# NWI Reicofil Spunbond Facility

# Fabrication Trial Plan

# Information needed before the Trial Plan

**Step 1: Select the configuration, pack and the type of bonding desired**

|  |  |  |  |
| --- | --- | --- | --- |
| **Pilot Configuration /****Bonding** | **Minimal / Light** | **Calendared** | **Hydroentangled** |
| **R4s Single Beam Spunbond** | □ | □ | □ |
| **Premade Webs** | □ | □ | □ |
| **Specialty** | □ | □ | □ |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fiber cross section /****Capillary Count** | **6861****#/meter** | **5510****#/meter** | **3507****#/meter** | **2687****#/meter** |
| **Sheath-Core** | □ | □ | □ | □ |
| **Side by side** | □ | □ | NA | □ |
| **Tipped Trilobal** | □ | □ | NA | □ |
| **37 Islands in the Sea** | NA | NA | □ | NA |
| **4 Segmented Pie** | NA | NA | □ | NA |
| **16 Segmented Pie** | NA | NA | □ | NA |
| **32 Segmented Pie** | NA | NA | □ | NA |
| **Specialty:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | □ | □ | □ | □ |

**Step 2: Specify the resin(s)**

Examples are shown in Red. You need to specify these for your polymer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Polymer Grade/Type** | **Manufacturer** | **MFI****[g/10 mins]****@ 230 C/2.16 kg****or Viscosity** | **Melting Temp****[C]** | **Processing****Temp****[C]** | **Degradation Temp****[C]** |
| **Metocene MF650X PP** | LyondellBasell | 1200 | 170 | 220-280 | 300 |
| **PET** | Indorama | 0.65 IV | 265 | 280-320 | 400 |
| **PA6 – B27E** | BASF | 2.7 RV | 245 | 265-285 | 400 |

If you are not sure what these properties are, NWI’s Analytical labs can determine these characteristics for our normal fees for such a service.

# If NWI is required to characterize the polymers, the materials must be received at least four weeks prior to the trial.

Please specify details of any rolls that may be unwound and combined with the spunbond web, e.g., sheet of pulp, meltblown fabric, etc.…

**Step 3: Specify the Bonding Mechanism**

***Hydroentangling***

**Please specify the desired strips**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Jet Strip Capillary Diameter (Microns)** | **Number of Rows** | **Spacing** | **Desired Strip** | **Injectors****(1 to 7)** |
| 130 | 1 | 600 | □ |  |
| 130 | 1 | 800 | □ |  |
| 130 | 1 | 1200 | □ |  |
| 150 | 1 | 600 | □ |  |
| 150 | 1 | 800 | □ |  |
| 150 | 1 | 1200 | □ |  |
| 90/130 | 2 | 1200 | □ |  |
| 130/130 | 2 | 1800 | □ |  |
| 150/150 | 2 | 2400 | □ |  |
| 130 | 1 | 1000 | □ |  |
| 130 | 1 | 2000 | □ |  |
| 130 | 1 | 3000 | □ |  |
| 100 | 1 | 500 | □ |  |

**Please specify the desired pressures (e.g., 30, 100, 150, 200, 250, 250, 250)**

|  |  |
| --- | --- |
| **Injector** | **Pressure [bar]** **30 to 250** |
| 1 | 30 |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |

***Thermal Calendar Bonding***

**Please specify the desired calendar settings**

|  |  |  |  |
| --- | --- | --- | --- |
| **Calendar Pattern ID** | **Temp****[C]****(50 to 300)** | **Pressure****[bar]****(20 to 80 N/m)** | **Desired Roll** |
| *Engraving ID: 11.11.98**Bonding shape: Square**Bonding area: 19.87%**Figures/cm²: 32.7**Square size: 0.78 mm x 0.78 mm* |  |  | □ |
| Engraving ID: U2888Bonding shape: EllipseBonding area: 18.10%Figures/cm²: 49.9Ellipse size: 0.88mm x 0.52mm |  |  | □ |
| Engraving ID: similar U2090Bonding shape: DiamondBonding area: 14.6%Engraving depth: 0.68mmFigures/cm²: 34.6Diamond size: 0.75mm x 0.75mm |  |  | □ |
| Engraving ID: U5714ABonding shape: RoundBonding area: 12.10%Figures/cm²: 24.0Circle diameter: 0.8mm |  |  | □ |
| Engraving ID: U5938Bonding shape: QuiltBonding area: 12.10%Figures/cm²: 24To be ordered in 2018 |  |  | □ |
| Engraving ID: None - smoothBonding shape: N/ABonding area: N/AFigures/cm²: N/A |  |  | □ |

