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Exercise Aleid2000

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1 Assignments

1.1 Assignment 1 – Pressure problem agricultural farm

The network shown in figure 1 (….\CASE1) is considered for the situation in the year 2005. Pressure relative to ground level is at least 20 MWC.

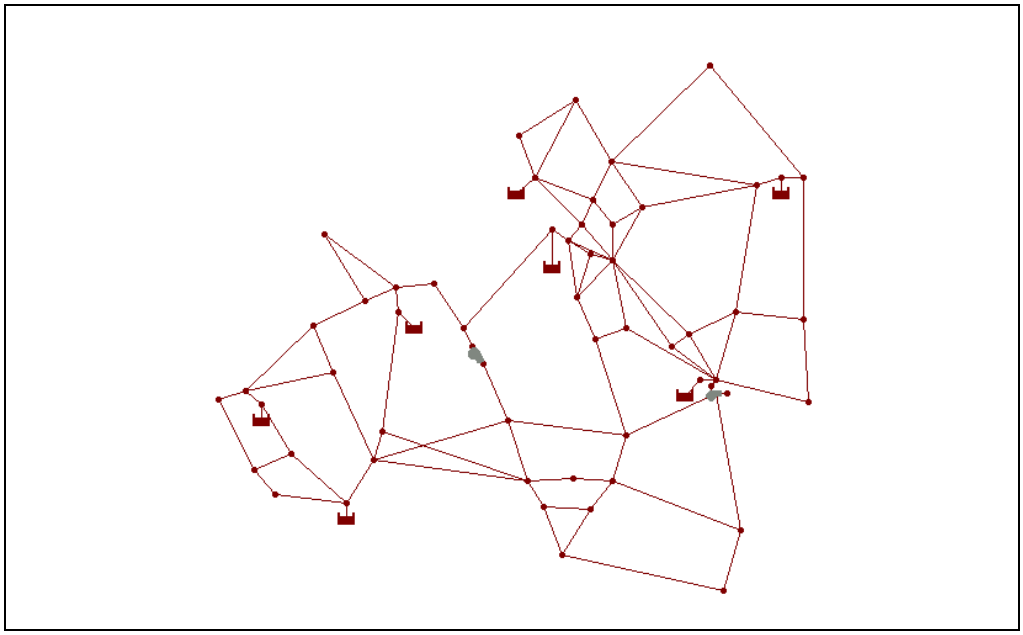


Figure 1 Example pressure problem agricultural farm

a. Make a 24 hour calculation for year 2005 with time steps of 1 hour en determine where, when and to what extend pressure problems occur.
b. What is the most efficient way to present and analyse the results?
c. Analyse the supply situation of the problem area and give (on paper) a solution for the problem.
d. The problem is caused by only one customer (a agricultural farm). What alternative can you offer for this customer?
e. Implement your solution and check whether this is sufficient to solve the problem.
f. Comment on your solution.

1.2 Assignment 2 – Network configuration and pump scheduling on time

Given the network of figure 2 (....\CASE2) supplied by a fixed pressure point H. Pressure with respect to ground level should be at least 20 mwc.

a. Make a multiple hour analysis of the network (model NET1.PRO) from 0 to 24 hour and consider the actual pressures in the network.
b. Pressures in parts of the network are unsatisfactory. What are possible solutions to solve the problem?
c. Implement your solutions by changing the model, recalculate and analyse the results.

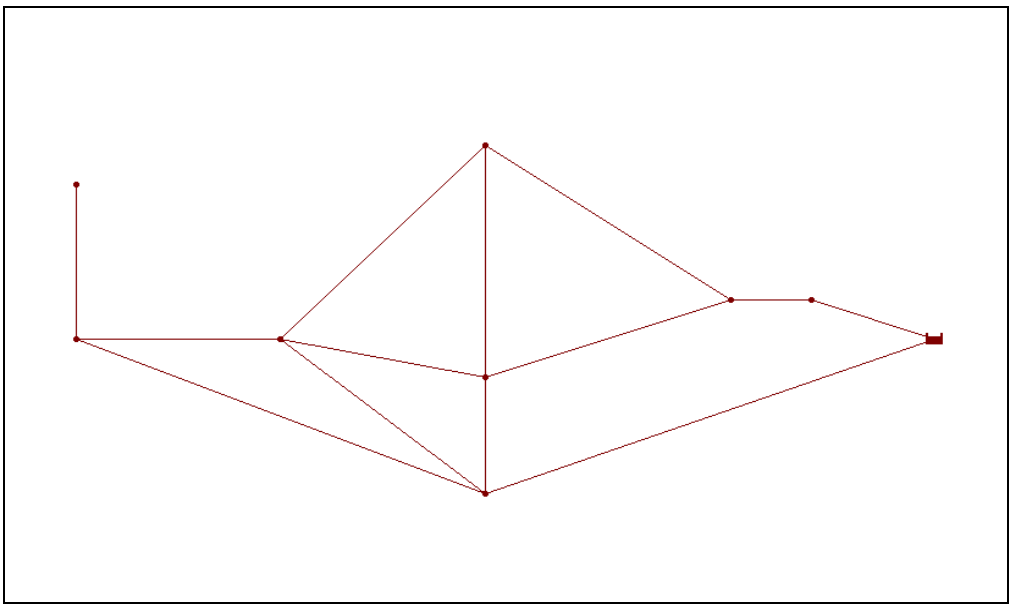


Figure 2 Example network pressure problem

Supply in point H is schematised in more detail. Instead of the fixed pressure point a number of pumps in introduced (model NET2.PRO). The pump curves are shown in figure 3.

