

**МОДЕРНИЗАЦИЯ НА ЙОНООБМЕННАТА
ВОДОПОДГОТВИТЕЛНА ИНСТАЛАЦИЯ В АЕЦ „КОЗЛОДУЙ“ ЧРЕЗ ЗАМЯНА
НА КЛАСИЧЕСКАТА ЙОНООБМЕННА ТЕХНОЛОГИЯ С МЕМБРАННО
ОБЕЗСОЛЯВАНЕ**

, . - .
”, - . ’ ”
N . 8, 1000

()

ROSA-9

(RO). (

BW30HR-440i, 40 RO

:

“ ”,

(),

-1000

16 Pa

320 ° .

(-1000).

(, , () , -)

-

I- II-

:

- ;

- ;

- ;

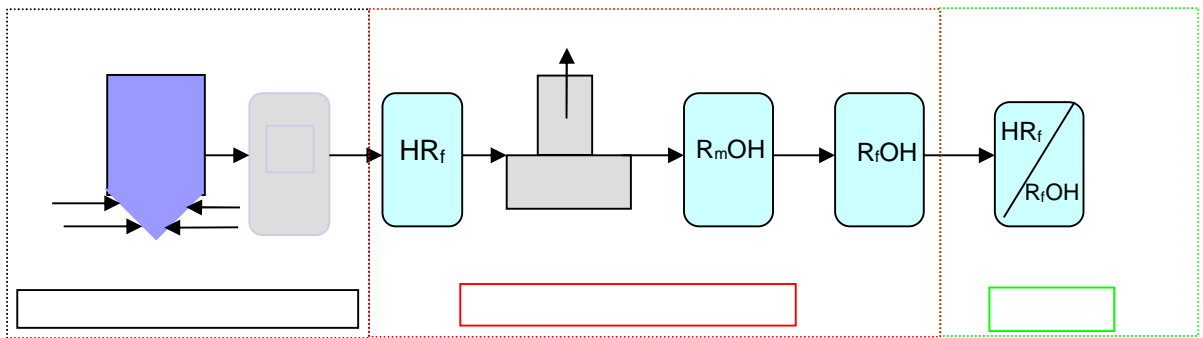
- ;

() .

[1].

m^3/h .

350



.1.

; HR_f -

; R_fOH -

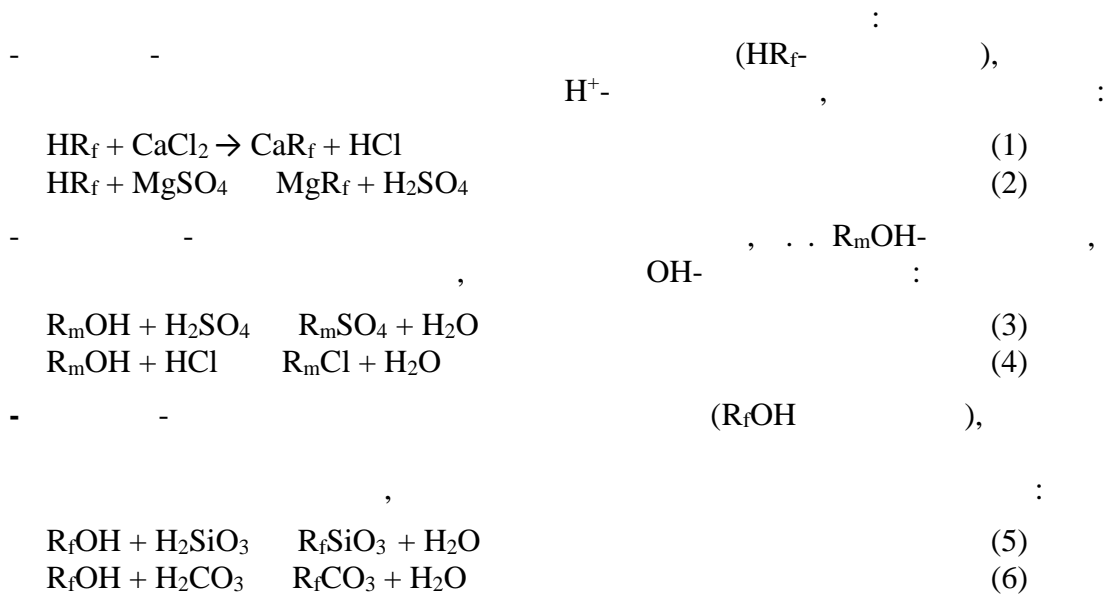
; R_mOH -

() .

