

CHARACTERISATION OF WASTEWATER GENERATED IN ANDALUSIAN SMALL POPULATIONS

Y. Asencio¹, M. Ternero¹, J.J. Salas²

¹ Department of Analytical Chemistry, Faculty of Chemistry, University of Seville.

C/ Profesor García González, 6. 41012 Seville (Spain)

e-mail: ternero@us.es; yasencio20@hotmail.com

² CENTA, Av. Américo Vespucio 5-A, módulo 10, 41092 Seville (Spain)

e-mail: jjsalas@centa.es



1.- Introduction

The characterisation of urban wastewater streams (flow and quality's determination) is a preliminary and essential stage for the proper design of the facilities involved in its treatment. In small populations, both the flow and quality of wastewater are subjected to sharp daily oscillations which have a marked impact on the functioning of the different units implemented in the wastewater treatment plants.

For improving the knowledge of the real characteristics of the wastewater generated in the small towns of Andalusia, data from sampling campaigns conducted in 61 urban areas with less than 3,000 inhabitants have been collected and analysed.

RANGOS	POBLACIONES	HABITANTES
I.1 0-500 HABITANTES	Monte Sotomero	6
	Las Delgadas	35
	Tras de la beatas	47
	Pamparela	126
	La Popera	298
	Borra	315
	Portugal	358
I.2 500-1.000 HABITANTES	Villateja	408
	Beaube	495
	Capitana	545
	Lasarte	600
	San Nicolás del Petro	629
	La Dehesa	662
	Oñate	700
I.3 1.000-1.500 HABITANTES	La Dehesa	776
	Dizna	816
	Trevelz	842
	Aloka	908
	San Juan	963
	Zoga	968
	Torre Aquilino	1.008
I.4 1.500-2.000 HABITANTES	Bedar	1.014
	Santa Elena	1.032
	Gargal	1.107
	Fachal	1.131
	Los Galbanos	1.150
	Corpe	1.162
	Maria	1.464

RANGOS	POBLACIONES	HABITANTES
I.4 1.500-2.000 HABITANTES	ADA	1.504
	A La Encina	1.528
	Alameda de la plaza	1.533
	Cerezales	1.536
	San Juan de la Sierra	1.542
	Camiller	1.594
	Real de la Jara	1.626
	Villas del Degre	1.637
	Pedroche	1.670
	Puñena	1.736
I.5 2.000-2.500 HABITANTES	La Malaga	1.812
	San Juan de Moraleda	1.853
	Alamo	1.894
	Urcub	1.929
	El Garro	2.009
	Monteale	2.021
	Orcera	2.070
	Cerezales del campo	2.077
	La Victoria	2.197
	Gozaloma	2.205
I.6 2.500-3.000 HABITANTES	Pedroche	2.267
	San Juan	2.342
	El Real de Espel	2.414
	San Juan	2.434
	San Juan	2.460
	Carta de los Espedros	2.467
	Chilluevar	2.535
	Bermejo	2.627
	Sorbas	2.854
	García	2.858
I.6 2.500-3.000 HABITANTES	Pedro Abad	2.913
	Pedro Abad	2.980
	La Lantigua	3.048

Concretely, the water use per person and the hourly flow's evolution for different ranges of populations has been examined in this study. In parallel, the production per capita of various pollutants (suspended solids, BOD₅ and COD), and its hourly evolution, for the different populations' ranges studied has also been determined.

2.- Methods

In most of the populations studied, the information relative to flows and qualities of the sewage water, has been compiled from the annexes which are included in the construction projects of the WWTP. In other cases, sampling campaigns have been carried out. In those campaigns, a Sigma 950 flow-meter has been employed.



Figure 1.- Flowmeter Sigma 950.

For taking samples of the urban wastewater stream an automatic sampler was used. Samples were taken each hour during a period of 24 hours (Figure 2).



Figure 2.- Automatic sampler Sigma 900.

From the single samples, and considering the flow pattern of the wastewater stream, an integrated sample was obtained. This sample was then analyzed (SS, BOD₅ and COD) in the laboratory of Experimental Plant of Carrión de los Céspedes (Seville).

3.- Results and Discussion

From the information gathered, we have proceeded to analyze the characteristics of both the flow and quality of wastewater generated in small urban areas of Andalusia.

* FLOW

a) Wastewater allocation: the allocations of wastewater per inhabitant (l / inhabitant.d) for different ranges of populations has been analyzed (Figure 3).