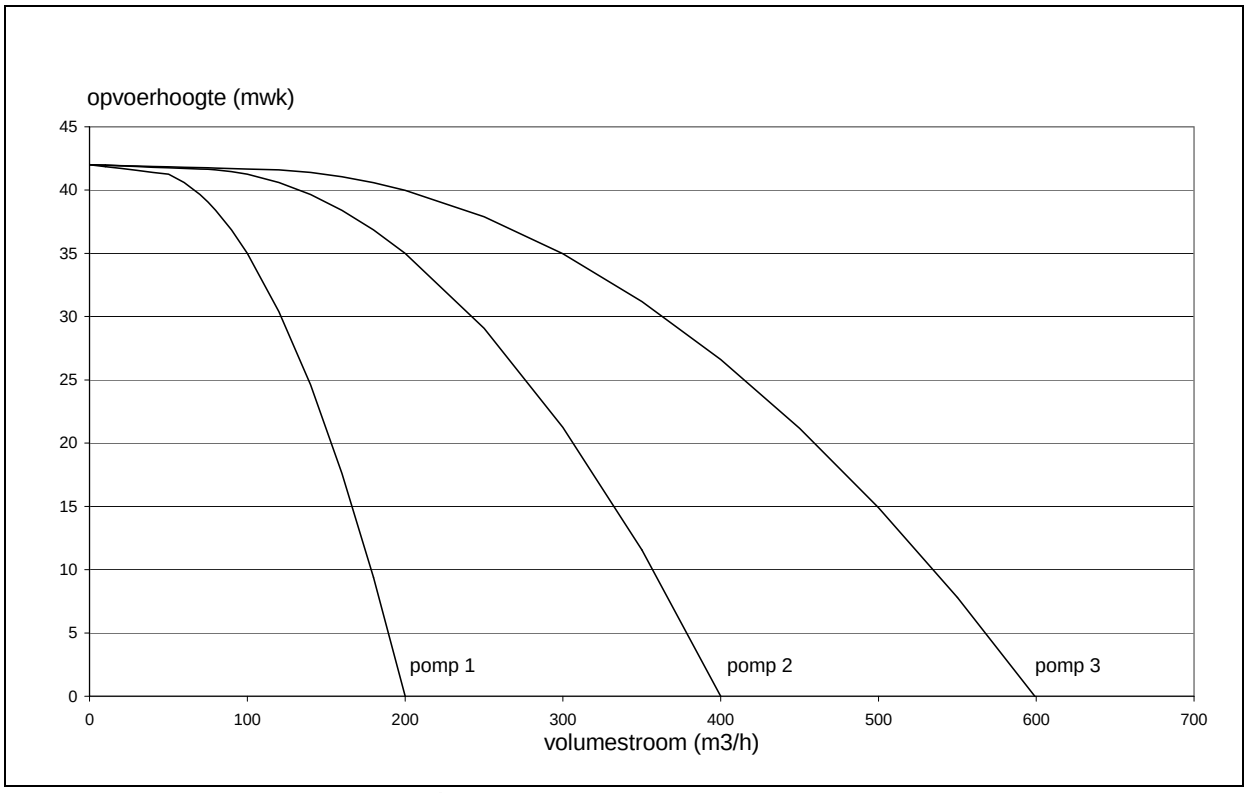


Figure 3. Pumping curves pump 1 t/m 3

Pumps in the model are not yet tuned for the new situation. Set point for the pumps is pressure in point A between 25 and 40 mwc.

d. Consider how pumps should be switched to fulfil the abovementioned set point. Change the time in the pump controls to activate the pumps, recalculate and check the result.

1.3 Assignment 3 – Assign demand patterns

In the model (....\CASE3), the demand are left out. The demand in node C has the following hourly pattern:

0	1	2	3	4	5	6	7
0.55	0.35	0.25	0.2	0.2	0.3	0.55	1.3

8	9	10	11	12	13	14	15
1.6	1.7	1.65	1.6	1.45	1.35	1.2	1.15

16	17	18	19	20	21	22	23
1.1	1.25	1.4	1.25	0.9	0.9	0.8	0.65

a. Assign for node C an avarege demand of 50 m3/h and the above mentioned hour pattern (hour-pattern number = 2) and e day factor of 1.2 (day pattern number = 2; day 1).

A long term prognosis is made based on the year 2003. A grow percentage of 5% is fore seen during 3 years. The following 2 years will have a growth rate of 3%, after which the growth reclines to 0%.

b. Assign for node C the growth factors (grow-pattern number = 2).
c. What is the given and calculated demand en pressure (mwc +gl) in node C at 9:00 hour in 2003 and 2008?
d. Why deviates in 2008 the calculated demand from the given demand?

1.4 Assignment 4 - Reliability

In directory ....\CASE4 you will find a strongly looped network coupled with a demand pattern for a maximum day (day factor=1,8).

a. Let pipe element between the nodes XD106 - XD003 fail by making the diameter equal to 1 mm. Install the global pressure threshold at 20 mwc + gl to make the calculation pressure dependant.
b. Perform the calculation for the year 2004 from 0 to 24 hour with time steps of 1 hour and determine with the results the maximum hour.
c. In what part of the supply area an effect on the calculated demand can be noticed for this maximum hour? Give three names of affected nodes. For how many nodes the calculated demand is less than 100% of the give demand?
d. Which nodes have down stream pressures below 15 mwc+gl consequently having a larger effect than 25%? For how many nodes this is the case.
e. Which node has the lowest pressure? What is the effect on the supply/demand?
f. Is there a problem with reliability of the affected model area?

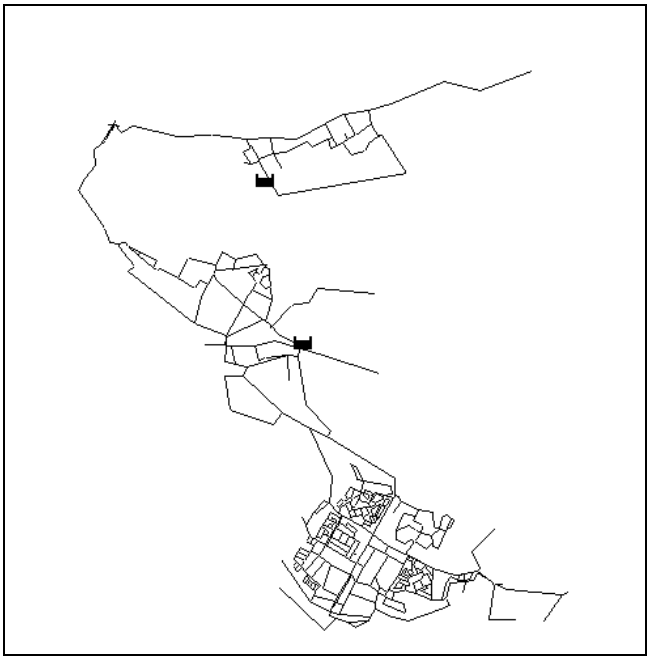


Figure 4 Reliability calculation

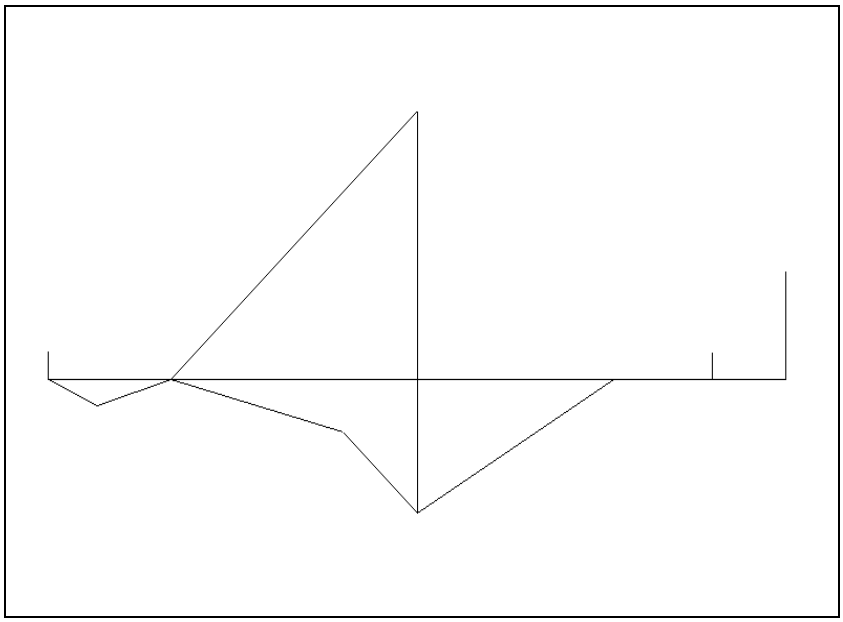
1.5 Assignment 5 – Dynamic controls

Base for this assignment is the model from case2 (....\Case5\Net2.pro). Requirement is a pressure in point A between 25 and 40 mwc +gl. From energy point of vies pressure is point A is preferably below a maximum of 35 mwc+gl.

a. Design a dynamic control for the pumps that meets both the requirements and wishes. Delete the controls on time and add new controls for each pump. Determine the working areas of the pumps using the (constructed) pump characteristics; See figure next page.
b. Check the adjusted control with a 24-hour calculation with time steps of one hour staring at zero hour. Make a pressure graph for point A.
c. Reduce the calculation time step to 5 minutes and en check again the calculated pressure at point A. What is your conclusion?

1.6 Assignment 6 – Controls and valves

In the directory ....\CASE6 a simple network with double supply is presented. On the right hand side the network is supplied with a continuous and constant flow from a production pumping station. At the left hand side the network is during day hours supplied with a storage pumping station. During night hours the storage is filled.



