

UNC Charlotte – Lee College of Engineering Senior Design Program

Senior Design Project Description

Company Name	<i>TC Transcontinental Advanced Coatings</i>	Date Submitted	04/18/2019
Project Title	<i>Development of Precision Measurement Device for Coating Dies (TC_COAT)</i>	Planned Starting Semester	Spring 2020

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

Discipline	Number	Discipline	Number
Mechanical	5	Electrical	
Computer		Systems	
Other ()			

Company and Project Overview:

TC Transcontinental Advanced Coatings (formerly Coveris Advanced Coatings) develops & manufactures high-quality coatings for films, foils, and other specialty substrates that enhance, strengthen, and protect the products that touch our everyday lives.

From polyurethane films and foams used in wound care, ostomy and medical devices to conductive coated films and foils used in batteries and communications systems, we partner with the most respected brands in the world to supply reliable and precise solutions that are tailor-made to our customers' design and application requirements. With ISO-certified manufacturing facilities in the United States and the United Kingdom, and a converting and distribution center in China, we serve our customers on a global scale, providing flexible, personal support in real time to respond to your needs swiftly.

Our team will work with you to help solve your most significant problems, developing and implementing a custom plan that will deliver the quality you demand at scale, all while adhering to the strictest confidentiality.

Our Products & Services

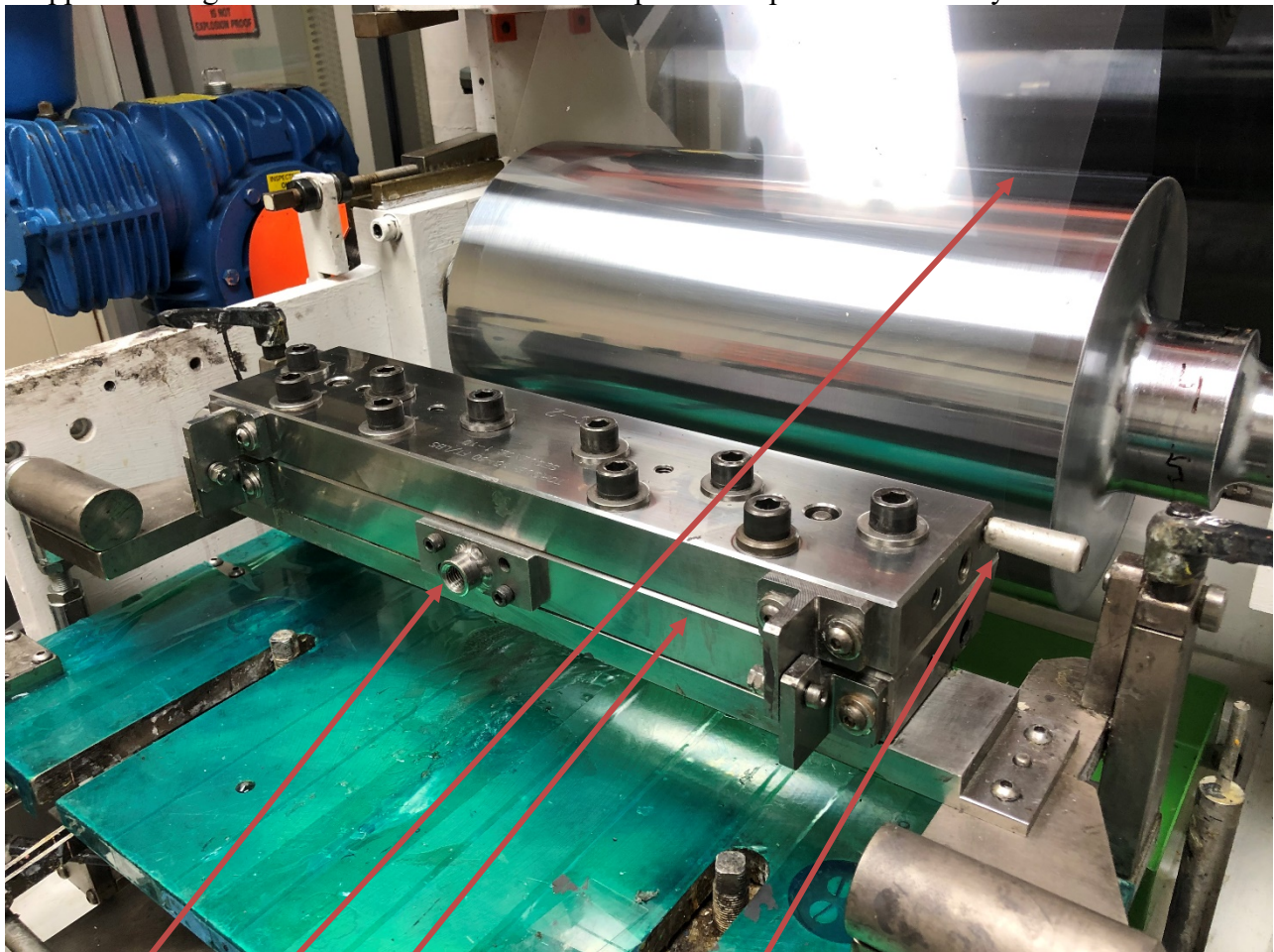
Quality lies at the heart of our business. All of our products are subject to stringent quality controls, consistently undergo thorough testing, and are manufactured in ISO-9001-2015 facilities to exacting standards in a clean-room environment. Our extensive product line represents some of the