1.

		HR_f	
	<p>Q=200 m³/h; D=3 m; F=17 m²; /</p> <p>3 : I-0.2m/ d=3÷8 mm II-0.4m/d=1.5÷5 mm III- 0.4 m/d= 0.3÷3 mm</p>	<p>Q=160 m³/h; D=3 m; F=7.1 m² W=24 m/h</p> <p>: KPS-200 1200 H IR 120 Na</p> <p>V =12 m³ H=1.7 m</p> <p>70 g 100% HCl/l</p>	<p>Q=250 m³/h; D=1.4 m; h=4 m</p>
R_mOH		R_fOH	
	<p>Q=160 m³/h; D=3 m; F=7.1 m² W=0-30 m/h</p> <p>: 41, 42 IRA 96</p> <p>V =11.2 m³ h=1.58 m</p> <p>R_fOH 60g100% NaOH/l</p>	<p>Q=160 m³/h; D=2.6 m; F=5.2 m² W=0-30 m/h</p> <p>: SBW IRA 402 Cl</p> <p>V =7.7 m³ h=1.45 m</p> <p>: 120g100%NaOH/l</p>	<p>Q=200 m³/h; D=3 m; F=5.3 m²; W=0-40 m/h</p> <p>: KPS-MB SBW-MB</p> <p>V =8.5 m³/V =2.83 m³/V =5.67 m³ h=1.63 m</p> <p>- 548 kg 95% H₂SO₄ 1493kg 45% NaOH/</p>
Q-	; V-	/	; D- ; F-
	; W-	; h-	; ;

“ ”



(CO₂)

H-

()

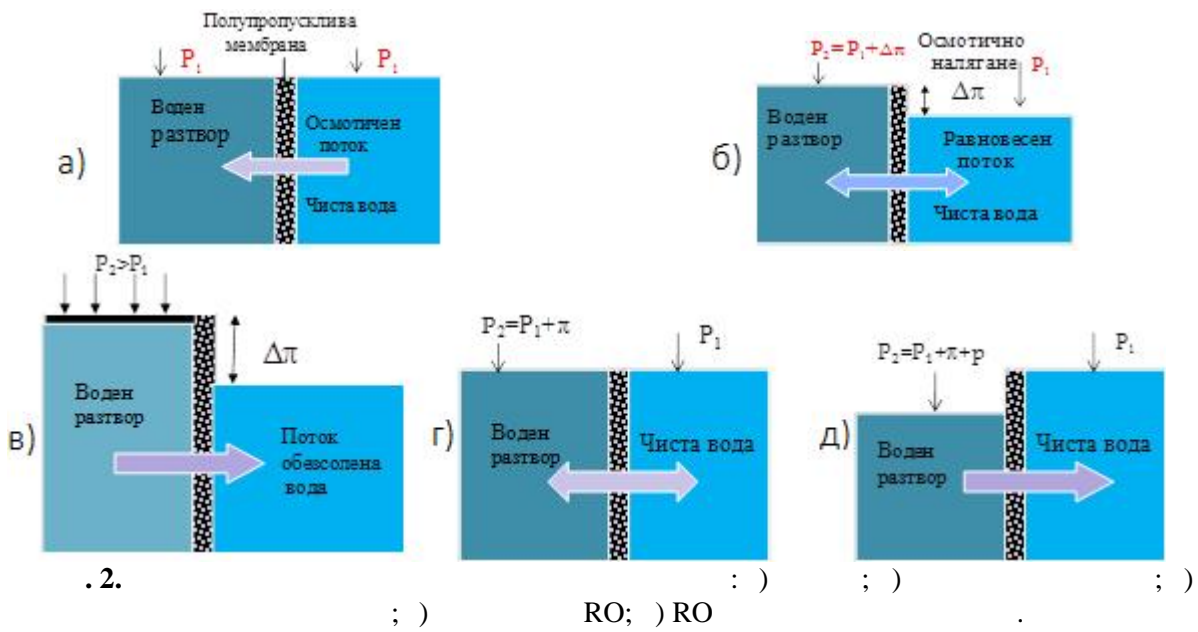
(RO),
RO [2,3].

