QuantityWare

QuantityWare Working Paper

ASTM D1250-19 Addendum 2 Analysis

Observable calculation differences using rounded and non-rounded CTPL factors

Version History

Version	Date	Description
00	2020-03-03	Initial Version
01		
02	2020-03-03	
03	2020-07-23	
04	2021-09-25	Modern QW document style applied

Contents

1. Introduction & Management Summary

ASTM D1250 has been issued as a new version with the designation ASTM D1250-19. This version is necessary due to the publication of API MPMS Chapter 11.1 Addendum 2 (May 2019). Ten (10) changes are listed in Addendum 2 which are classified as “minor” modifications in ASTM D1250-19.

One of these modifications requires that final densities and volumes should be calculated with **non-rounded volume correction factors** (CTL, CPL and CTPL). This modification affects calculation results of current ASTM D1250-04 BCS implementations and thus requires an advanced development such that the calculation models assigned to API MPMS Chapter 11.1 can be configured (via a switch in the conversion group settings) to apply non-rounded volume correction factors to quantity conversion calculations.

This advanced development is shipped via QuantityWare note #000090 (Available March 2020).

In this working paper, we compare calculation results with and without a rounded CTPL for different storage sizes and discuss the differences.

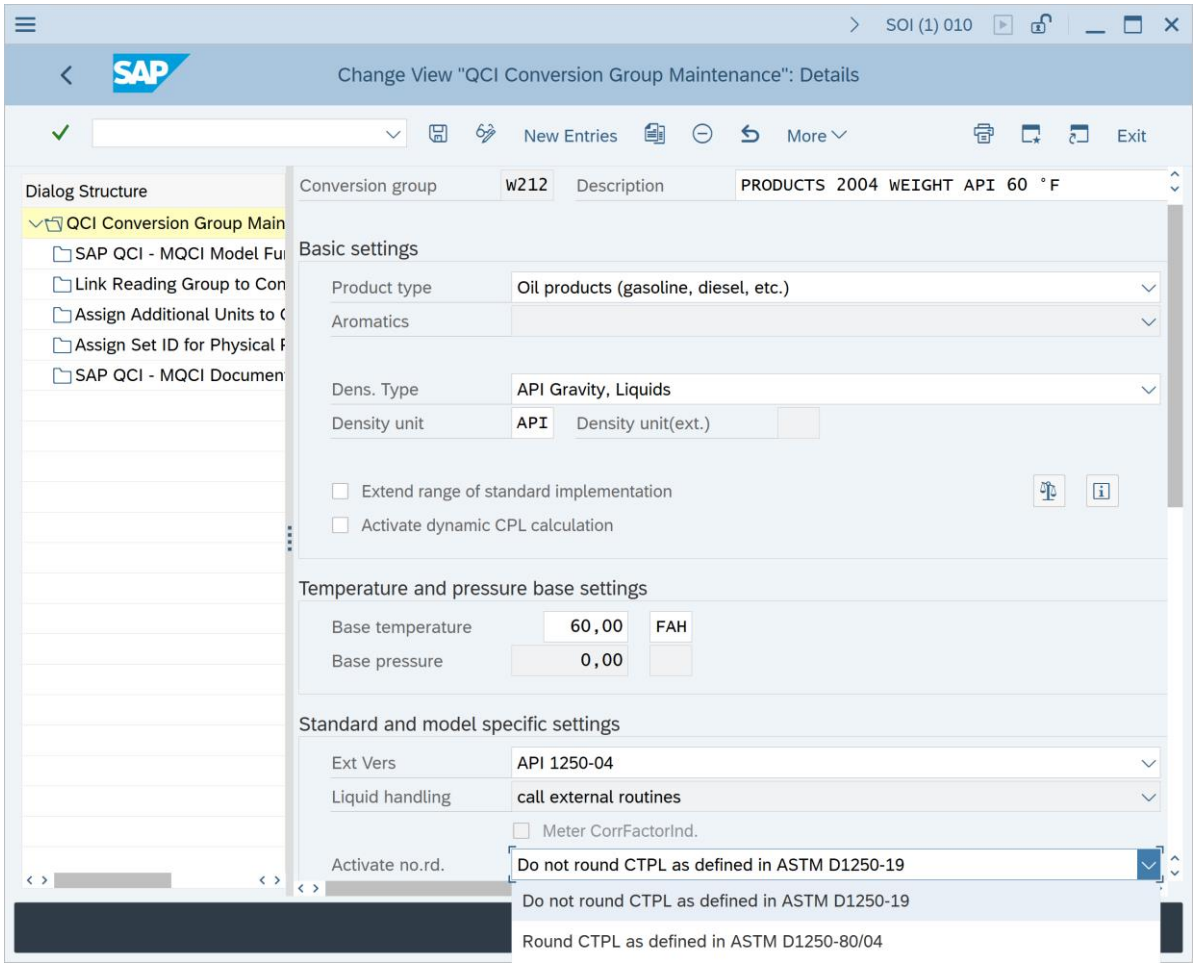
Stock control and pipeline measurements, product discharge from trucks and railcars as well as opening and closing tank dips in large tanks subsequently utilize such calculations, allowing a precise determination of product quantities (e.g. transferred mass and weight quantities of product out of a tank, calculation of net standard volumes (NSV) and so on).

