Exp.	Ave.	S	S/N	Specimen No.
1	37.19	4.57	18.21	5 Parallel
2	44.93	8.29	14.68	6 Parallel
Ave.	41.06	6.43	16.45	

Exp.	Ave.	S	S/N	Specimen No.
1	63.91	11.85	14.63	5 Parallel
2	78.16	9.91	17.94	6 Parallel
Ave.	71.03	10.88	16.29	

Tables 15 and 16 were the results of spraying in cross and parallel directions to the original direction. Figures 20 and 21 were the second layer profile of thickness along *Y* direction for spraying in cross and parallel directions to the original direction.

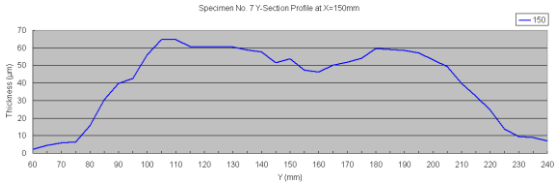

Figure 20. The second layer thickness profile along *Y* direction for spraying in cross to the original direction

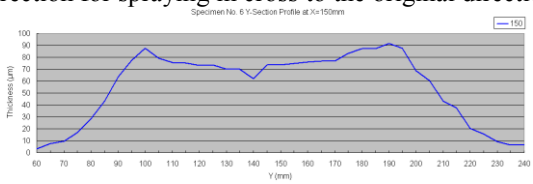

Figure 21. The second layer thickness profile along *Y* direction for spraying in parallel to the original direction

From the above results, the uniformity of layer thickness could be well maintained no matter how the second layer was sprayed in cross or parallel to the original direction if the optimal parameters found previously were used.

V. CONCLUSIONS

In this paper, "Liquid Spray Process" was proposed to use a spray pen to spread a thin layer of polymeric material on the forming bed for further layer forming in a rapid prototyping system. Using this kind of plane forming will decrease much time to make 3D workpiece. The optimal parameters and spraying method were found by the mentioned experiments.

The automatic spray pen and the continuous material supply system were built to improve the performance of spraying and the limit capacity of material supply cup. Taguchi method was used to obtain a set of process parameters such as height, velocity, acceleration, control air pressure, atomizing air pressure, fluid flow, material pressure and the rotation rate of gear pump, which were close to the optimization.

The coating thickness could be adjusted by modified velocity. The spraying uniformity would be close to optimal, if the velocity was 130 mm/s and the percentage of spraying overlap was 50%. The uniform coating thickness could reach as low as 25 μm. The uniformity could be well maintained no matter the second layer was sprayed in cross or parallel to the original direction if the optimal parameters were used.

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