Coil Evolution: Smaller Diameter Coil Production

Newell Franks II, Chairman/CEO Burr Oak Tool Inc.

It makes sense, in terms of efficiency, to reduce both the tube diameter and the distance between tubes, so that the same volume of coil can transfer more heat. Tighter patterns, enhanced fin surfaces, and stronger fin stock materials increase the amount of work required per unit area of die surface, which means that any given size press has a higher tonnage requirement than would have been the case five, ten, or twenty years ago. This is illustrated in figure 1.

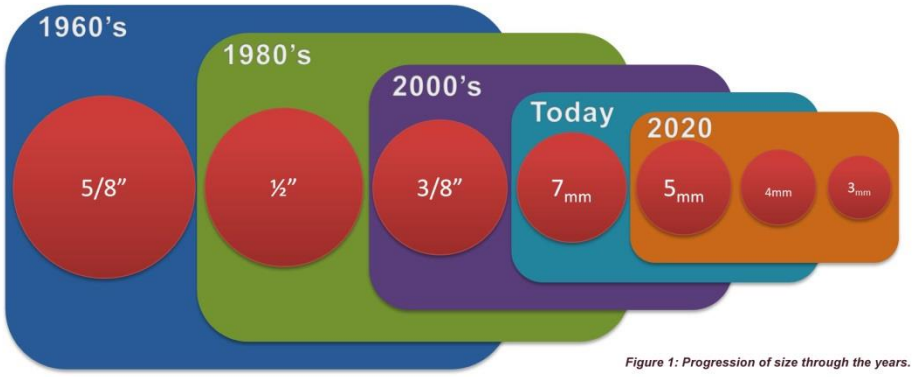

Figure 1: Progression of size through the years.

The implications of the changes to alloy and temper are not well understood or appreciated in the industry. Figure 2 lists some typical dies used in fin stamping today. For example, a 3/8" 48-row, four progression die processing 1100 0 temper stock requires 67 tons from the press. Altering the alloy and temper to 8006 series H-26 changes the required tonnage to 124 tons. The amount of work required of the press has doubled. Since most dies of this size in the world today are running in 100 ton presses the change in material in many cases has exceeded the rated capacity of the press. Typically this process has been gradual: first the increase of temper over a period of several years or even decades then the more recent move to a different alloy. Gradually problems developed with fin forms like collar bases because the press gradually lost the capability to properly close the fin die. The life of the press main bearings has also dropped as the presses have been forced up and out of the designed range.

Coil Evolution: Smaller Diameter Coil Production

Newell Franks II, Chairman/CEO Burr Oak Tool Inc.

											ESTIMATED TONNAGES				
Die	Die Specifications	Length	Width	Draws	Form	Enhance	Enhance Cut Length	Collar Height	Alloy	Material Thickness	1100 Temper 0	1100 H22	1100 H24	1100 H26	8006 H26
1	7mm x 49 rows x 4 progression	0.850	0.736	3	R	LAS	3.25	0.050	1100	0.004	42	52	62	68	78
2	9.52mm x 48 rows x 4 progression	1.000	0.866	4	W	LAW	4.06	0.071	1100	0.004	67	82	97	108	124
3	7.94mm x 48 rows x 4 progression	1.000	0.625	4	F	LOF	3.31	0.063	1100	0.006	83	102	121	134	154
4	9.52mm x 48 rows x 4 progression	1.000	0.866	4	F	LOF	3.25	0.100	1100	0.006	94	116	137	152	175
5	7.94mm x 48 rows x 4 progression	1.000	0.625	4	F	LOF	3.31	0.063	1100	0.006	83	102	121	134	154
6	9.52mm x 48 rows x 4 progression	1.000	0.750	4	F, W	LOF	4.65	0.100	1100	0.005	83	103	122	135	149
7	7mm x 48 rows x 4 progression	0.827	0.472	4	S	LAS	2.625	0.125	1100	0.008	86	106	125	139	160
8	9.52mm x 48 rows x 4 progression	1.000	0.866	5	R	LOF	5.2	0.087	1200	0.0051	101	125	148	164	187
9	9.52mm x 48 rows x 4 progression	1.000	0.866	5	R	LOF	3.3	0.071	1200	0.0045	79	97	115	127	146
10	5mm x 70 rows x 4 progression	0.630	0.546	5	F	LAF	3.7	0.056	1100	0.0038	73	90	107	118	135
11	5mm x 70 rows x 6 progression	0.630	0.546	5	F	LAF	3.7	0.056	1100	0.0038	110	135	161	177	204
12	5mm x 70 rows x 8 progression	0.630	0.546	5	F	LAF	3.7	0.056	1100	0.0038	146	180	214	235	270
13	7mm x 72 rows x 3 progresssion	0.827	0.526	4	F	LOF	2.75	0.071	3102	0.0045	62	77	91	101	112
14	7mm x 72 rows x 4 progression	0.827	0.526	4	F	LOF	2.75	0.071	3102	0.0045	86	107	120	135	148
15	5mm x 84 rows x 4 progression	0.750	0.449	5	F	LOF	3.7	0.063	1100	0.0038	99	123	138	160	176
16	5mm x 84 rows x 6 progression	0.750	0.449	5	F	LOF	3.7	0.063	1100	0.0038	148	184	207	240	264

