Application of IS-OIL TD in Oil and Gas Secondary Distribution

Applies to:
SAP ERP (ECC6.0 version onwards) with IS-OIL components. For more information, visit the Supply Chain Management homepage.

Summary
The objective of this document is to provide a general understanding of the processes and functionality available in the standard IS-OIL Transportation & Distribution (TD) component in SAP. It describes the most used functionalities of SAP IS-OIL TD in Oil & Gas Secondary Distribution (finished goods), mainly for the distribution of finished goods from Terminal/Depot locations to end customer and/or service stations by truck. 

This document does not cover the customizing steps for IS-OIL TD.

Author: Phang Kok Wai
Company: SAP MALAYSIA
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Author Bio
Phang Kok Wai is currently works at SAP Malaysia and has more than four (4) years of solution implementation experience mainly in the Logistics modules covering SAP SD, MM, LE & IS-OIL modules. His main focus includes providing professional consulting services to customers in the area of Outbound & Inbound Logistics and Industry Solution for Oil & Gas.
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Executive Summary

This document is designed for internal use only. Goal of this document is to outline the basic application of SAP IS-OIL Transportation & Distribution (TD) component on a broad level for Oil & Gas Secondary Distribution (finished products).

Transportation is a crucial element in the logistics value chain that has an effect on both outgoing and incoming goods distribution. Effective and efficient transportation planning and processing helps to keep the cost at a desirable level. Effective transportation also ensures that shipments of finished goods arrived at the destination as scheduled. As such, shipment cost play an important role in calculation and settlement of the costs incurred for the distribution and dispatch of a shipment to the customer. Proper control of the shipment costs ensures that the product remains competitive.

The objective of this document is to provide a general understanding on the application the IS-OIL TD functions to handle the following:

- Delivery of product from a Delivery Plant to a Customer (i.e. Sales)
- Transfer of product between two Company-Owned locations (i.e. Stock Transfers)
- Receipt of purchased product from a vendor (i.e. Purchasing)

The graphic below display the overall processes involved in IS-OIL TD component in SAP
Prerequisites

Transportation Planning Point

To use the IS-OIL TD bulk shipment functions, the organizational unit, transportation planning point (TPPt) is required. Generally, the transportation planning point consists of a group of employees, physical location or logical location of an organization who are responsible for organizing transportation activities. The transportation planning point is responsible for planning shipments with particular features. A bulk shipment is assigned, planned and executed for one transportation planning point.

Transportation planning point is not a master data, but a configuration in the IMG and is assigned to a Company Code as shown in the example as follow:

![Change View "Transportation planning points": Overview](image)

Defaults for Oil & Gas

In addition, the **O3DEFAULTS** of bulk material (finished goods) has to be maintained and should be active for all the relevant Plants and/or Storage Location as displayed in the example below:

![Display Defaults](image)

Generally, this transaction is used for creating the default values for oil and gas quantity conversion. To support the oil and gas quantity conversion, the system uses default values for the relevant quantity conversion factors (for example, density, temperature, pressure, and chemical analysis data).
Vehicle Master

A vehicle is the means by which a shipment is transported from one location to another. In TD, a vehicle is defined as a master data record in transaction code O4V1, and with dependencies on other building blocks master data such as Transport Unit (defined in transaction code O4C1).

The vehicle master is defined for the following reasons:

- Each vehicle is unique and consists of a fixed number of transport units.
- Each transport unit is unique and consists of a fixed number of compartments.
- Each compartment is unique and is used as the basis to schedule and load product for transport.

Vehicles are used during scheduling, whereby drivers can also be assigned to the vehicle. License types are also assigned when creating a vehicle.

The following diagram provides an example of a vehicle (truck) which is used in Secondary Distribution:

Driver Master (Optional)

The driver master data record is used to store driver details, such as their shift period or drivers licenses in the SAP system. Drivers are assigned to vehicles during the scheduling process.

Below is an example of the driver creation screen where information such as name, licenses, partner, validity date, shifts of driver etc. can be maintained.
Routes

The routes can be automatically proposed from the Vehicle master records for the vehicle assigned or manually specified during scheduling. A check ensures the route specified is valid. The route is crucial for subsequent use in the shipment cost calculation.