As demonstrated in this paper, when applied to a single product, different well-defined measurement standard based calculations may lead to small, but noticeable differences of relevant product quantity values and properties. Thus, it is of utmost importance that business partners agree on a common measurement standard basis for their business transaction processes.

2. ASTM D1250 – Comparison Calculations for Different Storage Sizes

For the comparison calculations, we utilize two QuantityWare conversion groups, that are derived from our BCS template. Conversion group Q212 is the reference template conversion group based on ASTM D1250-04 CTPL factors, which are rounded to 5 decimals.

Conversion group W212 is a copy of Q212, where we simply set the indicator to not round the CTPL (VCF) factor and utilize the non-rounded factor for the quantity calculations.



For the comparison calculations, we utilize three different capacity sizes. A railcar, a pipeline batch and a refinery tank.

We define a unit of measure (UoM) group WPA with six different UOM, that are rounded as defined in API MPMS Chapter 11.5 – Table 1 – Significant Digits for Bulk Quantities:

BB6 – (NSV) – barrel at 60 °F – rounded to 2 decimals

UG6 – (NSV) – gallon at 60 °F – rounded to 0 decimals

LB – (NSM) – pounds – rounded to 0 decimals

LBA – (NSW) – pounds – rounded to 0 decimals

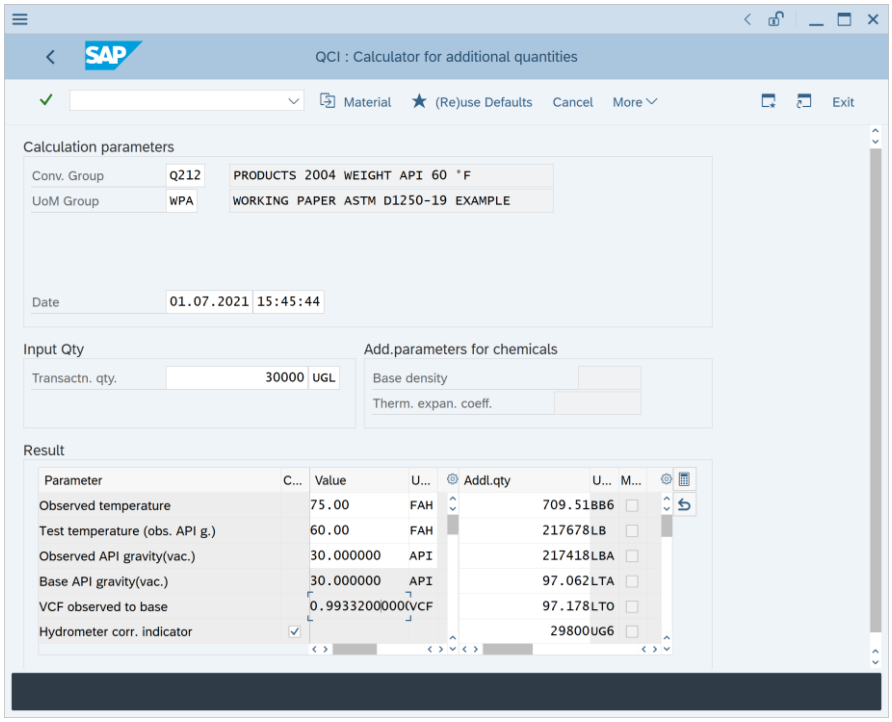
LTA – (NSW) – long tons – rounded to 3 decimals (API MPMS Chapter 11.5 defines 4 decimals – SAP only allows quantity values with up to 3 decimals in the display of the Oil & Gas Test Calculator)

