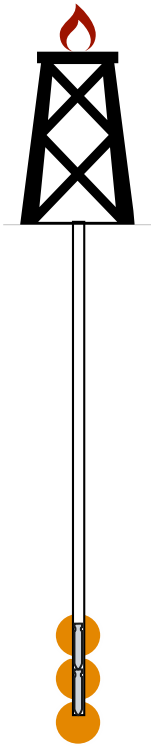


# RESERVOIR FLOW STIMULATION

## PRODUCERS & INJECTORS



ORANGE CAPSULE



Reagents are pressed into the reservoir to reduce the influence of molecular surface properties at the interfaces of different media.

Reaction products react with naphthenic acid of oil and form surfactants. This reduces the surface tension and increases the wettability of petroleum hydrocarbons on the interface of oil and rock and facilitates their access to the production casing.

Moreover, produced compounds react with the water-insoluble salts deposited in the pores and channels of the formation and convert them into water-soluble compounds.

As a result of this reaction formation pores are released and chemically cleaned, the coverage is increased which builds up well production and increases oil recovery factor.

Water injection wells can be cleaned to the same extent in order to increase their intake capacity.

The technology is not limited by the nature of the reservoir, well depth or the extent of the reservoir injectivity.



**METHOD RELIABILITY**

Proved in practice

Out of all carried out jobs we have achieved 100% in reliability and effect observed in 98% of stimulated wells

**EXTENDED TREATMENT**

Repetitive 5-day operation

Series of extended procedures designed for more efficient treatment. The flow rate increases by 400 – 500%.

**INCREASE IN PRODUCTION**

Guaranteed

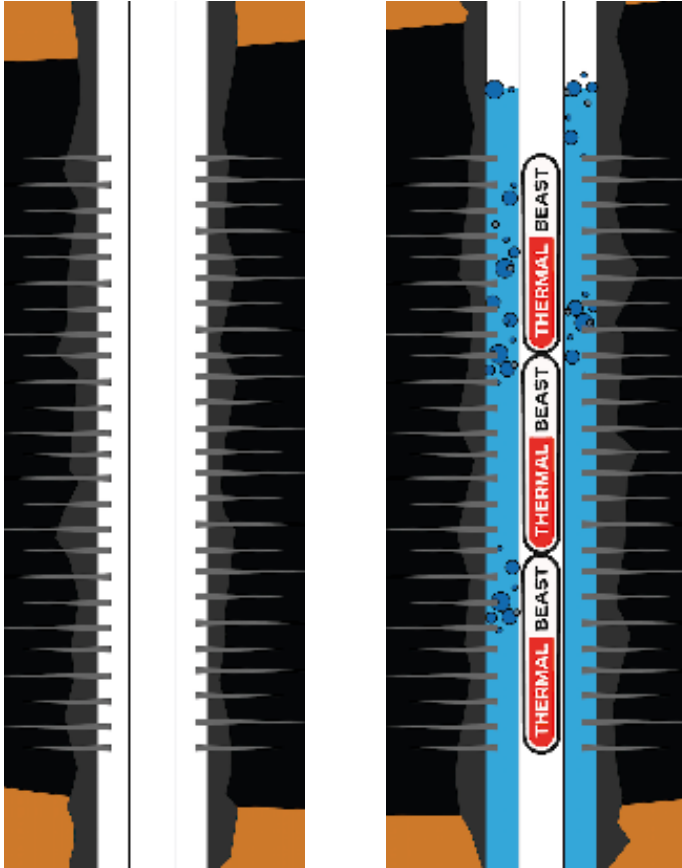
We have seen an average increase in production between 80 - 350% from the initial flow rate

**EFFECT DURATION**

Long lasting effect

Depending on the reservoir conditions and properties we have noticed the continuous effect for 9-12 month.





