

I'm working on the biofiltre modelling which needs to build a filter-wash cycle, here is my variables and equations used to control the cycle:

```
parameters <-  
{  
  OBJ Washback_frequency "frequency of backwash" : Frequency := {: unit <- "1/d"; value <-  
    1.0; group <- "wash":};  
  OBJ Washback_Time "time for backwash" : Time := {: value <- 0.00140000000 ; group <-  
    "wash":};  
  OBJ Filter_Time "time for filtering" : Time := {: value <- 1 ; group <- "wash":};  
  OBJ Ensemencement_Time "time for ensemencement" : Time := {: value <- 2 ; group <-  
    "wash":};  
};
```

=>The filter-wash cycle is divided by two parts: Washback_Time which is the time for backwash and Filter_Time which is time use for filtering. The Washback_frequency is the frequency of backwash, for example if the frequency = 2 (1/d) means 2 turns of filter-wash cycles will be done in one day. The Ensemencement_Time is the time to control the period of no backwash which is 0 (d) in my case.

```
state <-  
{  
  OBJ SwitchA "on/off filter" : Integer := {: value <- 1.0 ; group <- "wash":};  
  OBJ timer "calculate turns of backwash time and filter time" : Time := {: value <- 0.000 ;  
group <- "wash":};  
};
```

=>Timer is applied to calculate the backwash turns to compare with the real time in order to manipulate the SwitchA to control when filter or backwash opens according to the time, here is the codes:

```
parameters.Filter_Time = (1/parameters.Washback_frequency) -  
parameters.Washback_Time; //to calculate the time for a cycle  
  
state.SwitchA = IF (((independent.t - state.timer) < (parameters.Filter_Time)) ||  
(independent.t < parameters.Ensemencement_Time)) //to decide when filtering on/off  
  THEN 1.0/1.0 //filtering on  
  ELSE 0.0; // filtering off  
state.timer = IF ((independent.t - state.timer) < (1/parameters.Washback_frequency))  
//to decide when go to the next cycle  
  THEN state.timer  
  ELSE state.timer + (1/parameters.Washback_frequency);
```

Here is the parameters set and the table gives some examples of the values when simulation (PS: .Truth is a calculate variable for *independent.t - state.timer* and no difference between BAF_1 and BAF_7):

▼ Group: wash

Washback_frequency	1	1/d
Washback_Time	15	min
Filter_Time	0,98958333	d
Ensemencement_Time	0	d

Table				
.t [d]	.BAF_1.SwitchA []	.BAF_7.timer [d]	.Truth []	
3,98238399999993	1	3	0,982383999999934	
3,98585599999993	1	3	0,985855999999934	
3,98932799999993	1	3	0,989327999999934	
3,99279999999993	0	3	0,992799999999934	
3,99627199999993	0	3	0,996271999999934	
3,99974399999993	0	3	0,999743999999934	
4,00321599999993	1	4	0,0032159999999349	
4,00668799999993	1	4	0,00668799999993386	

In general, the cycle works, but sometimes the filter-wash cycle is missing, the problem occurs randomly in state-steady simulation:

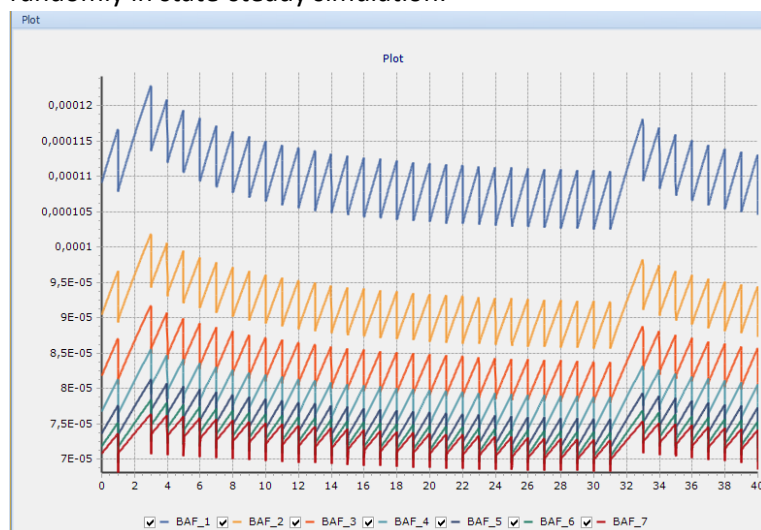


Table				
.t [d]	.BAF_1.SwitchA []	.BAF_7.timer [d]	.Truth []	
1,98945599999998	1	1	0,98945599999998	
1,99292799999998	1	2	-0,00707200000002017	
1,99639999999998	1	2	-0,00360000000002025	
1,99987199999998	1	2	-0,000128000000020334	
2,00334399999998	1	2	0,00334399999997981	
2,00681599999998	1	2	0,00681599999997973	

It seems to me that there are some errors of calculation in the phrase (*independent.t - state.timer*) which should be positive.