Stages can also be configured and maintained accordingly for each routes defined, as a shipment can consist of several point of departures or destination points, which can be manually specific during scheduling (detailed in the Scheduling section).
Scheduling

As a standard process, the scheduling process helps to plan bulk shipments and involves the following activities:

- Group underlying documents including Deliveries, Shipping Notifications and Reservations into one or multiple shipments
- Assign shipments to an appropriate vehicle, transport unit, and compartment
- Assigning a driver to the vehicle (optional)
- Change the quantities of product to be shipped
- Plan transport-related activities using the event handling function

The following graphic show the process involved in bulk scheduling process:

Functions in Bulk Scheduling:

Vehicle Assignment

This is performed in the Vehicles tab in the Bulk Scheduling screen. Vehicle(s) are assigned here accordingly during scheduling. When assigning a vehicle, the system automatically check the mode of transport against the vehicle mode defined in the bulk shipment type used for this transaction, hence preventing assignments which are incompatible.

In the vehicles overview screen, it is also possible to automatically determine information such as Carrier, Route, Shift and Trip when the relevant configuration has been maintained. Alternatively, these fields can be manually maintained or changed during scheduling.

The screenshot below shows an example of the vehicle information possible in the Vehicle Overview screen during scheduling:
Document Assignment (Load/Discharge-relevant indicators selection)

The underlying document used in a shipment is assigned here in the Document Overview screen (Document tab) during scheduling. Among the supporter scenario for bulk shipment creation are product purchases, outbound sales and product transfers.

The supported documents that can be assigned to the shipment during scheduling are:
- Outbound Delivery (both Sales and Transfer deliveries)
- Reservation
- Shipping Notification (Inbound Deliveries)

The graphic below show a typical example of a general product transfer and sales from the Delivery Plant:

For every document assigned to the shipment document, it is possible to check the document as a load-relevant, discharge-relevant or both. At least one indicator must be selected for a document assigned to the shipment.

Based on the above example, both Loading (L) and Discharge (D) relevant indicator is selected. Hence, the system will propose the product and quantities from the document in both Loading Confirmation and Delivery Confirmation process.

For each document assigned to the shipment, the following information is proposed:
- Plant/vendor/customer (depending on the type of document)
- Number of items in the document
- Weight & Volume information
- Status of the document
- Incoterms of shipment item (not proposed for reservations)
Compartment Planning

After assigning load-relevant documents and vehicles to a shipment, it is necessary to specify how the vehicle should be loaded. The assignment of product is carried out on the compartment level for the vehicles assigned to the shipment.

The diagram below describes that the number of compartment displayed during scheduling is defined by the transport unit assigned to the vehicle used:

A number of checks are performed during compartment planning, which includes the following:

- **Product compatibility** – This is to ensure that the products are compatible with the compartments.
- **Customer compatibility** – This is to ensure that the vehicles are compatible with the customers.

The **material master record** contains a product/compartment compatibility field used to assign compatibility groups to products. It is located in the Shipping section of the Sales/Plant view of the material master. Indicators within the assigned product group must correspond to the indicator group assigned to the compartment.

Similarly, the **customer master record** also contains the Cust. compat. group (customer compatibility group) field used to assign compatibility groups to customers. This field is located in the Shipping view of the customer master record. One customer compatibility group can be assigned to each customer.

During scheduling, no oil and gas quantity conversion takes place, because the values are only planned values.
Stages / Maintain Stages

A shipment can consist of several points of departure and several destination points. It can require various modes of transport and involve various service agents (i.e. custom agents, transporter, insurance etc.). The connections between the locations, modes of transport, and service agents are all recorded in the system using stages.

After a route has been assigned to the vehicle using vehicle assignment (described in Vehicle Assignment) and the shipment items has been assigned using compartment planning, it is possible to assign underlying documents to the Loading Points and Discharge Points of a route in the Stages tab/screen. For load-relevant documents, it is possible to assign a loading point. For discharge-relevant documents, it is possible to assign a discharge point.