- fill a ThermalBeast perforated capsule container with a Thermal Beast capsules ( 2 – 3 kg per meter of formation thickness).
- assemble a ThermalBeast perforated capsule container to the end of existing tubing string at the operational interval (targeted depth) and run the string to the well
- fill tubing with HCL acid
- thermochemical reaction starts within 20-30 mins
- thermochemical reaction results in a release of a large amount of heat, hot liquid and gas chemical components
- chemical reagents ejaculate from the a Thermal-Beast perforated capsule container and the process based on the principles of self-regulatory reaction
- reaction products are pressed into the formation and by the end of the reaction ThermalBeast capsules completely dissolve
- switch a well to operation on the flowline



### THERMAL POWER

Know-how and a lot of testing behind

The thermochemical reaction goes along with a strong release of the heat with up to 20 000 kJ/kg.



### NO OPERATIONAL RISK

Capsules totally dissolve

Capsules actively react with HCL acid and completely dissolve with no residues left after the operation



### SIMPLICITY OF OPERATIONS

Self-regulatory reaction guarantees the process

The process uses only standard workover equipment. The time of the procedure is no more than 2 hours.



### COMBINATION WITH OTHER METHODS

Capsule pre-treatment

Quick and cost effective option for treating formation before ultrasonic flow stimulation or other EOR methods.

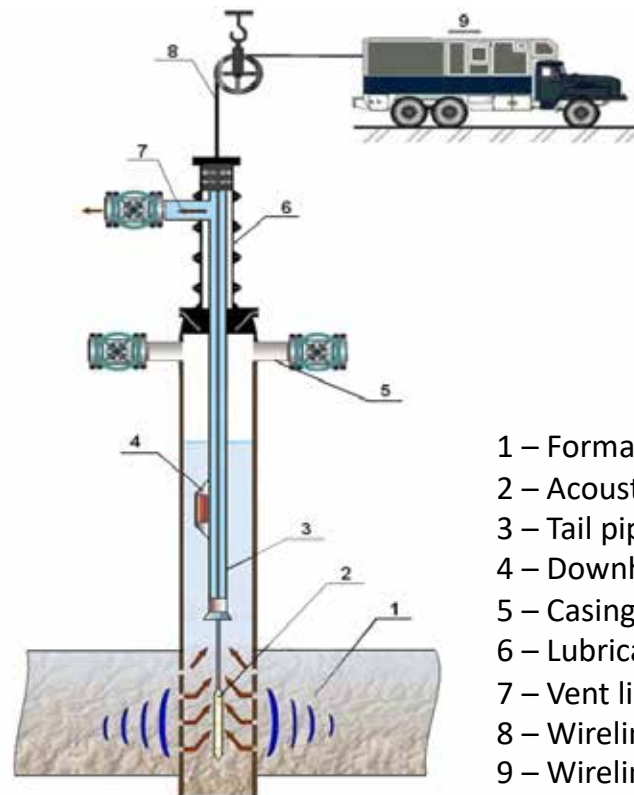
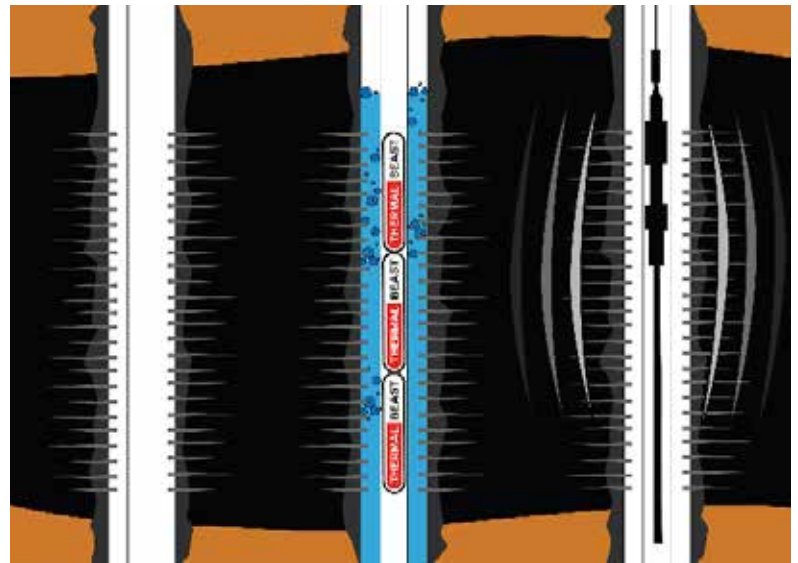