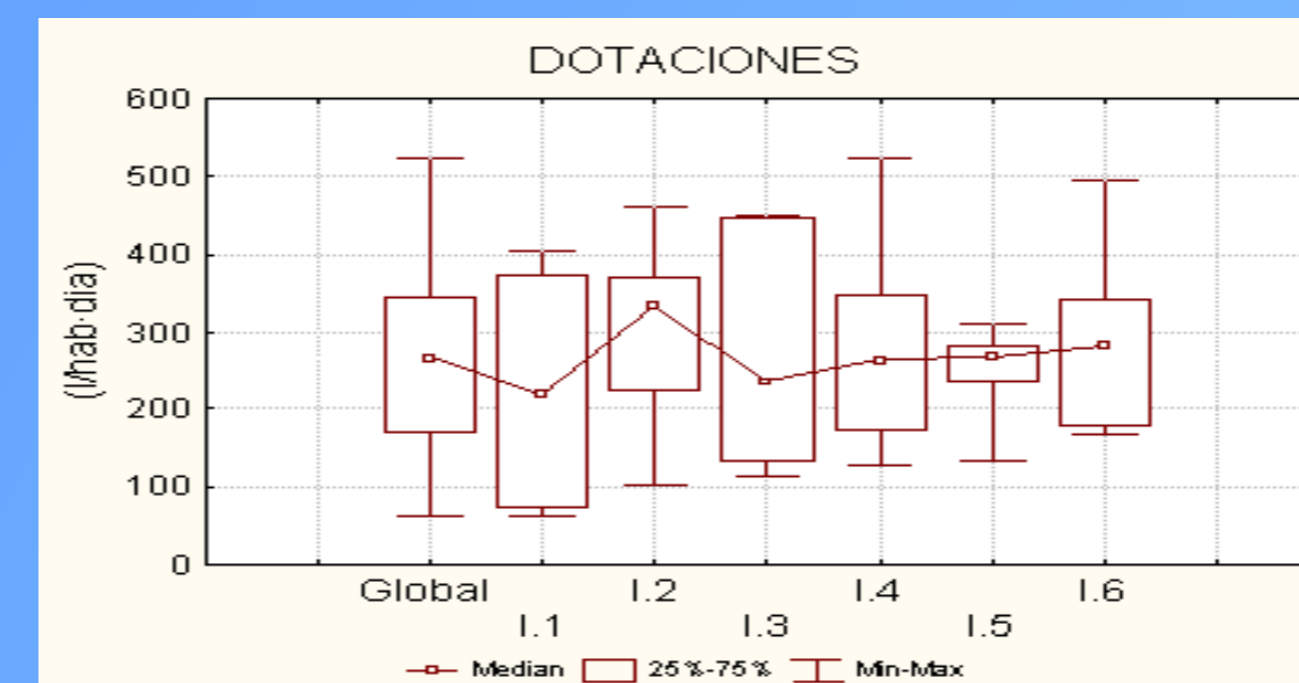
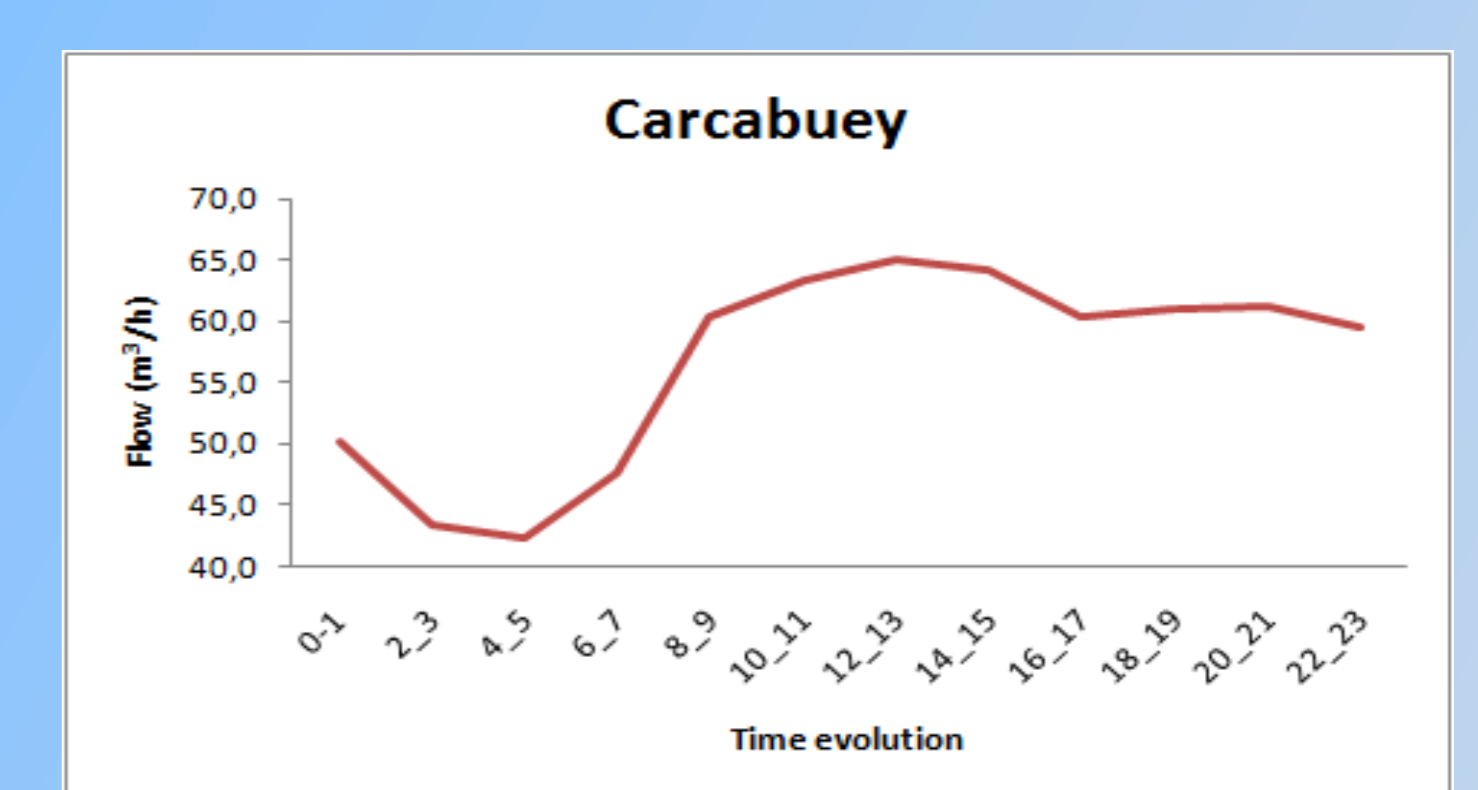