Figuur 5 Netwerk met productie- en suppletiepompstation

1. Finish the model of the production pumping station PSA with the following items:

a. a pump in the pipe PSAP01. The pump supplies with a set of pumps and necessary speed controls a continuous head of ± 42 mwc, with a maximum of 4000 m^3/h. Following the maximum the head of the pump rapidly declines to 0 mwk. The high pressure pumps from the clear water storage supply continuously.

b. A production storage (Clear water reservoir) on node PSAR02 with a bottom level at 2 m+RL and a maximum height at 5 m+RL. The content between these levels is 8000 m^3. The initial level in the clear water reservoir is 2 m + bottom level.

c. A valve in pipe PSAF01 that controls the switches in the treatment elements. The treatment elements are controlled in steps of 1000 m^3/h depending on the level in the reservoir PSAR02:
production = 3000 m^3/h below 3 m+RL;
production = 2000 m^3/h below 4 m+RL;
production = 1000 m^3/h below 4,75 m+RL;
production = 0 m^3/h above 5 m+RL.

d. A set point at node PSAR01 from which the pumping station PSA is supplied.

2. Finish the Suppletion pumping station SPB with::

a. A pump in the pipe SPBP01. The pump characteristic connects the points::

Q	=	0	H	=	45
Q	=	600	H	=	42

b. A control supplying the network from 7 tot 24 hour;

c. A suppletion reservoir at node SPBR01 with a bottom level at 1 m+RL and a maximum height at 3,5 m+RL. The content is 6000 m^3. The initial level in the storage is 0 m+bottom level.

d. A valve in pipe SPBF01 controlling the filling of reservoir SPBR01. The valve SPBF01 opens if pressure at node 1 is at least 25 mwc+gl. If you think more controls should be incorporated, feel free to do so.

3. Check with a 24-hour calculation using time steps of 1 hour if the controls work properly. If no solution seems to be possible at a certain hour, find out what causes this. Save the results of a model working on an hourly time step and recalculate the model with a ten minutes time step. Compare the results and comment on the differences.
4. How can you improve the performance of the suppletion reservoir and what are the controls than?
5. The switches of treatment elements should as constant as possible with as little switches as possible. Can you improve the control of the treatment and how is this calculated?

1.7 Assignment 7 – Flushing pipes

Consider the distribution net model (....\CASE7). The area will be flushed systematically under the condition of a minimum velocity of 1,5 m/s and a refreshment rate of three: the total flushed volume equals at least three times the content of the pipe.

a. Which strategy (order) will you follow to flush the area?

A hydrant is present on node 'A026'. The typical QH-relation of this hydrant is:

Q (m3/h)	0	20	40	60	80	100	120	140
dH (mwc)	0	2	4,3	8,7	16	26	38	53

of

$0 < Q < 20$	:	$\Delta H = 0.049 \cdot Q + 1$
$20 < Q < 200$	:	$\Delta H = 0.0032 \cdot Q^2 - 0.088 \cdot Q + 2.46$

The rind downstream of node 'A022' has to be cleaned.

b. Calculate the situation for hour 0 and present the velocities in colour. In which pipes of the ring the velocity is sufficient (>1,5 m/s)?
c. Which measures are necessary for flushing all pipe behind A021 effectively?
d. How long should the pipe loop A021 - A031 - A023 be flushed to reach the refreshment rate?

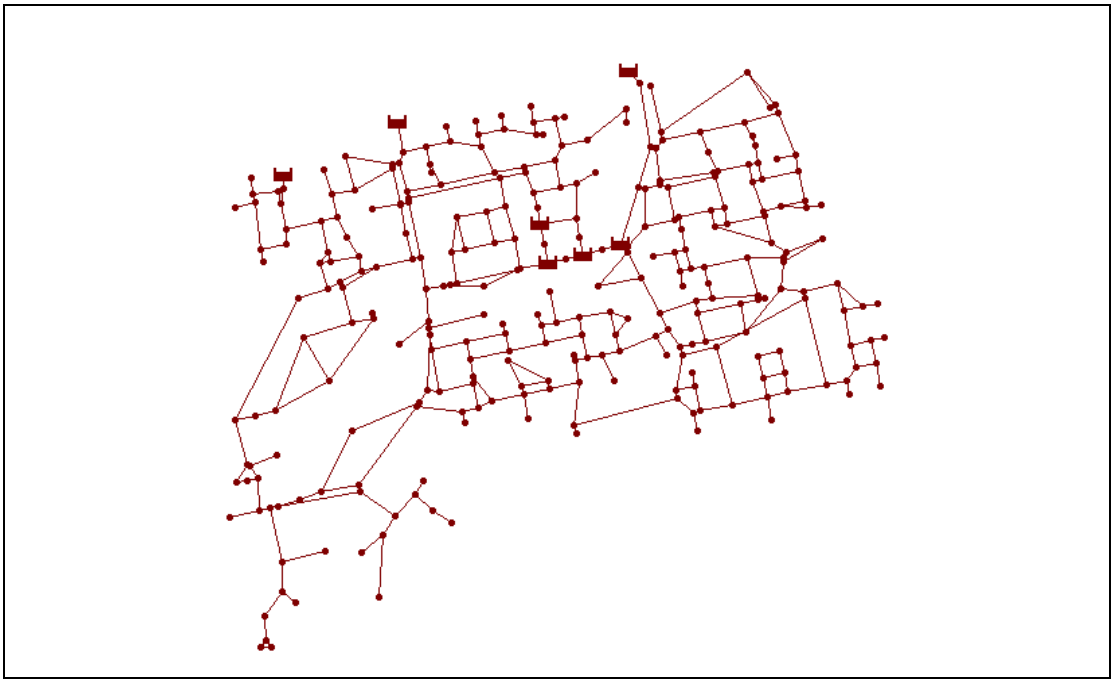


Figure 6 Distribution net subject to cleaning

1.8 Assignment 8 –Practical applications

a. Copy the content of sub-directory case4 to case9. Consider the case4-situation with failing pipe L00026 and the max.day-pattern. Assign a global; pressure threshold at 20 mwc. Around node YD140 there is a office building with a sprinkler installation. Simulate the sprinkler installation by connecting a reservoir (sprinkler storage) to node YD140. Pipe length is 50 m; internal diameter=150 mm; k=0,1. Maximum water level ('waste level') in the reservoir is 1m-NAP. Proper functioning of the sprinkler installation requires a supply of 20 m^3 in 10 minutes. Calculate the network with this requirement (save as case9a) and check if the flow is sufficient during a peak hour.

b. Consider again the situation with failing pipe L00026, maxday-pattern and global pressure threshold of 20 mwc. About 500 m west of YD190 a new building area is planned with the following growth prognosis (growth pattern 4):

Jaar	2004	2005	2010	2015	2020
Aantal aansluitingen	1000	2000	4000	6000	6000

The average yearly demand per connection is 150 m3. Pattern number 2 represents the hourly and day pattern. Add a new demand node to simulate the new area with a calculated demand for 2004 and reference to the patterns number 2. Connect this node to the existing network with one or two trunk mains and calculate the situation for the year 2009 (case9b). What is the pressure pattern during a max day in the new building area? What network configuration is necessary to connect the new building area?