most respected brands in the industry, including inspire®, Sentient™, z-flo®, reflex™, tecnilith®, and strat-fx™.

Through these branded products, we provide contract coating and toll coating and hard coated graphic overlay films for HMI manufacturers. The reflex line includes a variety of coated films for everything from whiteboards to food packaging, conductive films, and foils for medical applications, electronic films for high-performance electronic applications, digital imaging substrates for banners and signage, and polyurethane films and foils for medical grade adhesives and components. Since we take our responsibility very seriously, we are committed to sustainability in our manufacturing processes.

Project Requirements:

A global company, TC Transcontinental Advance Coatings has a large manufacturing facility in Matthews, NC. For the various coated products that TC Transcontinental makes, coating material is applied through a die onto a film. See an example of this process machinery below:

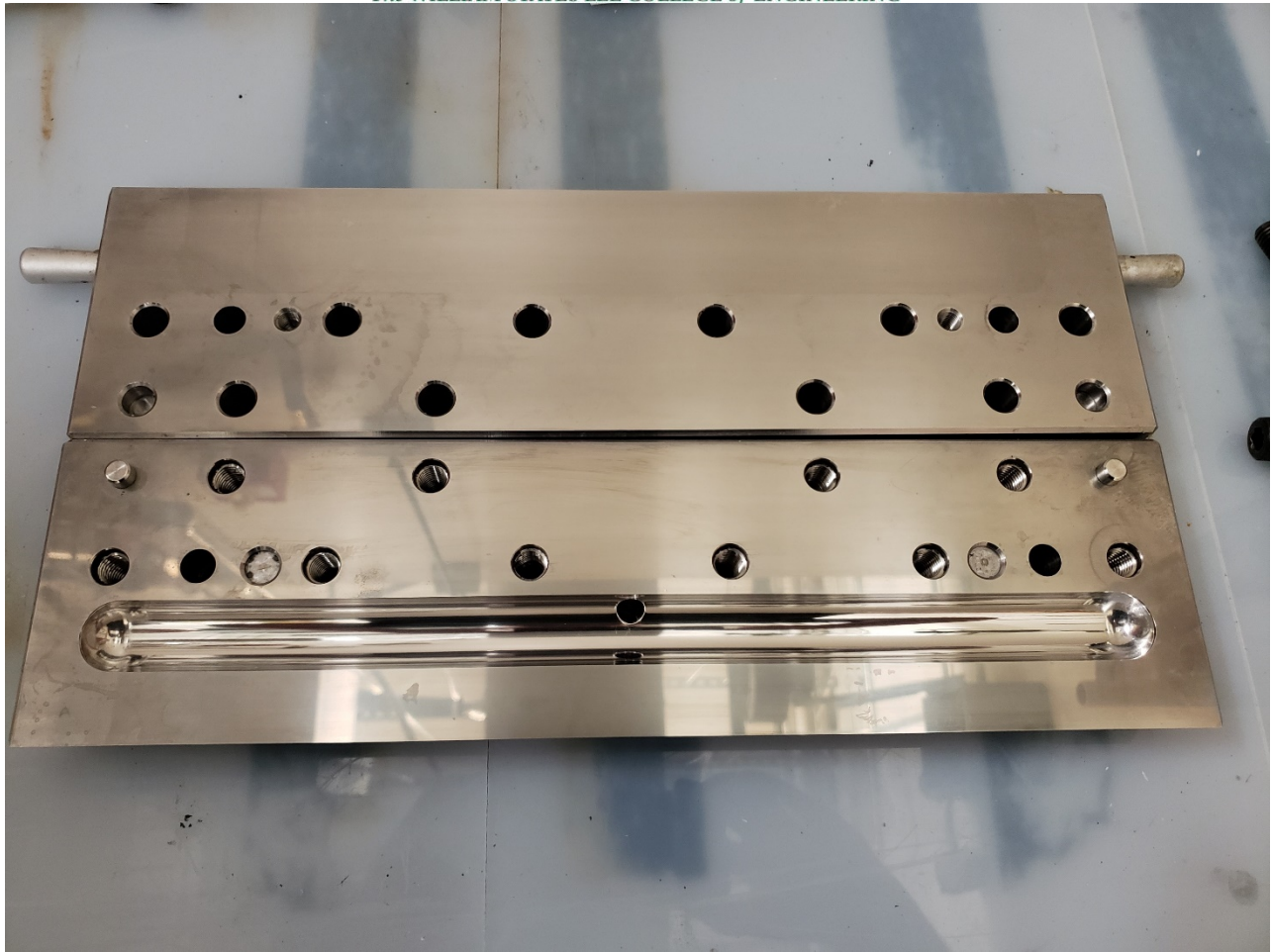


The port in the back of the die receives the coating material. Inside of the die, the material is dispersed through the length of the die, to the front “lip” where it is applied to a rotating roll of substrate film. The following picture shows the inside of the die:



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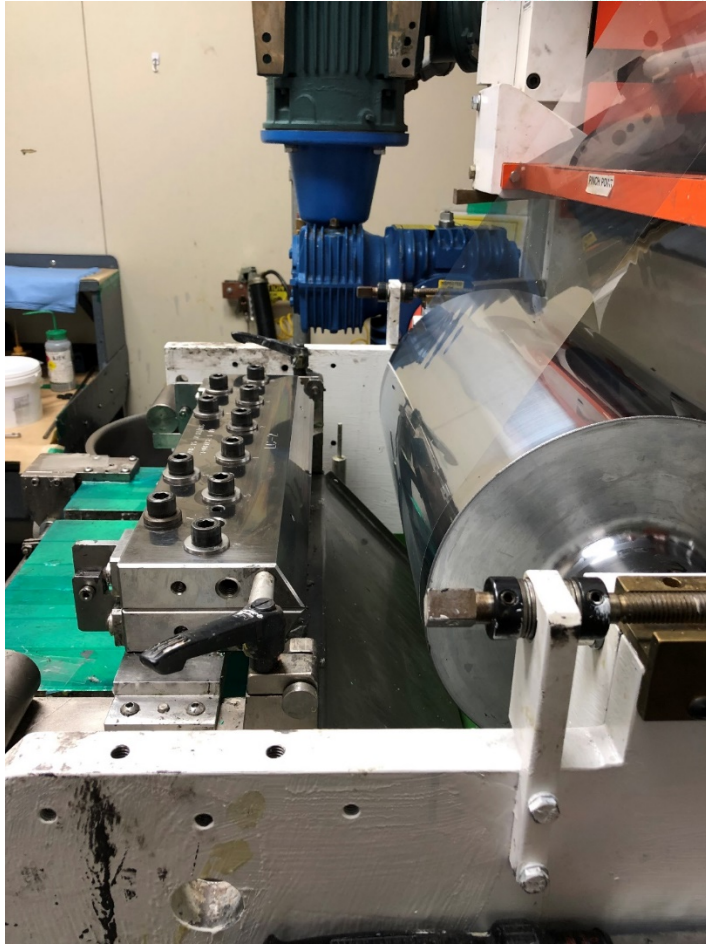
These dies are extremely precise which allows the coating material to be applied to very exacting tolerances. The flatness across the “face” (what is shown in the photo) is the key dimension.

The following picture shows the same machine set-up, from a side view. In this photo, the die has been moved away, but in the application process, it would be set very close to the film surface so the coating can be applied through the die.



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This project will deal with a measurement challenge for the internal surfaces of the die.

Project Requirements:

The dies for the production processes look like what is shown in the pictures, but the length can vary from 12" to 60". These dies are precisely machined by outside suppliers to micron tolerances in order to provide the quality of products that the company makes. Very small deviations can cause coatings to be too thin, too thick or inconsistent in application quality.