()

()

1,

(. 2,)



(π)(. 2,) . π

Morse:

$$\pi = i\phi MRT$$

(7)

i-

van't Hoff; φ-

; M-

; R=8.3145 JK⁻¹; T-

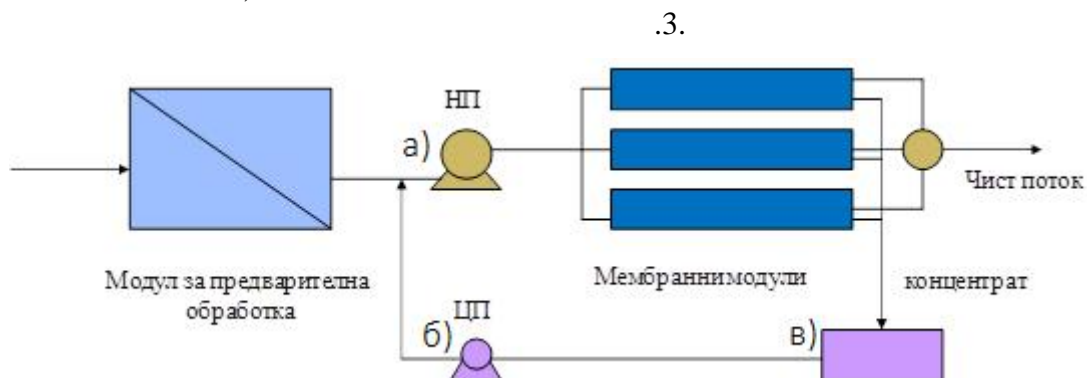
2 > 1

(. 2,)

2 = 1 +

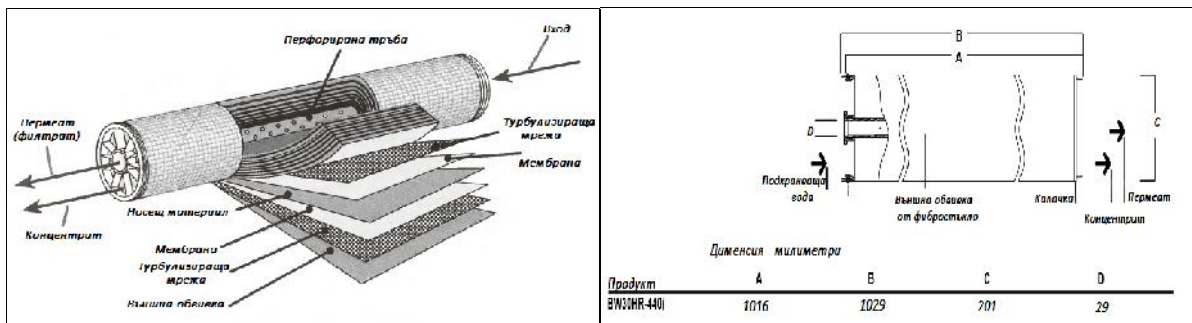
(. 2,)

2 > 1 + (. 2,)



.3.

.4



.4.

BW30HR-440i.

Dow Chemicals –ROSA –9 [4].

2 3.