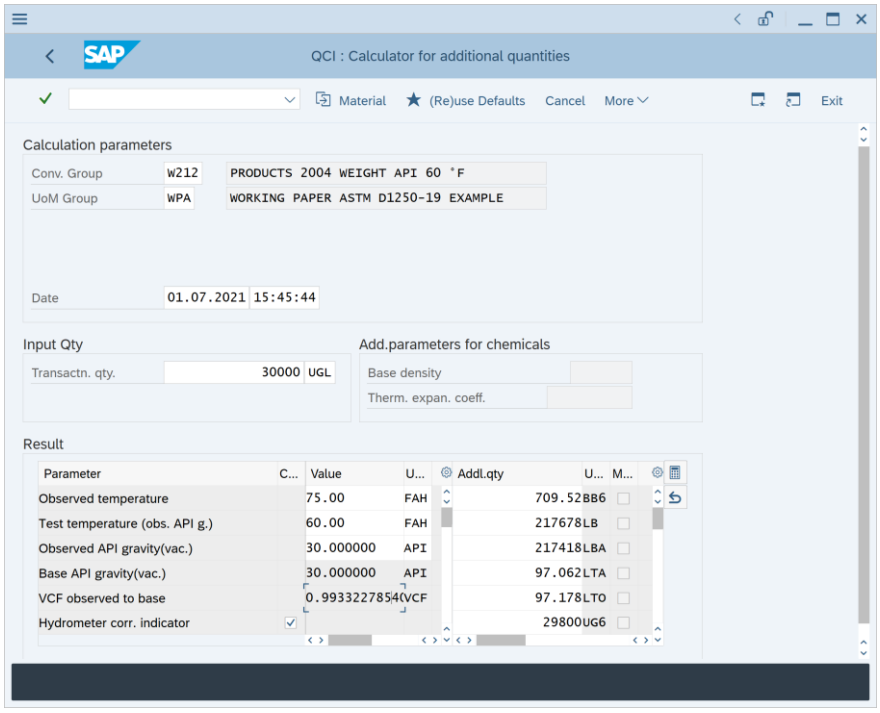
LTO – (NSM) – long tons – rounded to 3 decimals (see LTA)

The CTPL factor is labelled VCF in the Oil & Gas Test Calculator. In order to visualize the unrounded VCF, the display settings for the UoM VCF are set to 12. As transaction UoM we utilize UGL (NOV) – gallon and BBL (NOV) – barrel. For the sake of simplicity the product density is kept at 30 °API for all comparison calculations and the product temperature may vary to produce CTPL with different absolute deviations.