This is an example of a 60" die:

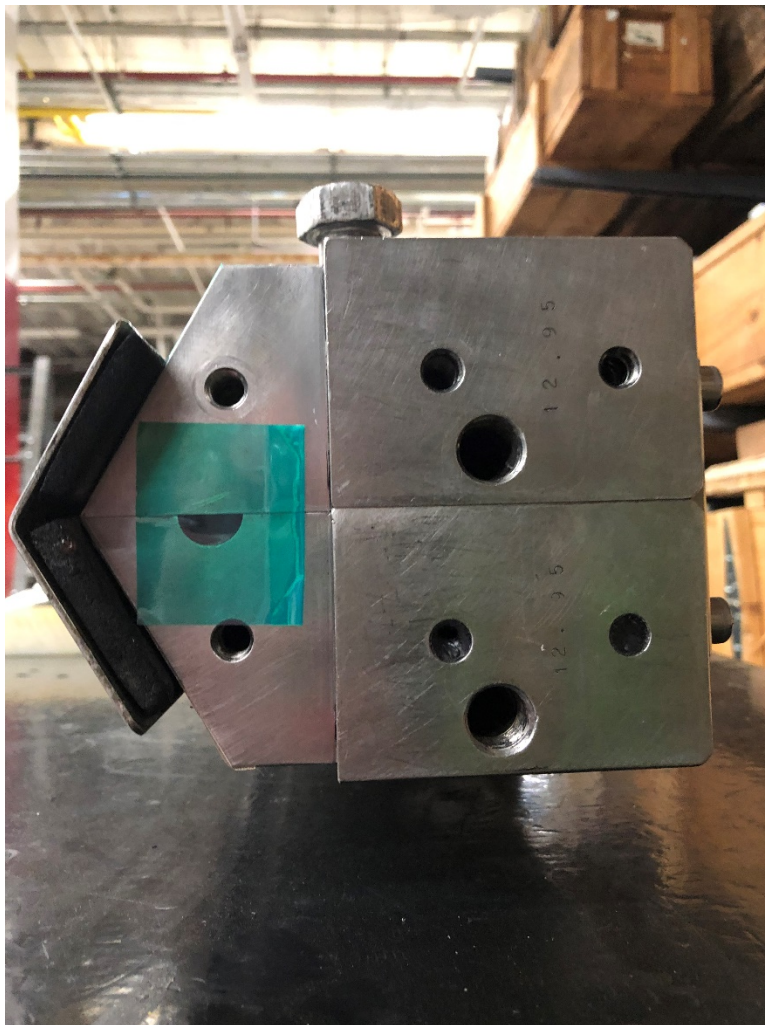


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Side view:



When a quality problem arises, it could be due to many factors, one of which is a die dimension being out of spec.

When the die flatness is out of spec, excess material is accumulated onto the roll. A low area in the die would allow more material to be applied to the roll creating a high spot. After many wraps of the roll, a band forms that renders the roll out of spec. See photo below:



Defect band

To confirm the die dimensions are the problem, the die flatness must be measured to micron tolerances.

This is an example of the current measurement output that is produced for a die:



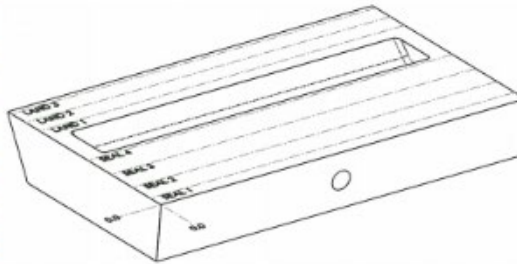
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LIBRARY	SEAL 1	SEAL 2	SEAL 3	SEAL 4	LAND 1	LAND 2	LAND 3
0.000	0.00001	0.00001	0.00003	0.00003	0.00002	0.00003	0.00001
2.000	0.00000	-0.00001	0.00000	0.00001	0.00003	0.00004	0.00000
3.000	0.00002	-0.00002	0.00002	0.00000	0.00005	0.00002	0.00000
5.000	0.00002	0.00000	-0.00002	0.00000	0.00000	0.00003	0.00000
6.000	0.00001	-0.00001	0.00002	0.00003	0.00000	0.00002	0.00000
8.000	0.00000	-0.00001	0.00002	-0.00002	0.00001	0.00001	0.00002
9.000	-0.00001	-0.00002	0.00002	-0.00002	-0.00001	0.00001	0.00000
11.000	0.00000	-0.00003	-0.00001	-0.00002	-0.00002	-0.00002	0.00000
12.000	0.00003	-0.00003	-0.00001	-0.00002	-0.00000	-0.00001	0.00000
14.000	-0.00004	-0.00004	-0.00002	-0.00000	-0.00004	-0.00001	0.00000
15.000	-0.00002	-0.00002	0.00001	-0.00001	-0.00002	0.00001	0.00000
17.000	-0.00002	0.00002	-0.00001	0.00000	-0.00004	0.00000	0.00001
18.000	-0.00002	-0.00004	0.00000	0.00000	-0.00002	-0.00001	0.00001
20.000	0.00001	0.00001	0.00002	0.00002	0.00001	0.00001	0.00000
21.000	0.00004	0.00001	0.00004	0.00000	0.00001	0.00000	0.00000
23.000	0.00000	0.00002	0.00000	0.00004	0.00004	0.00007	0.00000
24.000	0.00012	0.00000	0.00011	0.00000	0.00007	0.00010	0.00000
26.000	0.00015	0.00010	0.00012	0.00000	0.00012	0.00013	0.00012
27.000	0.00019	0.00014	0.00016	0.00011	0.00012	0.00016	0.00016
29.000	0.00020	0.00015	0.00015	0.00017	0.00013	0.00017	0.00017
30.000	0.00024	0.00016	0.00021	0.00015	0.00015	0.00019	0.00018
32.000	0.00023	0.00020	0.00022	0.00020	0.00015	0.00015	0.00015
33.000	0.00026	0.00020	0.00023	0.00022	0.00018	0.00020	0.00021
35.000	0.00029	0.00021	0.00023	0.00022	0.00021	0.00023	0.00022
36.000	0.00025	0.00025	0.00024	0.00020	0.00020	0.00022	0.00022
38.000	0.00020	0.00024	0.00024	0.00023	0.00022	0.00024	0.00024
39.000	0.00025	0.00023	0.00021	0.00023	0.00021	0.00023	0.00020
41.000	0.00025	0.00022	0.00023	0.00021	0.00022	0.00021	0.00022
42.000	0.00023	0.00023	0.00020	0.00020	0.00021	0.00020	0.00022
44.000	0.00023	0.00023	0.00020	0.00022	0.00019	0.00021	0.00022
46.000	0.00020	0.00023	0.00023	0.00020	0.00018	0.00020	0.00021
47.000	0.00021	0.00019	0.00023	0.00018	0.00020	0.00018	0.00021
48.000	0.00022	0.00022	0.00019	0.00021	0.00019	0.00019	0.00021
50.000	0.00020	0.00022	0.00021	0.00020	0.00017	0.00017	0.00020
51.000	0.00018	0.00020	0.00018	0.00018	0.00017	0.00014	0.00016
53.000	0.00010	0.00015	0.00016	0.00020	0.00012	0.00012	0.00012
54.000	0.00000	0.00011	0.00011	0.00020	0.00008	0.00007	0.00000
56.000	0.00012	0.00007	0.00010	0.00000	0.00008	0.00006	0.00000
57.000	0.00009	0.00007	0.00008	0.00004	0.00003	0.00003	0.00000
59.000	0.00000	0.00004	0.00003	0.00005	-0.00002	-0.00001	-0.00001

SEAL		LAND	
max	0.00029	0.00026	
min	-0.00003	-0.00005	
Deviation	0.00036	0.00029	

DATE		TIME	
DATE	11/16/18	TIME	7:00
INSP BY	RZ		



CTSD-18-12601-01 Final Die Flatness.xlsx
Lower Body (INCOMING)



TC does not have this measurement capability in house, so the die must be packed up and sent off for measurement. This is an expensive and time-consuming process, so TC would prefer to do this in house.

The objective of this project will be to examine this problem and define options for the Company to be able to perform these inspections in house. The team will explore options that enable the measurements to be performed reliably and safely. The goal will be to review possible measurement techniques and develop a design that meets the desired requirements of the in-house measurement process. A proof of concept for the apparatus would be built and tested as able within cost constraints.



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Expected Deliverables/Results:

- Broad analysis and documentation of possible technologies that can be used to accomplish this objective
- Return on Investment analysis of possible commercial off-the-shelf options
- Design of a custom apparatus to accomplish this goal as an alternative to a commercial purchase
- Proof-of concept build of the custom designed apparatus (as able within Project funding)

Disposition of Deliverables at the End of the Project:

Reports and Proof of Concept hardware to be given to the Supporter at the conclusion of the Design Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):