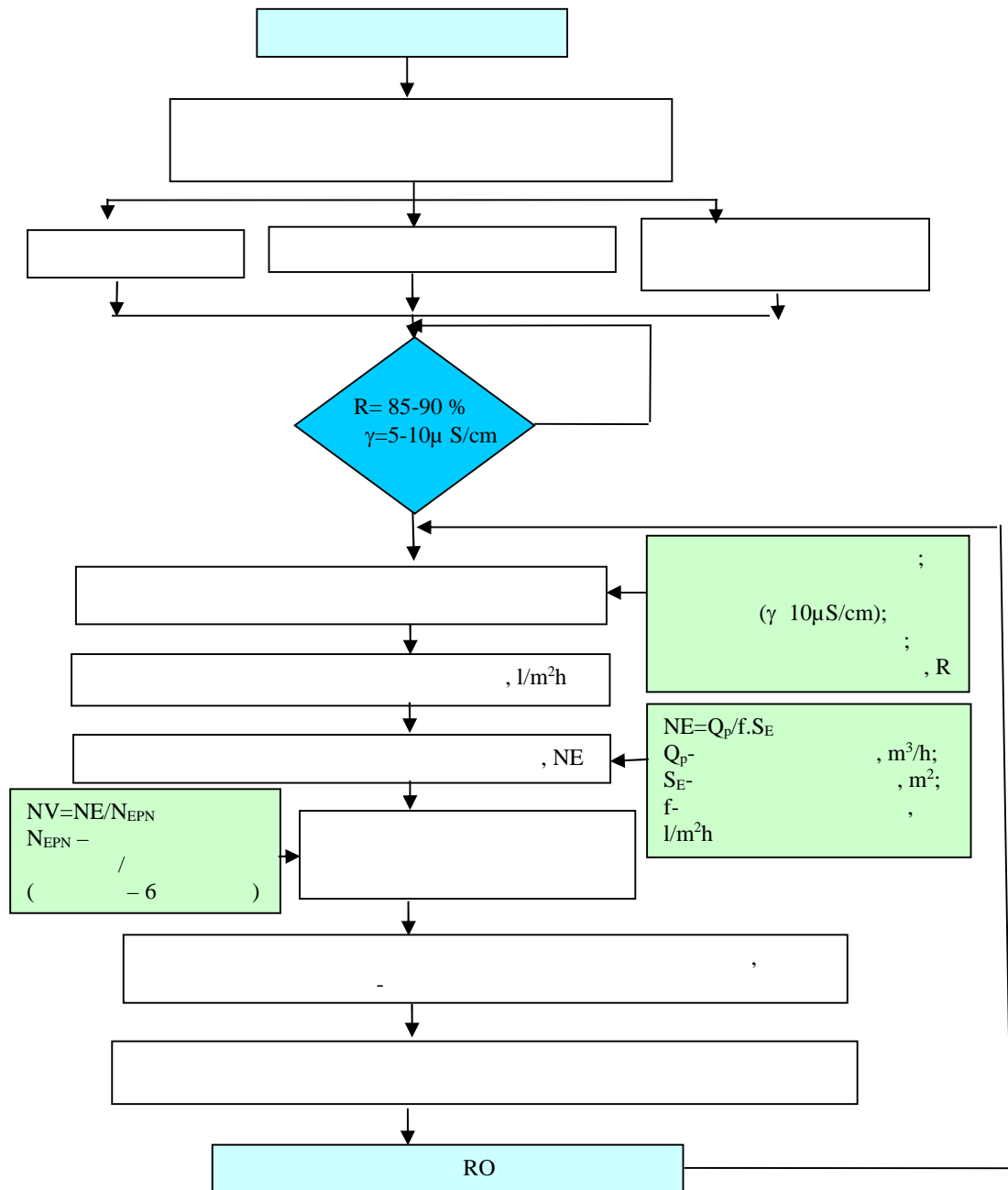
2.

x, $\mu\text{S/cm}$	pH	A_M , mg-eq/l	, %	, mg-eq/l	, mgO_2/l
450	7.83	3.50	89	4.40	11.37

3.

Cl, mg/l	Cu, mg/l	Fe, mg/l	Na, mg/l	Al, mg/l	SiO ₃ , mg/l	SO ₄ , mg/l	PO ₄ , mg/l	NO ₃ , mg/l
23	<0.01	0.28	15	0.36	6.60	39.60	0.24	5.9

.5.



.5.

a, - , .5, 8 .