2 Answer and explanation

2.1 Assignment 1 – Pressure problem agricultural farm

a. Open case1.pro; screen case1.pro (input): calculate\standard\calculation period from 0 through 24 uur\OK; screen case1.out (output): view\clour coding \select:head above GL (nodes); Adjust to node parameter; go through time window from 0 to 24 hour;
Answer: from 18:00 to 22:00 hour pressure at node 36BIS less than 20 mw +GL. At 21:00 h pressure is 18,13 mwc +mv.

b. Presentation: Pressure image in mwc+gl entire area per time step with presentation of node name and pressure in mwc+gl node 36BIS; graph of pressure in wmc+gl at node 36BIS. Analysis: Adjust colour coding for pipes in hydraulic gradient.

c. Volume flow 36 en 44 m3/h through respectively L00014 and L00015 at 21:00u. Solution: enlarge pipe L00014 (larger diameter). Pressure gradient pipe L00014 is 14,66 m/km.

d. Alternative solution: install reservoir at node 36BIS.

e. Diameter pipe L00014 for example 150 mm. Minimum pressure at 21:00 becomes 31,3 mwk +gl.

2.2 Assignment 2 – Network configuration and pump scheduling on time

a. At 19:00h at nodes A through E and I pressure below 20 mwc +gl.

b. The pressure gradient of pipe L00010 at 19:00 u is largest at 7,1 m/km.

Solution 1: Increase diameter pipe L00010 from 300 to 400mm and slight increase of fixed pressure with about 0,3 mwk at nodeH.

Solution 2. Increase fixed pressure at node H with 2 m to 33 m+NAP.

d. Time controls as follows:

```
LINK P1 CLOSED AT TIME  0                    ;
LINK P1 OPEN AT TIME  1                      ;
LINK P1 CLOSED AT TIME  6                    ;
LINK P1 OPEN AT TIME  7                      ;
LINK P1 CLOSED AT TIME  12                   ; was 11
LINK P1 OPEN AT TIME  17                     ;
LINK P1 CLOSED AT TIME  21                   ; was 19
LINK P1 OPEN AT TIME  22                     ; was 20
LINK P1 CLOSED AT TIME  23                   ;
LINK P2 OPEN AT TIME  0                      ;
LINK P2 CLOSED AT TIME  1                    ;
LINK P2 OPEN AT TIME  6                      ;
LINK P2 CLOSED AT TIME  8                    ;
LINK P2 OPEN AT TIME  12                     ;
LINK P2 CLOSED AT TIME  22                   ; was 19
LINK P3 CLOSED AT TIME  0                    ;
LINK P3 OPEN AT TIME  7                      ;
```

Pressure at point A varies now between 25,4 tot 39,3 mwk +gl.

2.3 Assignment 3 – Appoint demand patterns

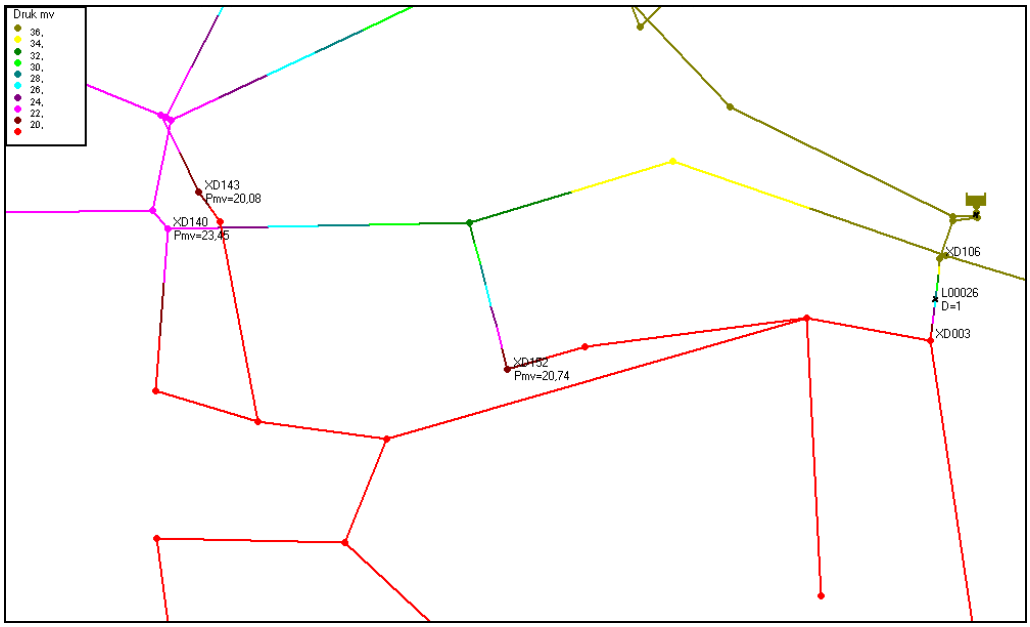
c. The calculation results are:

Year	Time	Given demand (m3/h)	Calculated supply (m3/h)	Pressure (mwc +gl)
2003	9:00	102	102	20,11
2008	9:00	123,42	115,09	18,65

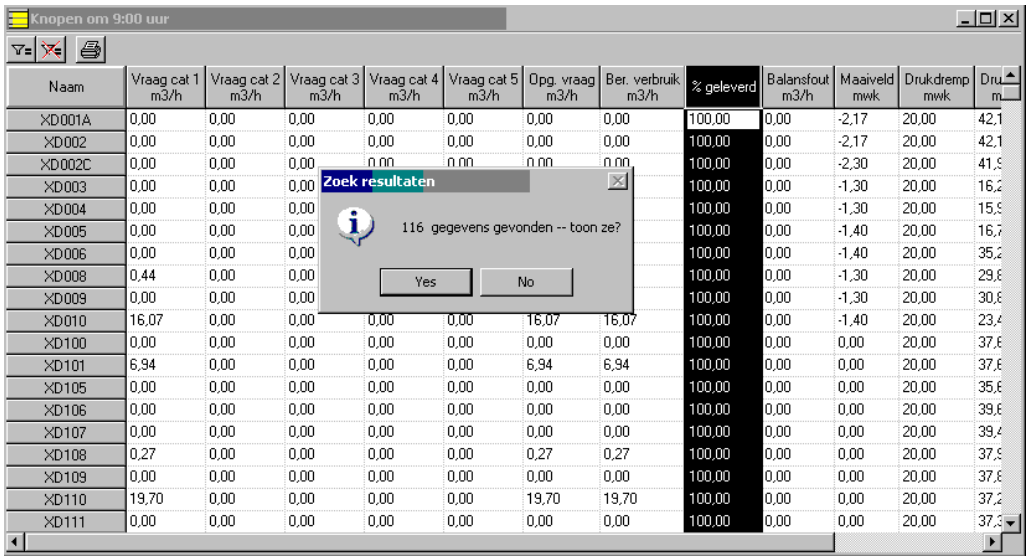
e. In the hydraulic options (Edit\edit input\ Hydraulic options) the global pressure threshold is set at 20 mwc (+gl). If pressure drops below 20 mwc +gl , the demand drops accordingly. In the calculation report this is noted as: 'Pressure dependent calculation? ... Yes'.

