

Solvent Management Plan (SMP)

for

OLED Materials Manufacturing Ltd site at Shannon, Co. Clare

1 Introduction

OLED Material Manufacturing Limited (OM²), an Irish company, is taking ownership of the Industrial Emissions (IE) Licence of the existing Eirchem pharmaceutical facility in Shannon Free Zone, Shannon, Co. Clare (the Facility), most recently operated as an Active Pharmaceutical Ingredient (API) manufacturing site and now owned by Polymer Recycling Limited. OM² will adapt the Facility for the manufacture of organic light emitting diode (OLED) products based on the technology currently employed at the manufacturing sites of its contracted manufacturing partner, PPG Industries, Inc. (PPG) in Ohio, United States of America (U.S.). The IE licence of the Facility will be transferred to OM², a wholly-owned subsidiary of Irish parent company, UDC Ireland Limited, and ultimately of Universal Display Corporation, a publicly-traded company headquartered in the U.S. OM² and PPG will ensure best practice relating to environmental and safety management across the Facility's Environmental, Health and Safety (EHS) activities.

The proposed Solvent Management Plan (SMP) for the Facility, as described below, will be managed by the site EHS manager and will comply with the conditions set out in the current IE licence Reg No. P0020-02. The SMP will be submitted to the Environmental Protection Agency (the Agency) for agreement within six months from the date of grant of licence, will be implemented within three months of approval by the Agency, and will be submitted annually in the Annual Environment Report (AER).

The Facility will be in the process of internal restructuring and facility start-up during 2021 and 2022. During this time, the detailed SMP will be developed based on the equipment procured and installed during 2021. This document endeavours to explain, at a high level, the methodology of implementing the SMP. Future projects and potential solvent emissions will be added to this management process throughout our Management of Change (MOC) process. This document will review and incorporate the inputs and outputs as described in the Agency's Guidance Document "Air Advice Note No. 1: Good Practice for Solvent Mass Balance and Fugitive Emission Assessments for EPA Licensed Sites".

The Environmental Management System (EMS) will meet the ISO14001 management standards and the site will also have a robust Safety Management System which incorporates the elements of ISO45001. The EHS Manager on site will be part of the leadership team reporting to the site manager and will have support from corporate personnel.

2. Solvent Inputs:

2.1 I1: Solvents Purchased

Solvents brought into the Facility for the site process will be purchased and inventoried via our Enterprise Resource Planning (ERP) program, i.e., SAP. SAP data can be queried individually, or in mass, and such inventory information includes material type, supplier, order quantity, quantity received, and quality of that material (among other information). This information is verified by in-field monitoring (tank level indication) and regular inventories (also managed in SAP). This information will then be incorporated into an Excel worksheet with the worksheet name I1 Solvent Inputs.

2.2 I2: Solvent Reused on Premise

There is no current plan to recover and reuse solvent at the Facility immediately, as historically the quality impact to the OLED product by solvent reuse significantly outweighs the value of reusing the solvent. However, internal Pollution Prevention (P2) assessments are completed regularly, which assessments evaluate ways to reduce impact to the environment through reduction in use, reclamation, or selling solvent as a by-product to an industry where quality may not be as critical (in lieu of incineration).

These activities involving reducing the solvent impact may be reviewed against the Agency and European Union (EU) guidelines for reuse or alternate use.

As new chemistries are developed, new solvent ratios are determined in product development and such ratios are minimised as much as possible. Our Research and Development (R&D) colleagues undertake regular reviews for alternative solvents with lower impacts and substitute where feasible and practical while maintaining product integrity and performance.

3 Solvent Outputs:

3.1 O1: Emissions in Waste Gases

The Facility is fitted with scrubbers and a Thermal Oxidizing Unit (TOU) which collects process vapours for incineration before emitting to atmosphere. The TOU will undergo testing as required by the IE licence and the data will be used to track emissions through the stack, where applicable.

3.2 O2: Organic Solvents Lost in Water

The process design of OLED materials requires no wastewater treatment on-site. Any organic solvent lost in water will be calculated and shipped off site as hazardous waste for treatment with losses being tracked. Sources of solvents lost in water may be during TOU scrubber usage, which will be tracked and monitored. The water from the scrubber will be tested and the percentage of solvent documented in the tracking file.

3.3 O3: Quantity of Organic Solvents Which Remain as Contamination or Residue in Products Output from the Process

OLED products are dried via vacuum drying to dryness. Analytical data will be compiled for mass balance purposes.

3.4 O4: Uncaptured Emissions of Organic Solvents to Air

The OLED material manufacturing process is primarily a closed operation. There are times however, that product-laden solvent is transferred between equipment (e.g., from process to drying oven). A mass balance on the process will determine these amounts.

Activities will be evaluated and tracked in the overall SMP including:

- Emission calculations from venting of storage tanks;
- Solvent handling;
- Spills; and
- Extraction systems.

3.5 O5: Organic Solvents Lost due to Destruction or Abatement Techniques

This will be applicable to the TOU. Actual efficiency of the TOU will be evaluated during start-up activities and calculations will be incorporated into the mass balance calculations. The Facility manufacturing process does not directly consume or destruct solvents.

3.6 O6: Organic Solvents Contained in Collected Waste

Solvents in waste streams will be managed and tracked via a plantwide waste tracking spreadsheet.

Drum waste information will include:

- A unique drum ID;
- Waste stream name (or Profile Number, identifying the average percentage of components in the stream);
- The batch identification number from which the drum was generated;
- Weight of the drum;
- The date the waste was generated; and
- The date a drum was shipped off for incineration.

Bulk waste will be tracked and recorded. Bulk waste inventories and shipments will be tracked via tank instrumentation and manifests.

3.7 O7: Organic Solvents Contained in Preparations, intended to be sold as a commercially valuable product

Not applicable to current process. Opportunities to sell product instead of incineration will be evaluated in the future.

3.8 O8: Organic Solvents collected and sent away for recovery/recycling rather than disposal

The OLED material manufacturing process utilises chemistry obtaining precious metals. In the U.S. operation, certain solvent waste streams are segregated and sent to a metal recycler that extracts the precious metal from the solvent. We intend to identify a suitable precious metal refiner who can manage this process and implement this metal recycling activity, while maintaining compliance with all regulatory requirements.

3.9 O9: Organic Solvents release in other ways

No additional releases known.

For inspection purposes only.
Consent of copyright owner required for any other use.