And for documents that are relevant for both loading and discharge, a loading point and discharge point can be assigned in one item. The shipment cost process can then use such assignments to calculate and settle costs with a service agent, based on the quantity of product transported between the specified loading and discharge points along the route.

In the Maintain Stages tab/screen, it is also possible to indicate which of the relevant stage items are relevant for shipment cost calculation (as shown above).

Events Handling

During scheduling, the events handling can be used to capture time-related information on a wide range of transport-related services and/or activities, such as scheduling an inspection at loading or scheduling cleaning services for a ship, scheduling of loading time and scheduling of hose disconnection time etc. An Event Default Group is assigned to the Bulk Shipment Type in configuration in order to automatically propose all the relevant Event Types for a Bulk Shipment Type.

A customized report can then be developed to obtain all events, planned dates/times, actual date/times, vehicle and other related information for a particular Bulk Shipment number in the table OIGSE. This would provide a wholesome view of the activities during scheduling.

Events can be maintained throughout the shipment processing stage, even when a TD shipment is at Status 6 (completed). To continue maintaining event for completed Shipment (Status = 6), the transaction code O4L4 can be used.
Loading Confirmation

The process of load confirmation records the actual quantities and products loaded for a particular shipment. Manual load confirmation is an alternative to data entry using a Terminal Automation System (TAS). Several different processes occur within the load confirmation step, the most important being the entry of actual loaded quantities. Quantities in scheduling are planned quantities and are proposed at the load confirmation stage. The planned quantities and the quantity of the products actually loaded may have changed. These quantities in the quantity field can be entered, or these quantities can be entered based on readings from Vehicle Meters or Rack Meters. In cases where product had been previously left on the vehicle, these quantities can be recorded in the shipment as prior-to-load quantities.

The following graphic show the process involved in loading confirmation process:

Functions in Loading Confirmation:

Capturing Actual Loaded Quantity

The quantities and materials are automatically proposed during loading confirmation from the quantities in the document assigned in the shipment during scheduling. The materials are displayed at the product and compartment level. The actual loaded quantity is the amount actually loaded into the compartment, which can differ from the amount proposed from scheduling due to temperature or density variances etc.

Hence, the proposed quantity can still be manually changed during loading confirmation process or alternatively the reading can be entered from Vehicle Meter or Rack Meter functions. In addition, the actual loaded quantities can also be captured using a Terminal Automation System (TAS) Interface. This interface allows data on loading transactions (loading information) to be sent from SAP Oil & Gas to an external system (Terminal Automation System). After the loading transaction has taken place, the external system sends the loading information back to SAP Oil & Gas, where it is processed automatically (quantity is captured). This can be accomplished using IDocs and Application Link Enabling (ALE) or using an internal table and a Remote Function Call (RFC).
Left-on-Vehicle, Prior-to-Load and Reversal functions

Left-on-Vehicle Quantities
Product can be left on the vehicle in the compartment into which it was loaded. If product is left on a vehicle, the system proposes a prior-to-load quantity during loading for the next shipment using the same vehicle. The prior-to-load quantity can be used to form part of the new shipment.

Prior-to-Load Quantities
With the prior-to-load quantity, a quantity left can be included on the vehicle from a previous shipment in the next shipment using the same vehicle.

Based on the below example, in the delivery confirmation of a previous shipment, there is a left-on-vehicle quantity of 10L. For the next shipment using that same product and compartment, the system proposes that left-on-vehicle quantity (of 10L) as the prior-to-load quantity (10L) during loading confirmation of a new shipment (100L). For the left-on-vehicle quantity, it is flagged as prior-to-load quantity in a new shipment as shown below:

In the Load Bulk screen of a new shipment, by selecting the function Edit → Get prior to load, the system displays for each transport unit in the shipment both the previous shipment number and any left-on-vehicle quantity entered during delivery confirmation.

Reversal
There is also reversal functionality in the Loading Confirmation process that allows reversal of incorrect entries relating to loading. To do this, click on the Correction button at the initial screen of the Loading Confirmation screen.