2.4 Assignment 4 – Reliability

a. Find the pipe by selecting info\nodes\node name and selection type List. When nodes are located, zoom in and adjust the pipe diameter (right click the mouse and edit input)
b. The result of the pressure image at the maximum hour 9:00 is as follows:

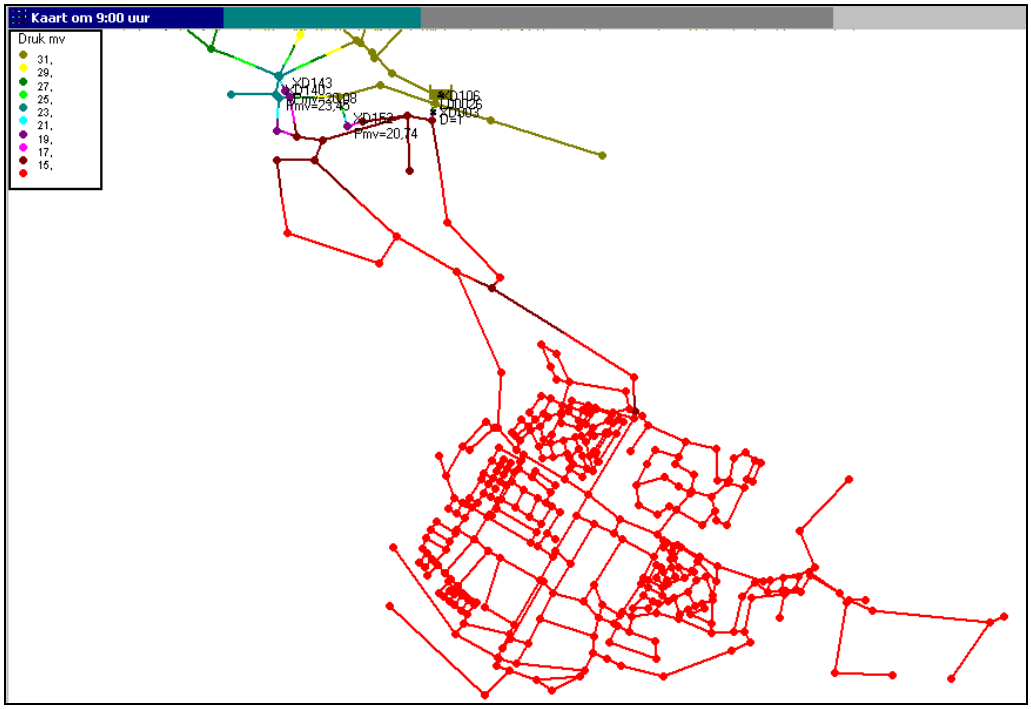


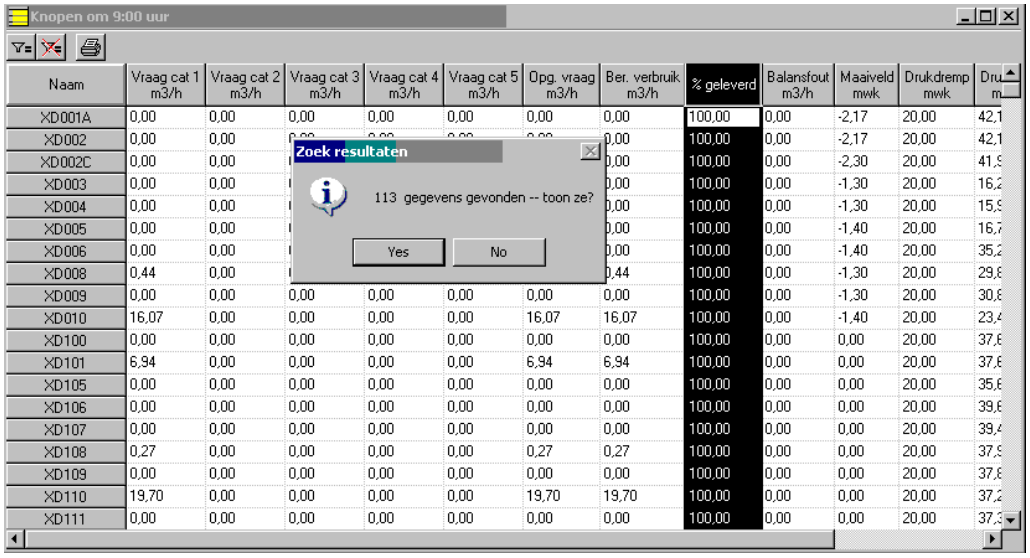
c. Report using the filter <100% supplied (\report\snapshot\node; use the left upper corner icon for filtering):



Naam	Vraag cat 1 m3/h	Vraag cat 2 m3/h	Vraag cat 3 m3/h	Vraag cat 4 m3/h	Vraag cat 5 m3/h	Opg. vraag m3/h	Ber. verbruik m3/h	% geleverd	Balansfout m3/h	Maaiveld mwk	Drukdremp mwk	Dru... m
XD001A	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	-2,17	20,00	42,1
XD002	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	-2,17	20,00	42,1
XD002C	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	-2,30	20,00	41,9
XD003	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	-1,30	20,00	16,2
XD004	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	-1,30	20,00	15,9
XD005	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	-1,40	20,00	16,7
XD006	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	-1,40	20,00	35,2
XD008	0,44	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	-1,30	20,00	29,8
XD009	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	-1,30	20,00	30,8
XD010	16,07	0,00	0,00	0,00	0,00	16,07	16,07	100,00	0,00	-1,40	20,00	23,4
XD100	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	37,8
XD101	6,94	0,00	0,00	0,00	0,00	6,94	6,94	100,00	0,00	0,00	20,00	37,8
XD105	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	35,8
XD106	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	39,8
XD107	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	39,4
XD108	0,27	0,00	0,00	0,00	0,00	0,27	0,27	100,00	0,00	0,00	20,00	37,9
XD109	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	37,8
XD110	19,70	0,00	0,00	0,00	0,00	19,70	19,70	100,00	0,00	0,00	20,00	37,2
XD111	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	37,3

d. Screen dump and report using filter <75% supplied:





Naam	Vraag cat 1 m3/h	Vraag cat 2 m3/h	Vraag cat 3 m3/h	Vraag cat 4 m3/h	Vraag cat 5 m3/h	Opg. vraag m3/h	Ber. verbruik m3/h	% geleverd	Balansfout m3/h	Maaiveld mwk	Drukdremp mwk	Dru m
XD001A	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	-2,17	20,00	42,1
XD002	0,00	0,00					0,00	100,00	0,00	-2,17	20,00	42,1
XD002C	0,00	0,00					0,00	100,00	0,00	-2,30	20,00	41,9
XD003	0,00	0,00					0,00	100,00	0,00	-1,30	20,00	16,2
XD004	0,00	0,00					0,00	100,00	0,00	-1,30	20,00	15,9
XD005	0,00	0,00					0,00	100,00	0,00	-1,40	20,00	16,7
XD006	0,00	0,00					0,00	100,00	0,00	-1,40	20,00	35,2
XD008	0,44	0,00					0,44	100,00	0,00	-1,30	20,00	29,8
XD009	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	-1,30	20,00	30,8
XD010	16,07	0,00	0,00	0,00	0,00	16,07	16,07	100,00	0,00	-1,40	20,00	23,4
XD100	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	37,6
XD101	6,94	0,00	0,00	0,00	0,00	6,94	6,94	100,00	0,00	0,00	20,00	37,6
XD105	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	35,6
XD106	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	39,6
XD107	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	39,4
XD108	0,27	0,00	0,00	0,00	0,00	0,27	0,27	100,00	0,00	0,00	20,00	37,9
XD109	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	37,8
XD110	19,70	0,00	0,00	0,00	0,00	19,70	19,70	100,00	0,00	0,00	20,00	37,2
XD111	0,00	0,00	0,00	0,00	0,00	0,00	0,00	100,00	0,00	0,00	20,00	37,3

e. At 9:00 the pressure at node YD003 is 9,41 mwc +gl, however this node has no demand; so no effect. At nodes YD277 and YD278 the calculated pressure is at 9:00 u 13,31 mwc +gl. The supply is at that time at those nodes 67% of the demand entered.

f. Only at times 9:00 and 10:00 the pressure is below 15 mwc+gl. On a daily base supply is above 75% of the demand entered for the maximum day. Conclusion is that there is no problem with reliability.