FP-3 FP-1000 FP-1400 FP-2100 Outside Press Range

figure 2: Die Tonnage

Presses in use today were not originally designed to deal with 8006 H-26 fin stocks. Many companies struggle with their press not closing correctly or have quality issues with their fins, and they don't know the cause. The OAK FP-3 is an example of a 100 ton fin press that served the world very well from 1970 when it was first designed. As you can see in figure 2 the FP-3 was a great choice for large dies running the lower tensile strength materials for many years. As good as the FP-3 press is it can't properly close many large dies that are currently running 8006 material. In harmony with our mission to innovate to meet customer needs, we have designed and built the FP-1400. The 1400 part of the name signifies a 1400 KN rating.

The FP-1400 is the first OAK press designed using finite element analysis (FEA). The FP-1400 is also dynamically balanced resulting in much smoother operation at high speeds. The FP-1400 utilizes a servo feed with integrated die support instead of the mechanical feed found on the FP-3. The robust die support is very useful for large dies that exceed the length of the press bed.

Coil Evolution: Smaller Diameter Coil Production

Newell Franks II, Chairman/CEO Burr Oak Tool Inc.

To enhance the overall efficiency of the fin line, OAK also has a newly designed stacker unit. Previously a large stack of fins might weigh between 400 and 600 pounds. With the change to 24, 26, or 28 fins per inch the fin stack can weigh ½ ton or more. The new stacking system is 3 times stronger than the previous design and has the power necessary to lift a stack of fins. This lift feature is a great help in moving fins to the lacing station. The stacker rods have also been updated. Most steel stacker rods are prone to corrosion which can cause interruptions in production. The newly designed stacker rods are non-corrosive, stronger, and electro-polished. Corrosion is no longer a problem and the polished finish allows fins to slip more easily down the rods for uniform stacking. Another new feature is the double-delta tip. The new tip design is especially effective for fins with small hole diameters.

Fin stock lubrication is a challenge for many customers. Using evaporative lubricants in a dip type tank requires customers to continually monitor that the right amount of lubricant is being applied to the material. Too much lubricant wastes money and negatively impacts the environment and too little can ruin fin die tooling (see figure 3). Our solution is the ESL (electrostatic lubrication system). The ESL applies an electrical charge to micro droplets of oil, and the oil droplets adhere to the fin stock surface. The deposition rate is adjustable and consistent. Customers have reported reductions in lubricant usage of up to 90%. Longer tool life, safer working conditions, zero VOCs, and a cleaner machine and environment make the ESL a good solution.

The new OAK Triumph hairpin bender presents a completely new approach to hairpin bending. It provides a more productive and effective solution than any other hairpin bending machine available today. Compared to our hydraulic bender there is up to a 70% increase in productivity, accomplished by bending 8 tubes per cycle and a faster cycle time. Length changes are made in a matter of seconds using the operator's touch screen; floor space is 30% less than a traditional hydraulic bender. The price point is lower than the OAK hydraulic machine it replaces. Stretch straightening of the tubes means no straightener to adjust. The absence of feed belts eliminates the feed belt contamination and slippage that is common when aluminum hairpins are produced. Currently the machine can produce hairpins ranging in length from 150-4,000mm. The new OAK Triumph hairpin bender provides a revolution in quality, performance, and value that is unmatched in the world today.

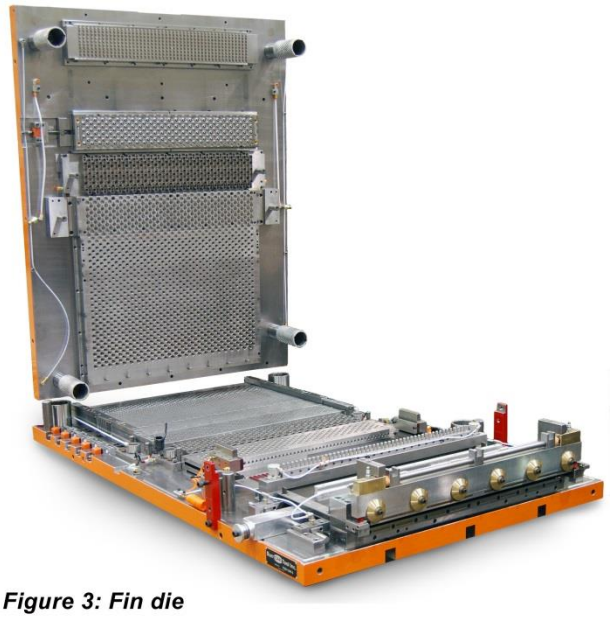

Figure 3: Fin die