The diagram above shows the difference between two different reversals possible in the Correction function in Loading Confirmation.
Using the Load bulk correction function, the system takes the quantities from the postings selected, and transfers these to the old item values. The system regards these quantities as entered but not confirmed, for the subsequent loading confirmation.

In addition, Seal Number for compartments of a shipment and sample number (related to Quality Management sampling) can also be maintained and recorded during Loading Confirmation process:

Oil Quantity Calculation in Loading Confirmation

Oil and gas quantity conversion is carried out when a loading confirmation is created or changed.

Whenever a goods movement occurs, oil quantity correction calculations are required. During loading confirmation, the movement of product into an in-transit storage location or plant prompts the system to make this calculation.

The conversion during Loading Confirmation is activated by:

- Using an HIM material, and
- Entering a loaded quantity, or
- Entering a quantity that was already in a compartment before loading

The system then use the defaults maintained for the material for a given Plant for the relevant quantity conversion factors. The screenshot below shows the oil quantity calculation interface screen triggered during Loading Confirmation:
In-transit Stock Handling

The concept of in-transit stock is central to the loading process. A goods movement occurs when the product is moved into the in-transit storage location, at which point Quantity Conversion Interface (QCI) parameters can be calculated and stored. Moreover, any excise duty postings which are a consequence of the goods movement are also performed.

In the example above, the in-transit storage location is used as a means of representing stock in the system, which is being transported on a vehicle. It is used to manage and control stock after it has left the Loading Plant and while it is in transit (in a vehicle). At Loading Confirmation, the stock is transferred from the loading storage location to the in-transit storage location, but remains under the control and ownership of the Delivering Plant. As such, the example above shows that the stock has been transferred from Plant GP02 in SLoc G2L1 to SLoc G2LT (In-transit storage location of Plant GP02).

Every subsequent transaction in TD that includes a goods movement results in an update in the in-transit storage location. This makes it easier to keep track of in-transit goods, as material gains or losses between loading confirmation and delivery confirmation can be posted. The date of the load confirmation is entered into the loading date field on the initial screen. The goods movement posting takes the date entered in the loading date field (as shown below) on the initial screen as the posting date for Loading Confirmation. The document date can be used to record the date the loading transaction was entered in the system.

The Final Delivery indicator (as shown below) can be selected to manually close a shipment and prevent further deliveries from being generated from the concerned Contract or Purchase Order. When the Final Delivery indicator is selected, no further deliveries are processed for the shipment and the relevant sales,
purchasing and stock transfer orders are updated accordingly. The call-off quantity and the open quantities in the contract are also updated.

<table>
<thead>
<tr>
<th>TU</th>
<th>Nr</th>
<th>Material</th>
<th>M</th>
<th>Meter Nr</th>
<th>SeqNr</th>
<th>Start Id</th>
<th>End read.</th>
<th>Prior to load qty</th>
<th>Uom</th>
<th>RC</th>
<th>Rb</th>
<th>Document</th>
<th>ID</th>
<th>IS</th>
<th>Item</th>
<th>TD</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>REGULAR-00</td>
<td></td>
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</tbody>
</table>

**Capture of Measurement Data**

During the loading confirmation process, an unlimited number of measurement readings for the same product movement can be captured and stored as reference. These readings stored in the shipment document are not posted against inventory and are not used to update underlying documents as they are inactive (as shown below). During loading and delivery confirmation, at least one active reading for each step must be selected to be used as the basis for the inventory.