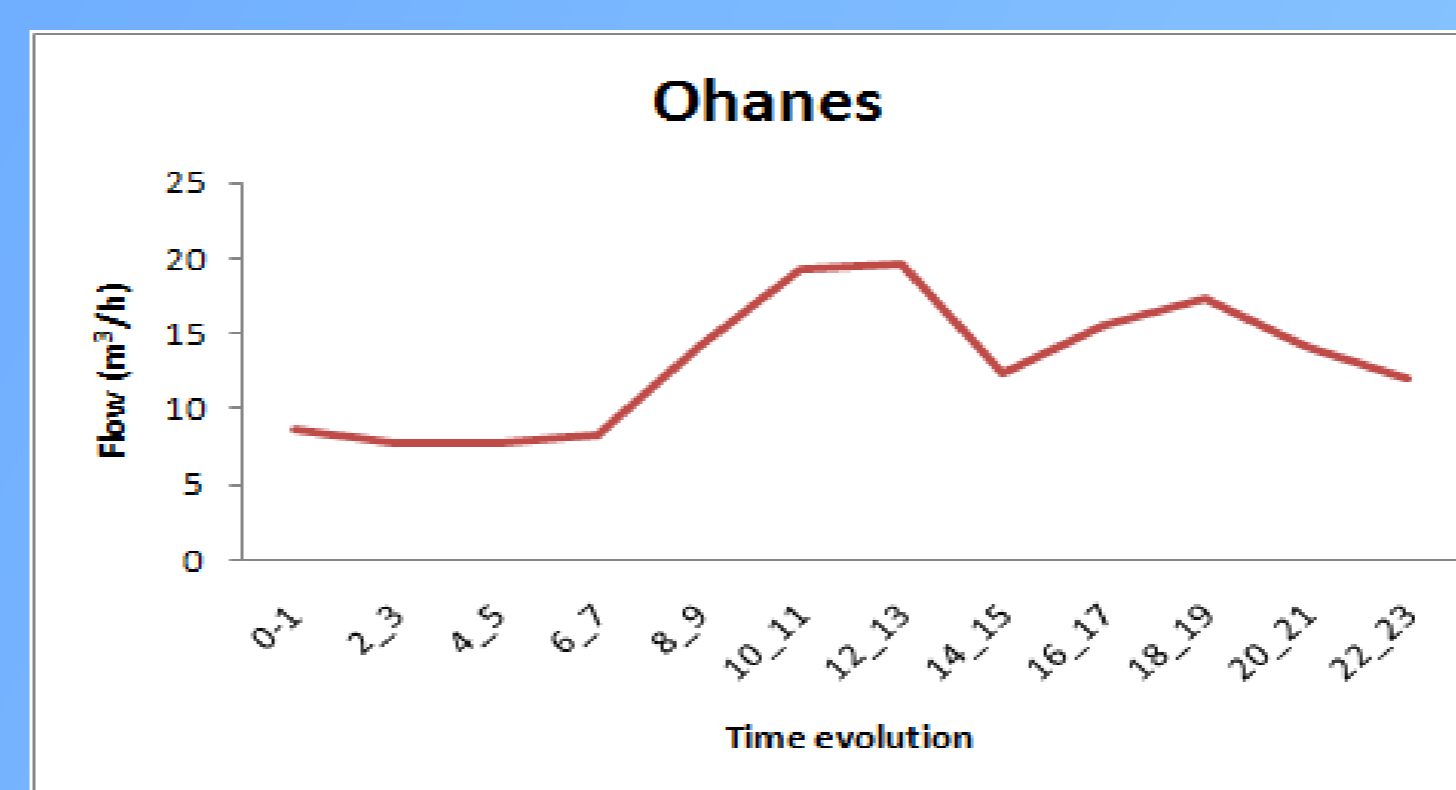