BW30HR-440i , 40 , RO

BW30HR-440i (. 4,), , RO 8.88

4. μS/ m, RO 8.88

- γ<5÷10 μS/ m. 0.45

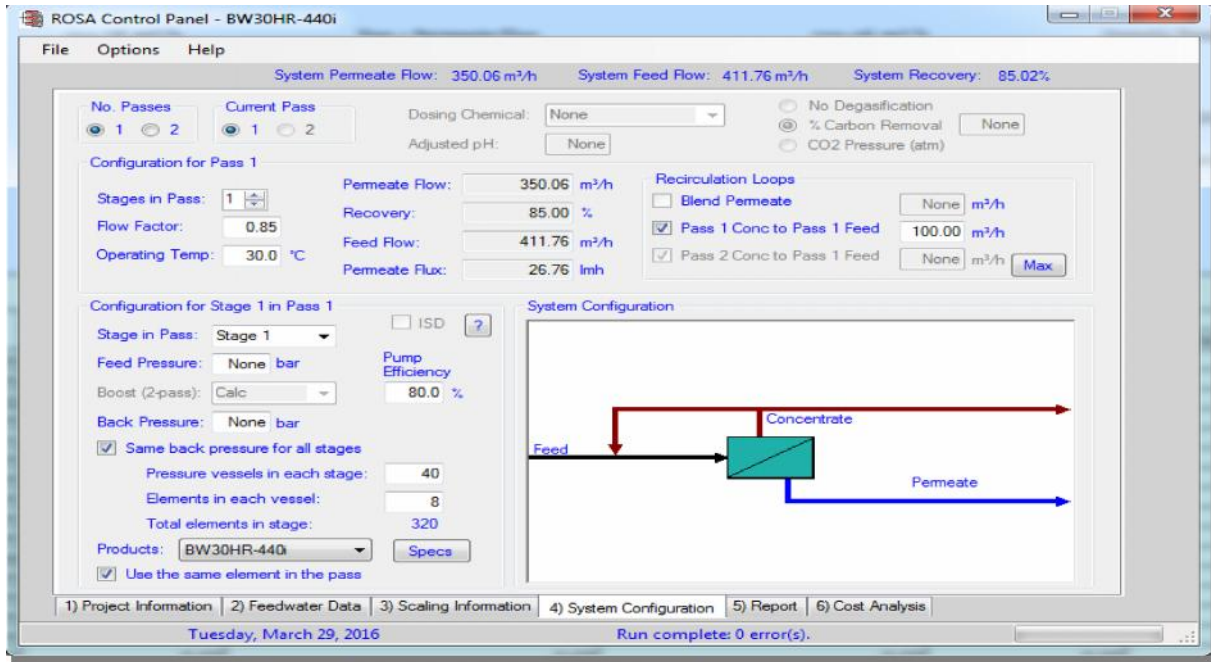
kWh/m³.

4.

BW30HR-440i

					41 m ²
		:			45
		:			41 bar
pH	:				1÷11
		:			19 m ³ /h

. 6.



. 6.

ROSA-9.

5.

5.

RO

	, m ³ /h	511.76	m ³ /h	,	350	m ³ /h	,	161.7
	, m ³ /h	411.76	S, mg/l		4.44	S, mg/l		1439.37
	, m ³ /h	100	γ, μS/sm		8.88	P, bar		6.61
pH		7.83	pH		7.83	pH		7.83
	, %	85						
	, bar	8.77						
	,	30						
	, m ²	13080						
		0.85						
	, mg/l	225						
		320						
	. e , kW/m ³	0.45						
	: Surface Supply SDI < 3							

6.

		RO		
. e , kW/m ³		0.45	0.1	0.07
100% NaOH , g/m ³		-	0	150
100% HCl , g/m ³		-	0	180
, m ³ /m ³		1.17	1.03	1.4
, m ³		-	-	0.4
-	A , g/m ³	3.75	0.08	-
	RoClean P111, mg/m ³	0.4	0.004	
	, mg/m ³	0.37	0.03	
			1.24	1.51

40

μS/ m,

8.88

85 %

[1] T. Younos, K. E. Tulou, Overview of Desalination Techniques, Journal of contemporary water reserach&education, 2005, Issue 132, pp. 3-10.

[2] O.J. Morin , Membrane processes - Principles and Practices of Reverse Osmosis, Encyclopedia of Life Support Systems (EOLSS)

[3] : , 1990.

[4] Software ROSA -9, Dow Chemical Company, www.dow.com.