<table>
<thead>
<tr>
<th>TU</th>
<th>Nr</th>
<th>Material</th>
<th>Pint</th>
<th>SLoc</th>
<th>Batch</th>
<th>Tr Qty</th>
<th>Tr...</th>
<th>A...</th>
<th>RC</th>
<th>Rb</th>
<th>Temp.</th>
<th>T...</th>
</tr>
</thead>
<tbody>
<tr>
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<td>REGULAR-00</td>
<td>GP01</td>
<td>G1LT</td>
<td>UNTAX</td>
<td>10,00</td>
<td>L</td>
<td></td>
<td></td>
<td></td>
<td>CEL</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>REGULAR-00</td>
<td>GP01</td>
<td>G1L1</td>
<td>UNTAX</td>
<td>99,00</td>
<td>L</td>
<td></td>
<td></td>
<td></td>
<td>CEL</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>REGULAR-00</td>
<td>GP01</td>
<td>G1L1</td>
<td>UNTAX</td>
<td>100,00</td>
<td>L</td>
<td></td>
<td></td>
<td></td>
<td>CEL</td>
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</tr>
</tbody>
</table>

Especially for pipeline and marine shipments, there can be multiple loading measurements for the same loading event. This is often referred to as a “four point” measurement. In the case of marine shipments, the first measurement is the quantity loaded at the loading point. The second measurement is taken onboard the vessel, which can be different from the first measurement taken. Both records can be stored for informational purposes, but one of these measurements must be selected in the load confirmation step.

When loading confirmation is completed, the postings must reflect the correct in-transit stock position for the shipment. If there are no differences between the measurements, or the sender and receiver agree on a negotiated measurement, only one material movement is necessary to move the stock to the in-transit storage location.

The third measurement is taken before the quantity onboard is discharged (prior to Delivery Confirmation). At this point, there could be some variation from the second measurement taken due to temperature or density variances during shipment to the receiving location. The last measurement is taken at the discharge point after the discharge is completed. Again, this quantity can be different from the third measurement taken earlier onboard at the vessel.
Delivery Confirmation

The delivery confirmation process is used to confirm the delivery of actual quantities in a bulk shipment. The following diagram shows the underlying processes involved with delivery confirmation.

![Delivery Confirmation Diagram]

Delivery confirmation is the final step in processing bulk shipments. This step enables one to enter the final quantities delivered and to process the differences between quantities delivered and loaded. Several options exist for processing product that has been loaded but not delivered. Delivery confirmation must be completed for each vehicle in the shipment. The vehicles in the shipment each have an individual status, however, it is not until the shipment has a Shipment Status = 6, that shipment processing is complete and the final postings are made. Delivery confirmation is also a prerequisite for shipment costing process. Within the delivery confirmation transaction, there are several methods of confirming the delivery, depending on the level of accuracy required for the information, and the amount of time required performing the process.

The delivery confirmation process includes functions for handling unplanned deliveries, and several options for dealing with undelivered materials. The delivered quantities can be entered manually or by using vehicle meters during delivery confirmation. Thereafter, the Final Delivery indicator can be checked to manually close a shipment and prevent further deliveries from being generated. It is possible to set the Final Delivery Indicator in the FD field for each line item in the Fast delivery confirmation screen or for each line item at Delivery Confirmation stage.

When the Final Delivery indicator is selected and the delivery is confirmed, no further deliveries are processed for the shipment and the relevant sales orders and purchase orders are updated accordingly. At that point, no additional deliveries are possible for the order items. Subsequent documents, such as Goods Receipts are also generated when the Final Delivery indicator is set and perform delivery confirmation for the shipment. Deliveries that are automatically generated by Material Requirements Planning (MRP) in the component Materials Management (MM) are also updated when the indicator is selected.
Functions in Delivery Confirmation:

Capturing Actual Delivered Quantity

The quantities is automatically proposed by the system during Delivery Confirmation, and are taken from either the scheduling or loading confirmation of the shipment, depending on the Balance load indicator set in configuration for the Bulk Shipment Type:

- If the Balance load indicator is set, the values are defaulted from the load confirmation transaction.
- If the Balance load indicator is not set, the values are taken from the scheduling transaction, because the balance loading procedure has not been performed to ensure that the loaded quantities are connected to specific documents.

From the example given in the Loading Confirmation process earlier, the Balance load indicator is set for the bulk shipment type used, hence the quantity is proposed in the Delivery Confirmation screen (as shown below). In addition, the screen also includes the prior-to-load quantity (10L) and the new shipment loaded quantity (100L) to be considered together as the final transaction quantity (110L) in the Delivery Confirmation screen.