2.1. Railcar Comparison:

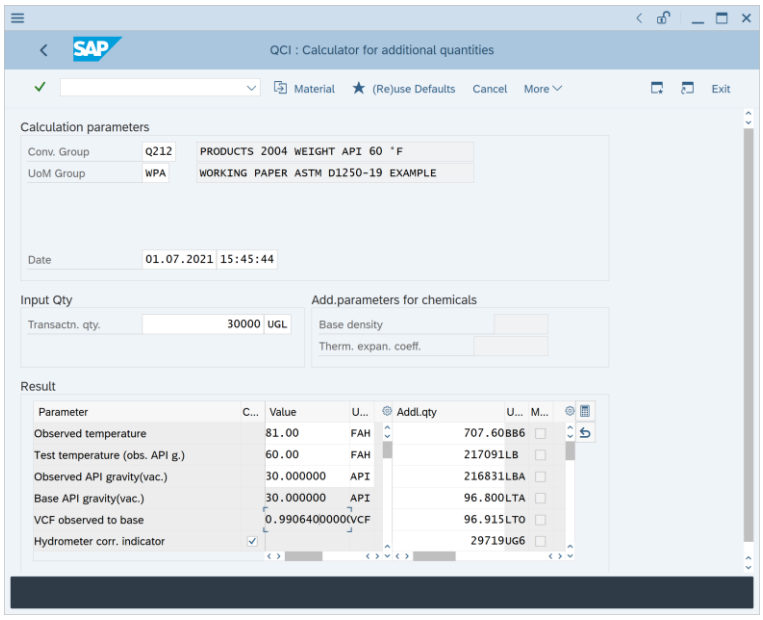
For the railcar comparison example, we chose a railcar capacity of 32 000 gallons, which is e.g. close to the capacity of a DOT 111 tank car and which is measured to contain 30 000 gallons of product. :

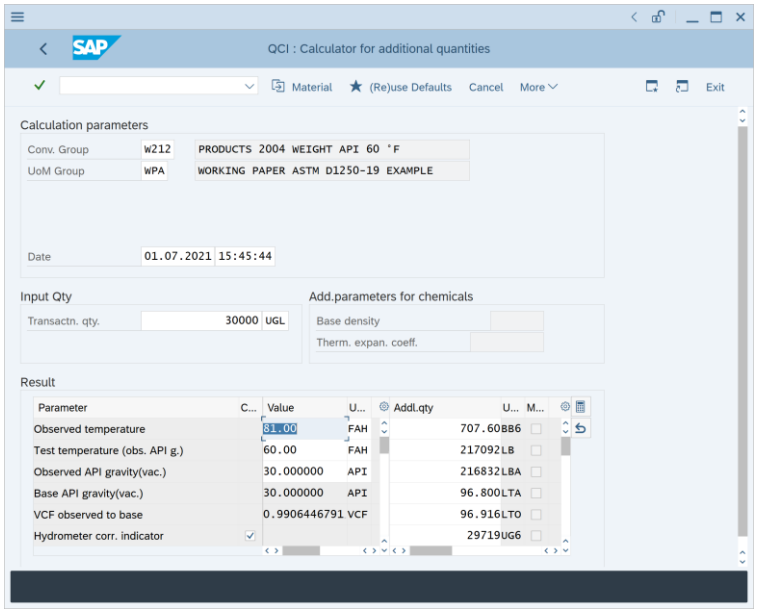




Comparing the results of both calculations, there is only a small noticeable difference between the two BB6 results of 0.01 BB6. This is as expected, since the rounded CTPL and the unrounded CTPL are identical to five significant digits, thus one expects small differences at the fifth significant digit or higher.

A second example with an observed temperature of 81 °F illustrates this general statement:

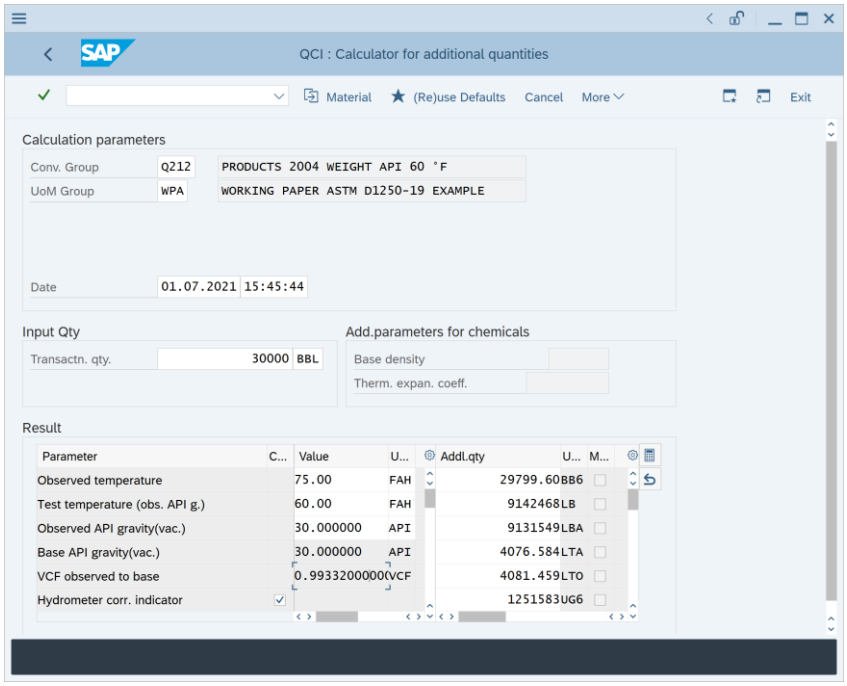


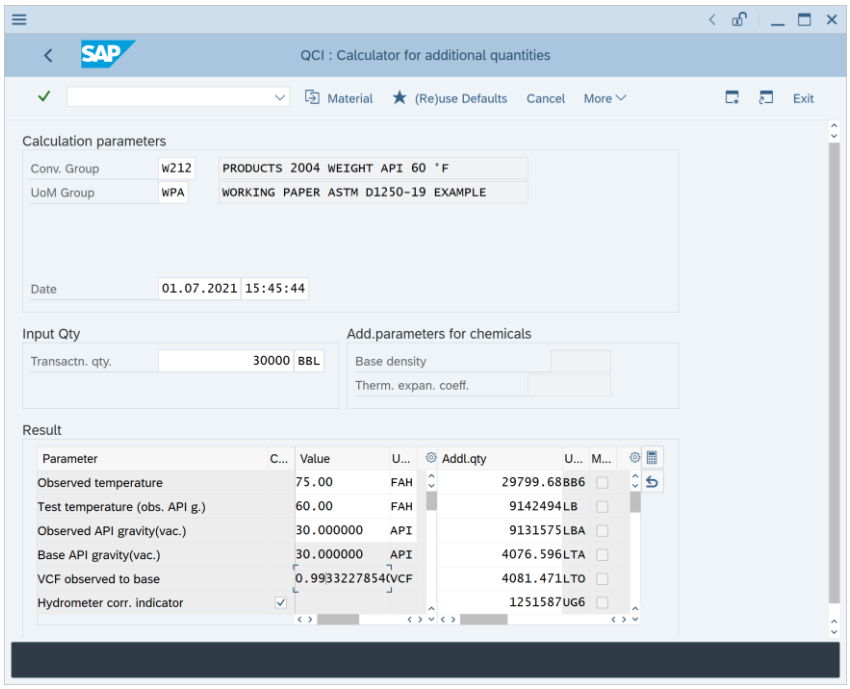


Here, the LB, LBA and LTO result differ by 1 unit each, the other values appear identical (due to rounding). Let's move to the second example of a typical pipeline batch, where the quantities involved are larger.

2.2. Pipeline Batch Comparison:

For the pipeline batch example, we utilize a batch size of 30 000 BBL.