2.5 Assignment 5 – Dynamic controls

1. First determine the network characteristic for the network between the pumping station and point A: The pressure drop between PSK06 and A is at the max hour 19:00 circa 3,7 mwc. The outgoing flow from the pumping station is at that moment 750 m3/h.
2. Plot the network characteristic on the pump curve graph; both for the desired minimum and maximum pressure.
3. Determine the working area of the separate and combined pumps on the graph. This results in the following table:

Qmax (m3/h)	Pompen on		
135	1A	-	-
270	-	2A	-
400	-	-	3
525	1B	-	3
- (>525)	1B	2B	3

Note that pumps 1 and 2 have different working areas. That's why we add two virtual pumps (1B en 2B) to the model. The original pumps 1 and 2 are renamed to 1A en 2A to indicate the difference.

4. The table is translated to the following controls:

```
LINK P1A OPEN IF LINK PSL006 BELOW  135                    ;
LINK P1A CLOSED IF LINK PSL006 ABOVE  135                  ;
LINK P2A OPEN IF LINK PSL006 ABOVE  135                    ;
LINK P2A CLOSED IF LINK PSL006 BELOW  135                  ;
LINK P2A CLOSED IF LINK PSL006 ABOVE  270                  ;
LINK P3 OPEN IF LINK PSL006 ABOVE  270                     ;
LINK P3 CLOSED IF LINK PSL006 BELOW  270                   ;
LINK P1B OPEN IF LINK PSL006 ABOVE  400                    ;
LINK P1B CLOSED IF LINK PSL006 BELOW  400                  ;
LINK P2B OPEN IF LINK PSL006 ABOVE  525                    ;
LINK P2B CLOSED IF LINK PSL006 BELOW  525                  ;
```

2.6 Assignment 6 – Controls and valves

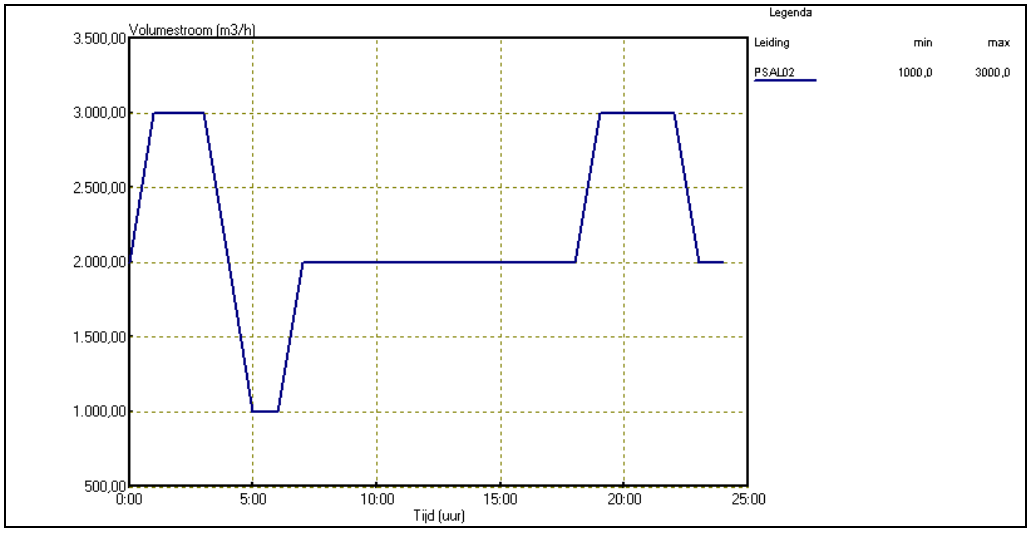
1. For PSAF01 a control is used with a FCV (Flow control valve). For reservoir PSAR01 a fixed pressure of 10 m+RL is chosen to enable feeding reservoir PSAR02 through gravity flow.

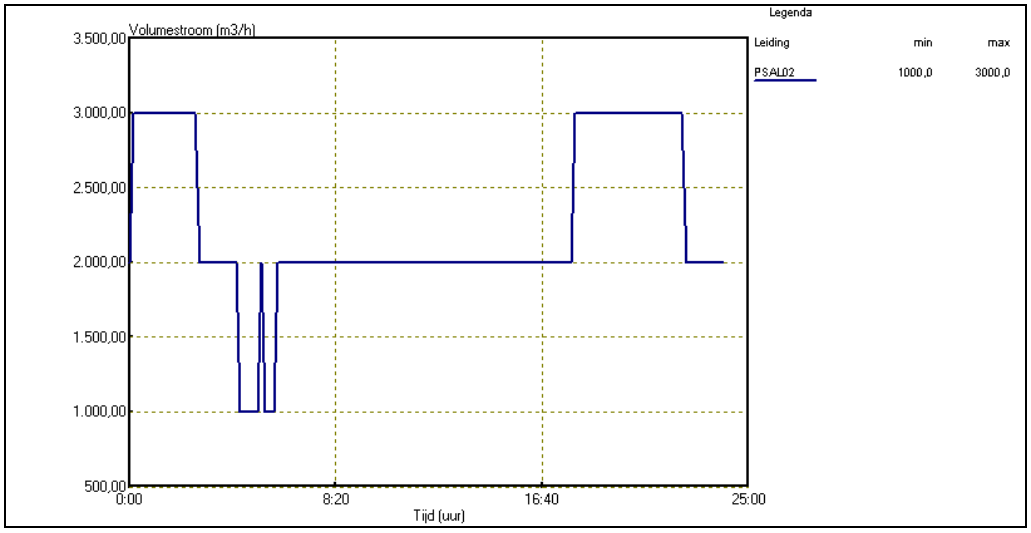
2. PSBF01 is equipped with a PSV (Pressure sustaining valve) to maintain the up stream pressure at 25 + 1 = 26 m+GL at node 1.

The controls using these boundaries are:

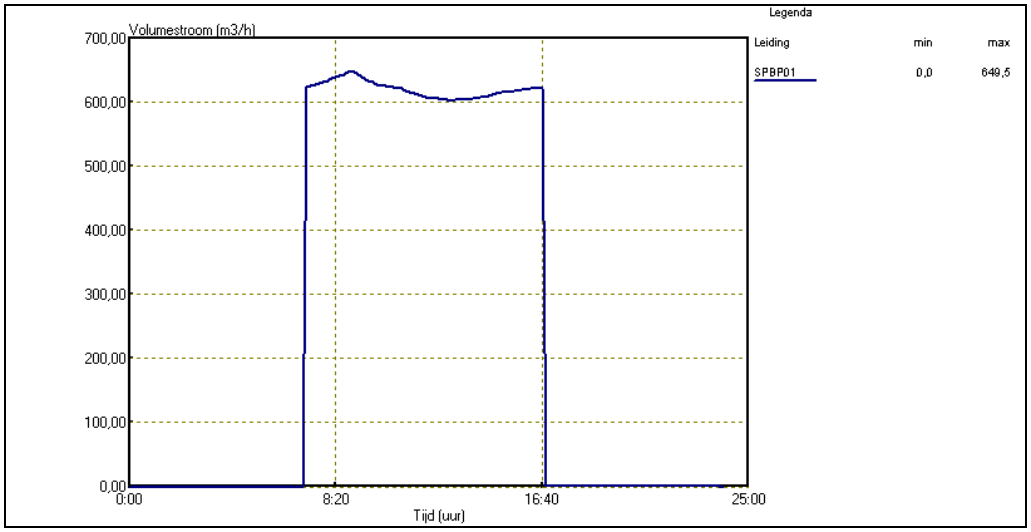
```
LINK PSAF01  0 IF NODE PSAR02 ABOVE  5        ; PSA zuivering
LINK PSAF01  1000 IF NODE PSAR02 BELOW  4.75  ; PSA zuivering
LINK PSAF01  2000 IF NODE PSAR02 BELOW  4     ; PSA zuivering
LINK PSAF01  3000 IF NODE PSAR02 BELOW  3     ; PSA zuivering
LINK SPBP01 CLOSED AT TIME  0                 ; SPB pomp op tijd
LINK SPBP01 OPEN AT TIME  7                   ; SPB pomp op tijd
LINK SPBF01  26 AT TIME  0                    ; SPB vulklep op druk bovenstrooms
LINK SPBL01 OPEN AT TIME  0                   ; SPB vulklep op tijd
LINK SPBL01 CLOSED AT TIME  6.99              ; SPB vulklep op tijd
```