Figure 3.- Flow allocations.

It is observed that, contrary to what would be expected, the allocations are not steadily increased when increasing the population size. Values range from 200 to 330 l / inhabitant.d.

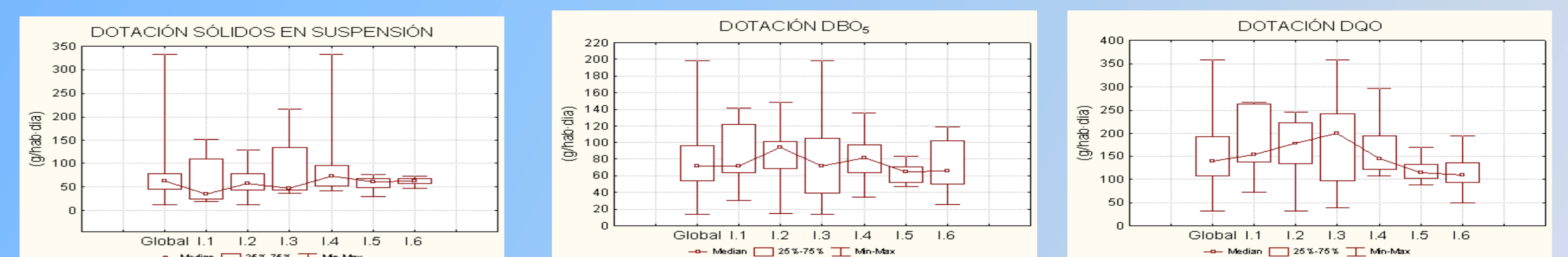
b) Hourly evolution: the daily evolution of the wastewater flow generated in most of the small populations studied haven been depicted. For instance, Figures 4 and 5 shows the curves obtained for two populations with 776 and 2,738 inhabitants respectively.



Figures 4 y 5.- Hourly evolution of the wastewater flow .