# NEAR-WELLBORE ZONE CLEANING: CAPSULES + ULTRASONIC

ThermalBeast capsule treatment is perfect solution before the ultrasonic flow stimulation to clean either inside the tubing or to speed up the ultrasonic process by flooding near-wellbore zone with hot surfactant produced from the capsules.

As a result ultrasonic operations have a greater impact on the reservoir:

- Destruction of the boundary layer, confining globule mud filtrate and other particles in the rock pores
- Removal of contaminants from the rock
- Improving communication of well - formation system
- Improving well productivity from the first hours
- Preserving effect up to 2 years during continuous flow from the well



- 1 – Formation
- 2 – Acoustic oscillator
- 3 – Tail pipe
- 4 – Downhole gauge
- 5 – Casing valve
- 6 – Lubricator
- 7 – Vent line
- 8 – Wireline cable
- 9 – Wireline unit

## Stage 1. Capsule pre-treatment

Reservoir flow stimulation with ThermalBeast capsules.

## Stage 2. Ultrasonic stimulation

Reducing resistance on the boundary of perforation channels. Ultrasonic treatment changing the viscoelastic properties of oil.

# EXAMPLES

## PRODUCER FLOW STIMULATION

Well number	Oil flow rate before treatment, <i>bpd</i>	Oil flow rate after treatment, <i>bpd</i>	Effect duration, <i>days</i>	Additional output, barrels
135D	19	51	431	7 258
3071	25	28	235	403
15716	9	16	317	1 912
20181	9, intermittent production - 2 days per week	11, stable production	428	541
15785	10, intermittent production - 2 days per week	13, stable production	420	1 057
20125	13, intermittent production - 2 days per week	19, stable production	340	1 925

## PRODUCER FLOW STIMULATION HEAVY AND HIGH VISCOSITY OIL

Well number	Oil flow rate, <i>bpd</i>		Flow rate increase, <i>bpd (%)</i>
	before treatment	after treatment	
443	17	44	27 (159)
2852	25	84	58 (233)
3330	11	53	42 (367)
3229	18	45	27 (148)
3232	14	30	16 (114)
3317	33	45	12 (37)
3218	36	46	10 (28)
1168	11	22	11 (106)
1159	29	57	28 (98)
3282	14	30	16 (114)
3218	36	46	10 (28)
3221	13	24	11 (81)

## INJECTOR WELL STIMULATION

Well number	Treatment interval, m	Injectability, <i>m<sup>3</sup>/day (pressure, MPa)</i>		Effect duration, <i>months</i>
		before treatment	after treatment	
21170	1803,8 - 1805,6	6(10,7)	123(10,0)	9+
21715	1690,8 - 1699	22(9,5)	254 (8,0)	8
20916	1764 – 1772	0 (11,0)	286 (5,0)	3+
14830	1608,4 – 1618,5	0 (15,5)	48(11,0)	3+
9634	1706,4 – 1708	11 (8,4)	222(10,0)	9+
10780D	1742 – 1756,9	75 (9,5)	238, (5,0)	7
21003	1795 – 1813,7	4 (10,0)	336 (7,0)	2+
20115	1634,4 – 1635,6	5 (11)	230 (9,0)	4+
21642	1873,6 – 1878,6	20 (8,5)	239 (10,0)	1+
20155	1758 – 1758,5	9 (10,0)	175 (8)	7



# EXPLORING THE VISION

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