***Kiss Roll***

**Please specify the desired Kiss roll settings**

|  |  |  |
| --- | --- | --- |
| **Temp****[C]****(50 to 300)** | **Pressure****[bar]****(20 to 80 N/m)** | **Desired add-on****(g/m2)** |
|  |  |  |

# Step 4: The Trial Plan

**Start-up Procedure:**

* Start the process with PP as the base polymer
* Increase temperatures to the desired set points for the polymer to be used
* Introduce the desired polymer
* Wait for the spinning to become stable with the following suggested settings
	+ Cabin Pressure: 1500 Pa
	+ Suction: 50%
	+ Throughput: PP: 200 Kg/m/h; PET: 300 Kg/m/h

**Establish base lines:**

1. Determine the desired throughput
* Adjust the throughput (kg/m/hr) at the highest cabin pressure (Pa)
* Increase throughput or lower cabin pressure until spinning is stable and no drips are generated.
1. Adjust the quench if needed to further ensure you have no drips andachieve the fiber properties desired.
2. Determine optimal diffuser settings
* Adjust the diffuser and the flaps so that the desired anisotropy ratio (MD/CD) is achieved. Do tensile tests on the Tensile Tester provided to determine MD/CD ratio.

The settings below are starting points for PP with a MFI in the range of 25-35. However, each polymer and process may vary to some degree.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Fiber Size** (den) | **Rate** (kg/m/h) | **Melt Temperature** (°C) | **Monomer Flow** (m³/h/m) | **Quench Air Flow** (X1/X2) | **Quench Air Flow** (m³/h/m) | **Process Air Temp** (X1/X2) (°C) | **Cabin Pressure** (Pa) | **SAS Gap** (mm) |
|
| 1.1 | 130 | 255-265 | 360 | 94% | 5975 | 25/25 | 1850 | 22 |
| 1.2 | 140 | 250-255 | 321 | 95% | 6091 | 25/25 | 1850 | 22 |
| 1.3 | 140 | 250-255 | 320 | 92% | 6072 | 20/20 | 1850 | 22 |
| 1.6 | 170 | 250-255 | 320 | 92% | 6080 | 20/20 | 1850 | 22 |

For running fibers around 1.2 and 1.1 den metallocene resin or special additives are necessary.

After the baseline is established, you can use a trial plan such as the one below or you can develop your own and submit with this document.

**Run the Trial Matrix:**

* This matrix uses 3 basis weights, 3 air, and 3 DCDs at 3 different throughputs.
* The numbers shown in red are simple examples – you need to provide numbers for your trial.
* The boxes marked with X are the samples collected. You can choose other desired samples.

|  |  |  |
| --- | --- | --- |
|  | **Polymer** | **Ratio (%)****90/10 to 10/90** |
| **Primary Polymer (e.g., Core)** |  |  |
| **Secondary Polymer (e.g., Sheath)** |  |  |
| **BW****(g/m2)** | **Cabin Pressure****(Pa)** | **Throughput****Kg/hr/m Min** | **Throughput****Kg/hr/m Middle** | **Throughput****Kg/hr/m Max** |
| **15** | **1000** | **X** | **X** | **X** |
| **1400** | **X** | **X** | **X** |
| **1800** | **X** | **X** | **X** |
| **25** | **1000** |  | **X** |  |
| **1400** |  | **X** |  |
| **1800** |  | **X** |  |
| **50** | **1000** | **X** |  | **X** |
| **1400** | **X** |  | **X** |
| **1800** | **X** |  | **X** |

Notes:

If you wish to establish the spinning speed, you can use the relationship shown below.

$$Throughput (GHM)= \frac{Spinning speed (m/min)}{9000}×Denier per Filament$$

Example:

If denier = 1; spinning speed 3000 m/min, throughput = 0.33 g/h/min

If denier = 2; spinning speed 3000 m/min, throughput = 0.66 g/h/min

Alternatively, we can calculate the denier from spinning speed and throughput.

$$Denier per Filament= \frac{\frac{Spinning speed (m/min)}{9000}}{Throughput (GHM)}$$

**Run order of samples:**

Put into an Excel spreadsheet to define all trial variables if needed

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample ID** | **Trial Variable** | **Trial Variable** | **Trial Variable** | **Trial Variable** |
| **Example****20181031-1** | Basis Weight10 gsm | Fiber Size1.0 dpf | Calender Temp140 C | Length10,000 m |
| **Example****20181031-2** | Basis Weight100 gsm | Fiber Size1.2 dpf | Hydro Pressures (BAR)50/100/100/100/100/100/100 | Length500 m |
|  |  |  |  |  |
|  |  |  |  |  |
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