Mass Balance guidelines for the Sustainable Juice Covenant

Introduction

Mass Balance refers to the conservation of mass within a physical system. Mass balance approaches are used across a wide variety of systems, from chemical processes, to tracking the flow of pollutants, recyclates and materials produced or processed sustainably. All approaches center on the principle of mass conservation: matter cannot disappear or be created spontaneously within a system, and therefore a system's input mass must be equal to the system's output mass.

Applicability of mass balance to the Sustainable Juice Covenant

The Sustainable Juice Covenant is centered on the target of 100% sustainable sourcing by 2030, applicable to all upstream sourcing volumes. This is applicable across the supply chain, and is according to a recognized set of sustainability standards at farm-level and processing:

- **Farm-level**: FSA bronze or equivalent (applicable to standards that have been benchmarked against FSA and are equivalent to FSA bronze or higher)
- **Processing/blending/bottling**: SA8000 or ETI/SMETA 4 pillar

For volumes to be recognized as sustainable, they need to meet these requirements at both farm-level and processing/blending/bottling, and if not, juice volumes cannot be recognized as sustainable. In this regard, juice volumes have a binary sustainability characteristic: either 'sustainable' or 'non-sustainable'.

The Juice Covenant includes globally sourced and traded volumes. Juice volumes are traded either as physically segregated batches, or batches are consolidated and blended.

Where batches of juice are consolidated and blended, it is not feasible to trace the sustainability characteristics of specific juice volumes across the supply chain, and we therefore need to do so based on mass balance principles.

Mass Balance Principles

Mass balance principles allow for the physical mixing of batches, while the bookkeeping of sustainability characteristics needs to be kept separate.

For simplification under the Sustainable Juice Covenant, we propose that all volumes are calculated to single-strength juice equivalent. This is relevant to concentrated juices and purees (non-NFC), the mass of which can be calculated to single-strength equivalent based on the ratio of the concentrate brix level to the reference brix level. The trade of juice volumes between supply chain partners can therefore be traced based on a common unit of measure (mass of single-strength juice equivalent).

Under the Sustainable Juice Covenant, this would therefore reduce the variables to the following:

- The type of juice/commodity that is being traded.
- The mass of single-strength equivalent of the juice/commodity.
- The sustainability status of the juice/commodity: 'sustainable' or 'non-sustainable'.
- Chain of custody option: mass balance or physical segregation.

As a rule, batches that are of the same juice/commodity, have the same characteristics ('sustainable' or 'non-sustainable'), and are handled under the same chain of custody option (physical segregation or mass balance) can be physically mixed and can be mixed in the bookkeeping.

Batches that are not of the same juice/commodity, have different sustainability characteristics, and are handled under different chain of custody options, can be physically mixed but cannot be mixed in the bookkeeping.

Figure 1 below illustrates physical mixing and associated bookkeeping based on a mass balance approach. In Figure 1, output has been split into either sustainable or non-sustainable product.

Under the Juice Covenant, it is also possible for companies to supply juice product to customers/clients for which a proportion is sustainable or non-sustainable. If this is the case, it is important that this split is reflected in the mass balance bookkeeping, and that the sustainable/non-sustainable juice that is split between output products is, on balance, equal to the input juice batches.

Figure 2 below represents an alternative where sustainable and non-sustainable juice is split within output products, and the associated mass balance bookkeeping.

Boundaries

Under a mass balance approach, it is important to define the temporal and spatial boundaries within which the physical mixture of product can take place, and these have implications on the mass balance calculations.