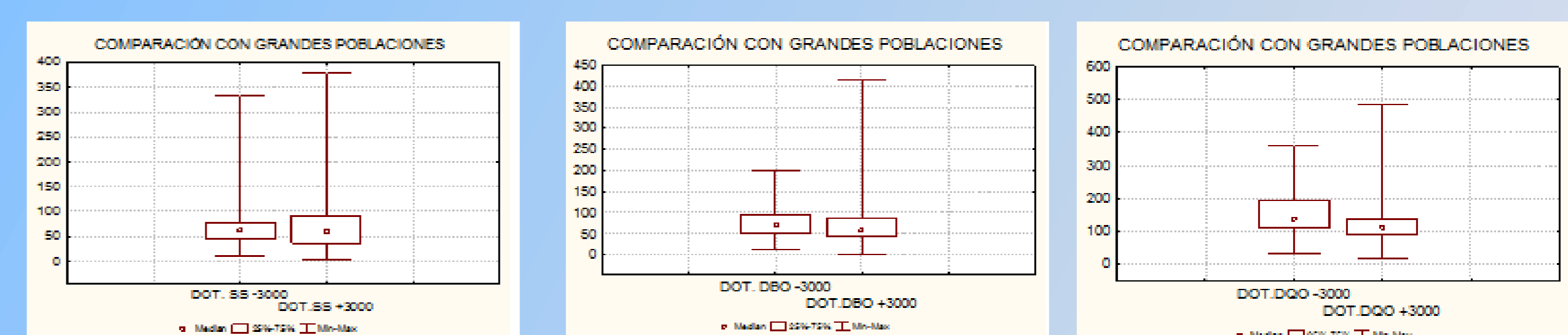
* QUALITY

a) Pollutants' allocation: Figures 6, 7 and 8 represent the allocations calculated for suspended solids, BOD₅ and COD (g / inhabitant.d), for the different populations' sizes studied. These allocations range between 50 -100 g SS/ inhab.d, 60 - 90 g BOD₅/ inhab.d and 110 -180 g COD/ inhab.d.



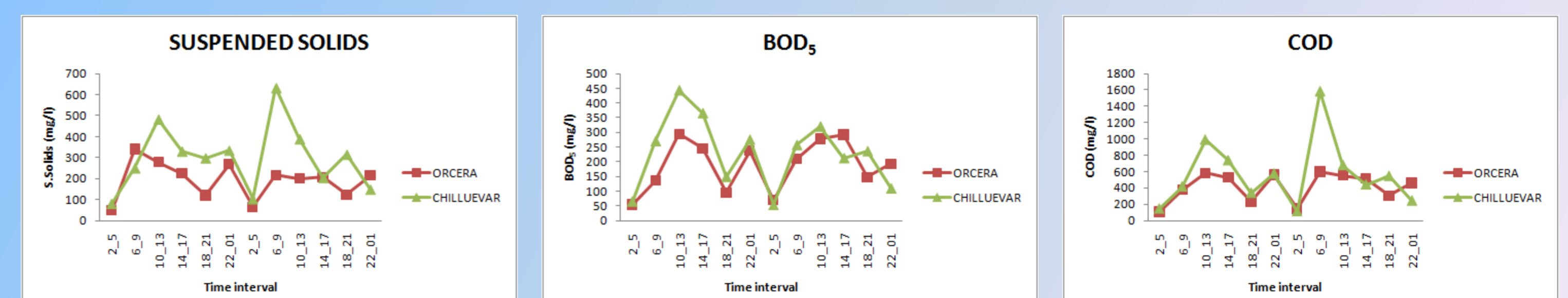
Figures 6, 7 y 8.- Allocations of suspended solids, BOD₅ and COD, for different population ranges.

Figures 9, 10 and 11 show the pollutants' allocations determined in populations with less and more than 3,000 inhab., which have been extracted from a similar studied conducted in Cataluña (Barrera, A., 1999).



Figures 9, 10 y 11.- Allocations of suspended solids, BOD₅ and COD in larger populations

b) Hourly evolution: Figures 12, 13 and 14 represent the evolution of the concentration of suspended solids, BOD₅ and COD in wastewater streams from two urban populations: Orcera (1,594 inhab.) and Chilluevar (2,070 inhab.).



Figures 12, 13 y 14.- Hourly evolution of suspended solids, BOD₅ and COD.

4.- Conclusions

The observed strong fluctuations in the flow and composition of wastewater in small populations, justify the need of previous sampling campaigns, with the length and detail required for a good characterisation of these streams in order to guarantee that the design of the treatment facilities meets those oscillations.

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References

-Barrera, A. (1999). Analysis and characterization of wastewater parameters necessary for the design of wastewater treatment plants of less than 2,000 inhabitants-eq. Specialty dissertation. ETS Engineers, channels and ports (Barcelona)
-Rodríguez Salas JJ, 2007, Natural systems for the purification of urban waste water: experiences in Andalusia.
-Manual of urban waste water purification. Collaboration with Centa.