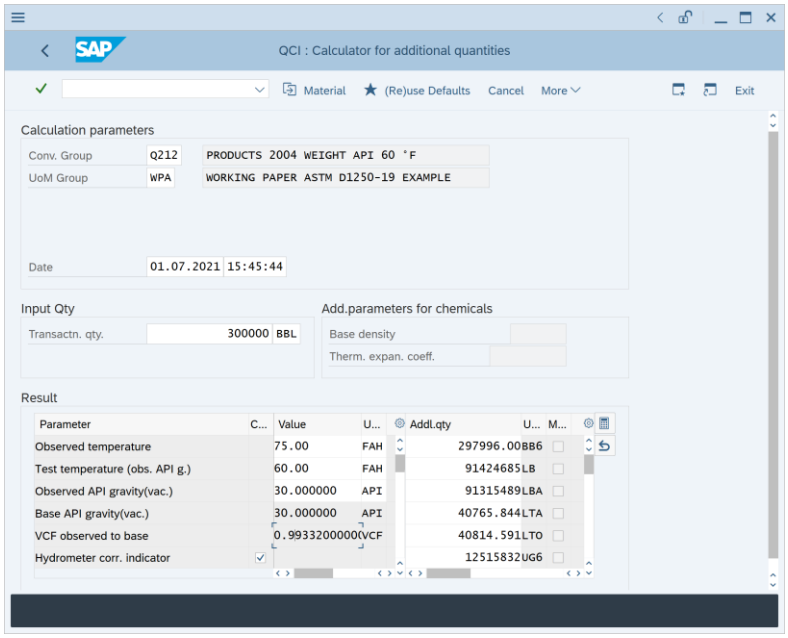


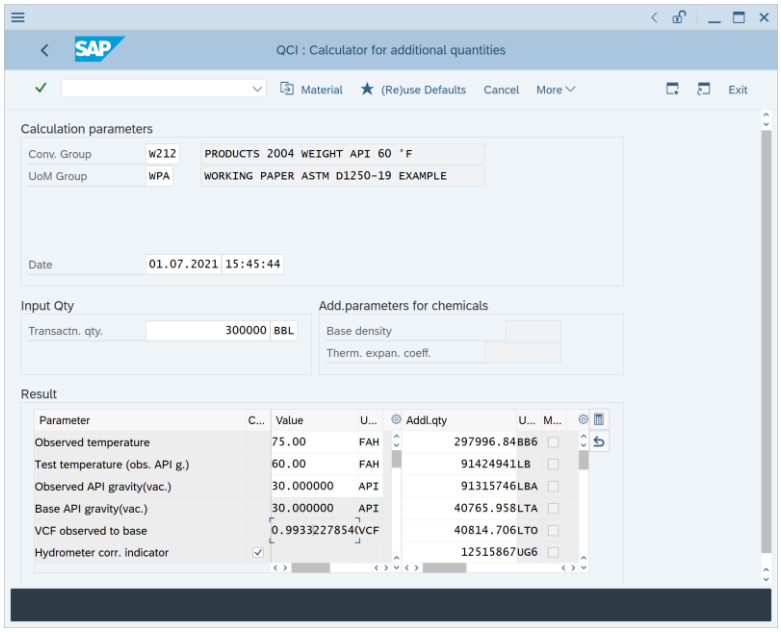


Here, all results show a noticeable difference, as expected.

2.3. Refinery Tank Comparison:

For the final comparison we utilize a refinery tank with a capacity of 400 000 BBL, which is measured to contain 300 000 BBL:





As expected, the absolute differences increase, and all quantity value results differ at the sixth significant digit.

3. Conclusion

With QuantityWare BCS, a comparison of calculation results between ASTM D1250-04 CTPL and ASTM D1250-19 non-rounded CTPL -data is made transparent to business users in all SAP Oil & Gas logistics transactions. The comparison calculations that we described briefly in this working paper are all reproduceable with QuantityWare BCS being installed in your system in your reference template client.

As shown by these comparison calculations, the question concerning such calculations is not how accurately the results of different measurement standard implementations match, but that business partners need to agree as to which measurement standards are to be utilized in which country for each of their bulk products, in order to avoid process disruptions.

With QuantityWare BCS, a change from ASTM D1250-04 CTPL calculations to ASTM D1250-19 CTPL calculations is a simple configuration click in a conversion group – which should be based on a transparent business decision and executed by a certified BCP consultant

Legacy “C-code” solutions would require an involved process to license, obtain, compile and test a new “C” version, along with the necessary integration of the new executable version into the SAP Oil & Gas QCI without the flexibility of “on/off” configuration control for the new rounding logic ; as with external executable usage, multiple executables would need to be installed and managed with all associated inherent risks.

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