Temporal boundary

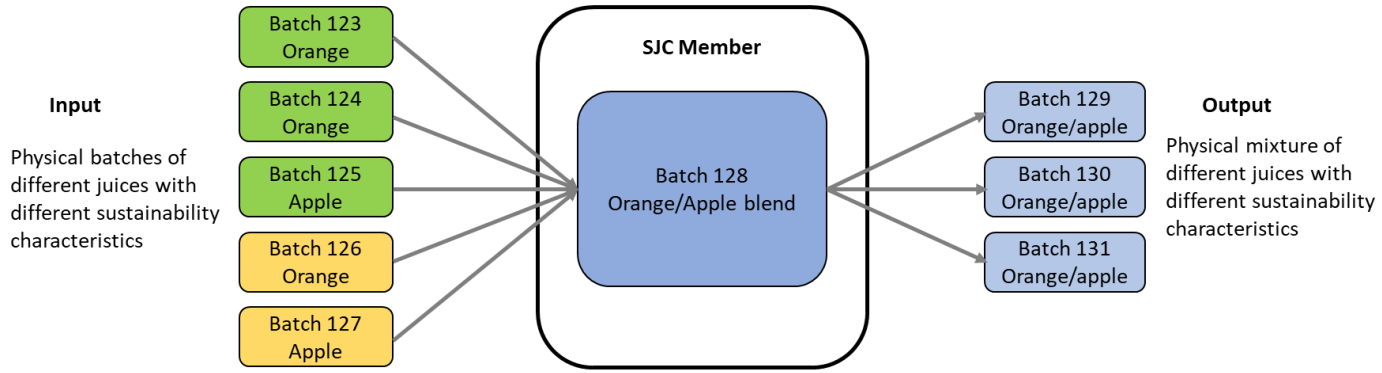
The temporal boundary refers to the timeframe for which the outgoing batches of sustainable and non-sustainable products must be equal to the incoming batches. It can be that a mass balance system needs to be continuously in balance, in which case the system needs to be in balance at any point in time. Alternatively, we can specify a period for which the mass balance system needs to be in balance. We refer to this as the 'mass balance period'.

Under the Sustainable Juice Covenant, the mas balance period is one calendar year (12 months). At the end of each mass balance period, the mass balance system needs to be in balance. In other words, at the end of each calendar year, the incoming sustainable mass (single-strength juice equivalent) must be equal to the outgoing sustainable mass.

However, if at the end of the mass balance period, the outgoing sustainable mass is lower than the incoming sustainable mass (i.e., there is a negative deficit at the end of the calendar year), then we have a mass balance credit. Mass balance credits can be carried over between mass balance periods for a maximum of three consecutive mass balance periods (i.e., for a maximum of three years). After three mass balance periods, the mass balance credit will become invalid. Mass balance credits are commodity/product specific (i.e., mass balance credits can be traded within commodities/products but not between commodities/products).

Spatial boundary

Under the Sustainable Juice Covenant, mass balance credits can be transferred between operations if both operations are under the ownership of the same company/reporting entity and relate to a specific commodity/product.



Input			
Batch No.	**Kind**	**Sustainability**	**Amount (MT)**
123	Orange	Sustainable	300
124	Orange	Sustainable	100
125	Apple	Sustainable	100
126	Orange	Non-sustainable	300
127	Apple	Non-susainable	200
Total			**1,000**

Company internal process			
Batch No.	**Kind**	**Sustainability**	**Amount (MT)**
128	Orange/apple blend	Sustainable	500
		Non-sustainable	500
Total			**1,000**

Output			
Batch No.	**Kind**	**Sustainability**	**Amount (MT)**
129	Orange/apple blend	Sustainable	300
130	Orange/apple blend	Sustainable	200
131	Orange/apple blend	Non-Sustainable	500
Total			**1,000**

***Figure 1**: Illustrative example of the physical tracking of juice batches that have been consolidated and blended, and the associated mass balance bookkeeping. In Figure 1, output products are either sustainable or non-sustainable.*

Output					
Batch No.	**Kind**	**Sustainability**	**Amount (MT)**	**MT Sustainable**	**MT non-sustainable**
129	Orange/apple blend	55% Sustainable	600	330	270
130	Orange/apple blend	85% Sustainable	200	170	30
131	Orange/apple blend	100% Non-Sustainable	200	0	200
Total			**1,000**	**500**	**500**

***Figure 2**:Illustratative example of the splitting of sustainable and non-sustainable volumes within output products, and the associated mass balance bookkeeping.*

References

ISCC (International Sustainability and Carbon Certification) 2016. ISCC 203 “Traceability and Chain of Custody” (v.3.1)