3. Resulting volume flow from treatment PSAL02 with time step 1 hour and 10 minutes (case6a)





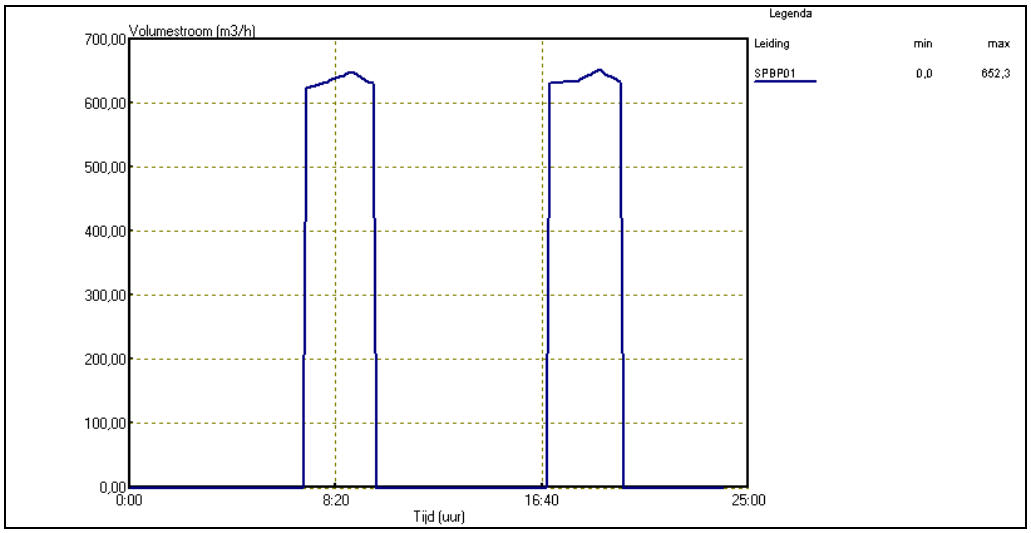
Resulting volume flow suppletion pumping station SPBP01 with time step 10 minutes:

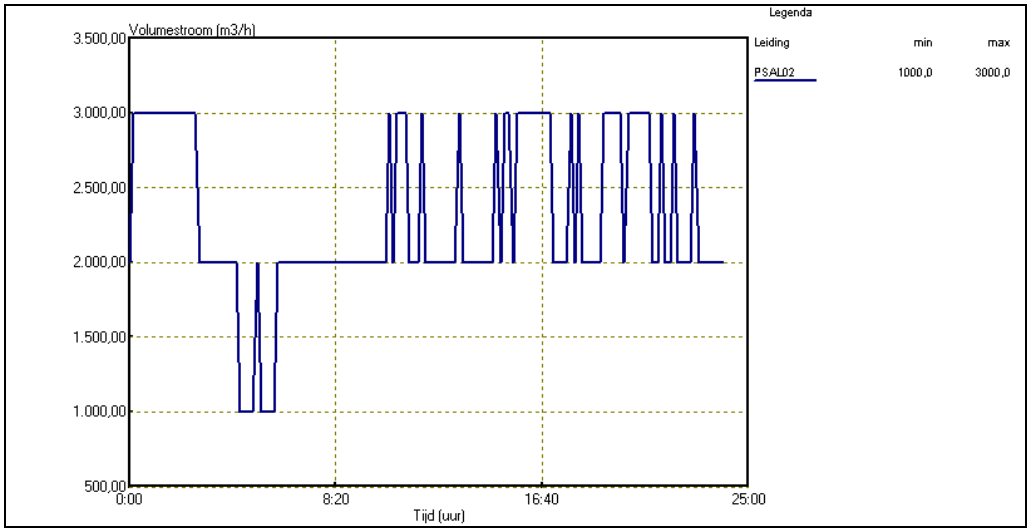


4. The use of SPB is sub-optimal because the reservoir is empty around 17:00 hour. This can be resolved through adding and changing of controls (case6b):

```
LINK SPBP01 CLOSED AT TIME  0        ; SPB pomp op tijd
LINK SPBP01 OPEN AT TIME  7          ; SPB pomp op tijd
LINK SPBP01 CLOSED AT TIME  10       ; SPB pomp op tijd
LINK SPBP01 OPEN AT TIME  17         ; SPB pomp op tijd
LINK SPBP01 CLOSED AT TIME  20       ; SPB pomp op tijd
```

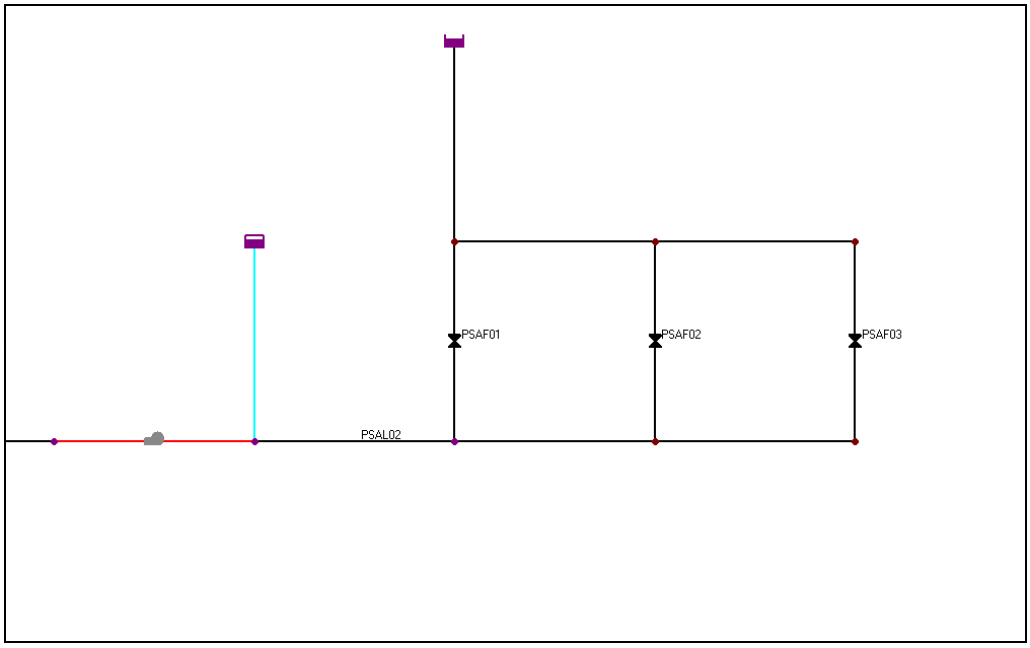
Results for pump SPBP01 and treatment street PSAF01 is as follows:



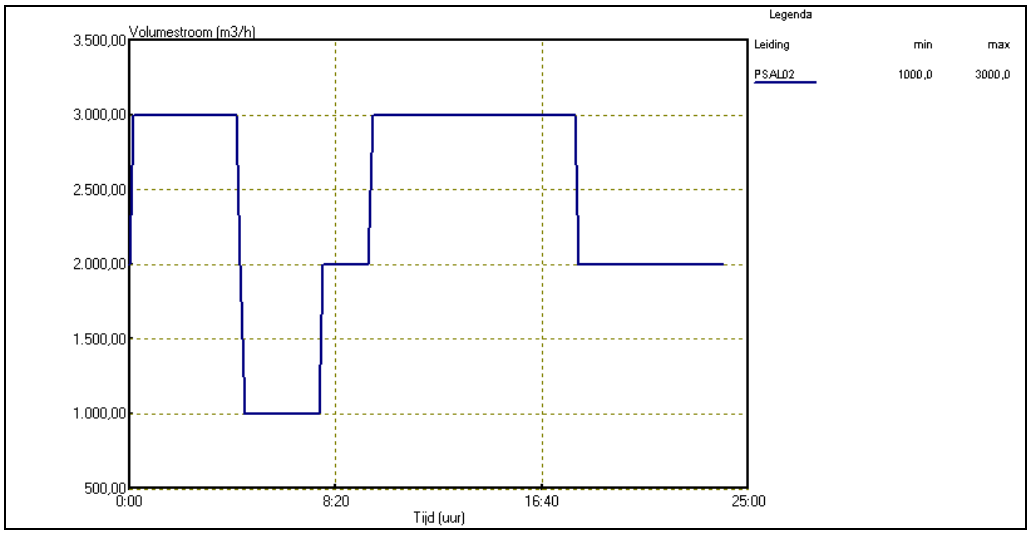


5. Use of treatment streets is sub-optimal. Improvement is possible by adding a FCV per treatment street with capacity of 1000 m3/h with the following controls (case6c):

```
LINK PSAF01  1000 IF NODE PSAR02 BELOW  4     ; PSA zuiveringstraat 1
LINK PSAF01  0 IF NODE PSAR02 ABOVE  4.9      ; PSA zuiveringstraat 1
LINK PSAF02  1000 IF NODE PSAR02 BELOW  3.5   ; PSA zuiveringstraat 2
LINK PSAF02  0 IF NODE PSAR02 ABOVE  4.7      ; PSA zuiveringstraat 2
LINK PSAF03  1000 IF NODE PSAR02 BELOW  3     ; PSA zuiveringstraat 3
LINK PSAF03  0 IF NODE PSAR02 ABOVE  4.5      ; PSA zuiveringstraat 3
```



This results in a volume flow from treatment through pipe PSAL02:



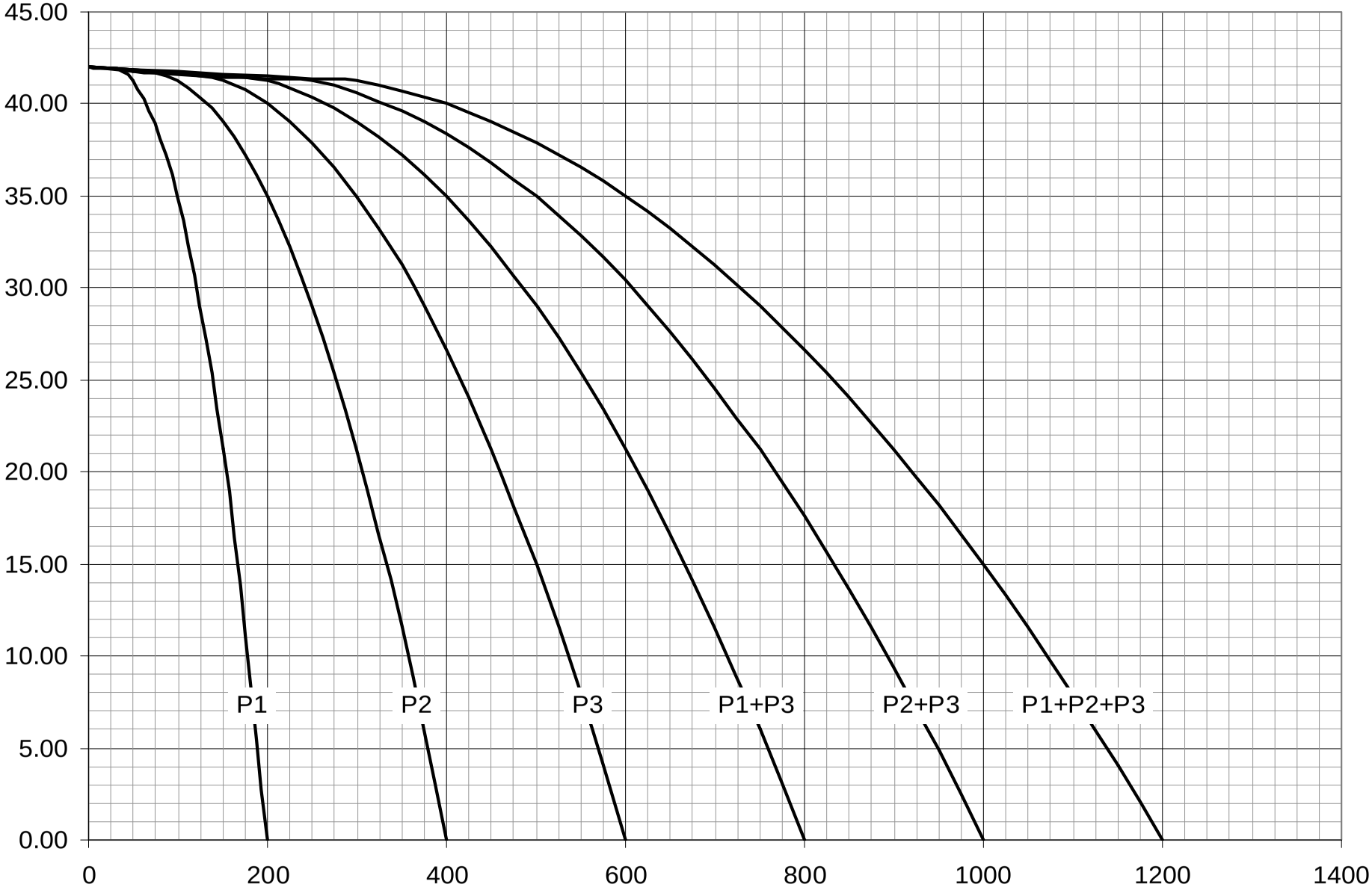
2.7 Assignment 7 – Flushing pipes

c. Six valve manipulations in three flushing actions (case 7a):

```
LINK A026 OPEN AT TIME  1          ;
LINK L00041 CLOSED AT TIME  1      ; 8 minuten
LINK L00046 CLOSED AT TIME  2      ; 3 minuten
LINK L00041 OPEN AT TIME  2        ;
LINK L00044 CLOSED AT TIME  3      ; 1 minuut
LINK L00046 OPEN AT TIME  4        ;
LINK L00044 OPEN AT TIME  4        ;
LINK A026 CLOSED AT TIME  4        ;
```

Alternative is eight valve manipulations in two flushing actions (case 7b):

```
LINK A026 OPEN AT TIME  1          ;
LINK L00041 CLOSED AT TIME  1      ; 11 minuten A021-A031-A023
LINK L00045 CLOSED AT TIME  1      ;
LINK L00045 OPEN AT TIME  2        ; 2 minuten
LINK L00041 OPEN AT TIME  2        ;
LINK L00046 CLOSED AT TIME  2      ;
LINK L00044 CLOSED AT TIME  2      ;
LINK L00046 OPEN AT TIME  3        ;
LINK L00044 OPEN AT TIME  3        ;
LINK A026 CLOSED AT TIME  3        ;
```


45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0
200
400
600
800
1000
1200
1400
P1
P2
P3
P1+P3
P2+P3
P1+P2+P3