Oil Quantity Calculation in Delivery Confirmation

Oil and gas quantity conversion is carried out when a delivery confirmation is created or changed.

The conversion during Delivery Confirmation is activated by:

- Using an HPM material
- Entering the quantity delivered
- By entering the return quantity

During delivery confirmation, entering quantities for the first time prompts the calculation. If for example the temperature value for a material is changed, the calculation occurs, but the Quantity Conversion Interface (QCI) does not appear.

Left-on-Vehicle, Rebrands or Returns functions

If for example the product cannot be delivered to the selected destination, several options exist in the delivery confirmation process to determine where the product should go.

Left-on-Vehicle

The product can be left on the vehicle in the compartment into which it was loaded. Leaving product on the vehicle means that the next shipment using the same vehicle has a prior-to-load quantity. The prior-to-load quantity can be used to form part of the next shipment using that vehicle (described in Loading Confirmation).
Rebrand
The product can also be rebranded upon its return to the Delivering Plant. This allows product which had been rebranded during loading to be returned to the correct tank within the delivering plant.

Return
The returned product can either be returned to the Delivering Plant or discharged at another Plant at which the returned material is held. The return date and time are then used in the material movement posting.

Gain/Loss Posting at Vehicle Close
Depending on the configuration maintained for the Bulk Shipment Type, gain/loss posting can occur during Delivery Confirmation is completed (when shipment is closed). This is controlled in the Gain/loss at close indicator in the Bulk Shipment Type, which determines whether a material posting is made for gains or losses when the shipment is closed. If this is not set in the Bulk Shipment Type or not manually selected in the Balance Vehicle screen during Delivery Confirmation, then no gain/loss postings are made. Without the gain/loss posting settings, any difference between load and discharge quantities remains in the in-transit storage location, which can be displayed in the transaction code MB5T for the Delivery Plant. Alternatively, this can be removed from the in-transit storage location manually via transaction code MIGO.

Unplanned Deliveries
In the Delivery Confirmation process, it is also possible to add unscheduled deliveries to a shipment during scheduling and Delivery Confirmation. This is useful in cases where the driver does not want to return the product to the Delivering Plant, but instead wants to deliver the product to a different destination (i.e. nearby location). For this to happen, the Delivery must be created in the system, then the delivery number is added to the existing list of deliveries in the shipment (as shown below). Thereafter, the unplanned delivery document is confirmed in the usual manner.
Delivery Confirmation as Proof of Delivery (POD) or as statistical purposes and freight

It is possible to set in the configuration to use the Delivery Confirmation as a means of capturing the Proof of Delivery (POD) or as a delivery confirmation quantity for statistical purposes and freight. In this case, the system posts a Goods Issue at Loading Confirmation.

In this case, the Balance Vehicle screen uses the actual discharge quantities (if any differences from loaded quantity) to calculate a gain or loss but no material document is generated to post the gain or loss.

Based on the example above, the system post a Goods Issue (movement type = 601) during Loading Confirmation.

Further to the completion of the Delivery Confirmation process (as shown below), no material document is generated for gain/loss posting for any differences in quantities.

Although no differences is evidenced in the document flow of the shipment document, the differences is captured in the standard transaction code VLPOD for the given Delivery document (as shown below).
VLPOD screen for Outbound Delivery 80006134

In the Delivery Confirmation process, SAP provides standard function modules to interface with external systems for automatic processing of delivery of bulk products. These interfaces provide the copying of data from external system to SAP Oil & Gas system.

Standard Interfaces for Delivery Confirmation Processing

Among the standard function modules available in the SAP system are:

- OIKDC_CREATE_ORDER_DELIVERY
- OIKDC_CHANGE_SHIPMENT
- OIKDC_DELIVERY_CONFIRM
- OIKDC_PRIOR_TO_LOAD
Related Content

IS-OIL Downstream Transportation & Distribution
Compatibility Checking in TD
Bulk Scheduling in TD Shipment
Loading Confirmation Processing in TD Shipment
Delivery Confirmation Processing in TD Shipment
TD Bulk Shipment Type

For more information, visit the Supply Chain Management homepage.