



*Hydraulic Press Technology*

# Hydraulic Press Solutions for the Aerospace Industry



# Recent Aerospace Customers



- ◆ Bell Helicopter
- ◆ GKN Aerospace
- ◆ Bristol Aerospace
- ◆ Whitcraft LLC
- ◆ Enginetics Corp.



# Sheet Molding Compound (SMC) Application



- ◆ Press for SMC (Sheet Molding Compound) application.
- ◆ 4,500 pieces of carbon fiber tape are stacked and then molded into a Helicopter Rotor Component.
- ◆ Improved customer's yield by 30%.



# Meeting Stringent Qualification Criteria



- ◆ 250-ton off-center load applied 12" (305 mm) inside the cylinder periphery.
- ◆ Guided Platen not out of parallel to the bed by more than .015" (.381 mm).
- ◆ Cylinder periphery defined as 12" (305 mm) in from the X & Y directions of the centerlines of the cylinder rams.
- ◆ Deflection of no more than .015" (.381 mm) on a 250-ton load maximum.
- ◆ Press subjected to 16 hour long dwells under full load and at maximum temperature.

# SMC Press Specifications



Platen Size	84" (2,134 mm) F-B X 84" (2,134 mm) L-R
Force	Adjustable from min 2500 lbs (1,134 kg) to max 800,000 lbs (362,873 kg).
Maximum Operating Temperature	400°F (204°C)
Daylight (Closed Height – Open Height)	4" (102 mm) To 18" (457 mm) (Includes Platens and Insulation)
Stroke	adjustable to 14" (356 mm)
Pass through width	84" (2,134 mm)
Floor to table	36.25" (920.75 mm)
Maximum Clamping Force	800,000 lbs (362,873 kg)
Cylinder bore diameters (Four Cylinders)	12" (305 mm)
Ram diameter	7" (178 mm)
Pumps	19 & 9 GPM
Ram Speed: Press, inches / mm per minute	Adjustable
Ram Speed: Open	17 inches per minute (432 mm per minute)
Maximum System Pressure (PSI)	1770
Motor H.P. (1200 RPM)	20
Overall Press Size	172" (4,369 mm) L-R X 180" (4,573 mm) F-B X 192" (4,877 mm) High
Weight of Press	245,500 lbs (111, 130 kg)

# Composite Material Press



## ◆ Application / Material

- Customer-developed composite material similar to carbon fiber, impregnated with the correct amount of resin.
- Titanium alloy hubs.
- Short shelf life and needs to be refrigerated until laid up in the molds.

## ◆ Preparation of Material

- Cut material sheet using a template to various shapes / sizes, all the same thickness.
- Using same template cut pieces are laid on top of each other with end hubs in middle.
- End result is a part with varying thickness due to machining and attachment requirements of individual part.



# Composite Material Pressing Sequence



1. Part placed in tool that locates end hubs. Tool is below 100° F (38° C).
2. Press has a settable:
  - ◆ platen temperature for each mold half.
  - ◆ time setting for ramping up temperature from 100° F (38° C) to maximum required temperature.
  - ◆ position setting for moving slide for up to 10 sequences.
3. Press closes to position setting with tonnage override to just make contact with part.
4. Press closes to position AND platen temperature (under 365° F (185° C) over a settable time - generally 0-30 min). Press achieves set position and temperature at exact end of sequence.
5. This continues with decreasing positions and increasing temperatures.
6. Temperature begins to cool by convection at controlled rate through use of water cooling Channels provided in heated platens of press.
7. At a settable sequence cooling water is turned on to cure part, set contours of tooling, and bring tooling temperature below 100° F (38° C).

# Composite Material Press Specifications



Model Number	4U-100-36 X 36-12L3
Force	Adjustable 0.4 to 100 tons
Force	Settable in .1-ton increments
Work Areas: Left to Right & Front to Back	36" (914 ,mm)
Overall width left to right including power unit	92" (2,337 mm)
Overall height	84" (2,137 mm)
Clearance between columns front to back	26" (660 mm)
Daylight = Maximum Open Distance	20" (508 mm) with 3" (76 mm) adjustment on column ends
Stroke	Adjustable to maximum 14" (356 mm)
Cylinder Bore Diameters	10" (254 mm)
Ram Diameters	7" (179 mm)
Heated Platen to floor height	40.5" (1,029 mm)
Motor Capacity	10 HP / 1200 RPM
Pump Capacity	12 & 3 GPM
Reservoir Capacity	45 Gallons Minimum (170L)
Maximum System Pressure	2546 PSI
Ram Speed: Close inches per minute in run mode	44 (1,118 mm)
Press inches per minute in run (or auto) mode	9 (229 mm)
Open inches per minute in run (or auto) mode	87 (2,210 mm)



# Composite Material Press Additional Features



## ◆ 10-1/2" (267 mm) Color Panelview Electronic Press Control

- A powerful, compact control for digital control over press functions.
- Simple, user-friendly system, with keypad or touch screen entry of control functions and set-up parameters.
- Closed Loop Pressure Control compensates for temperature variation and allows repeatable accuracy of  $\pm 2\%$ .

## ◆ With the Electronic Press Control you can:

- Set Digital Top Stop, Slow Down, and Bottom Stop stroke positions.
- Set Digital Pressure (Tonnage) set points.
- Counters: non re-settable press stroke counter, re-settable stroke and batch counter
- Dwell timer allows adjustable pressure dwells.
- Recipe storage. Stores set-ups for up to 70 recipes on board. Speeds press setup.
- Diagnostic capability. All PLC I/O points can be monitored on the screen.
- Manually cool and blow-dry the cooling platens.

## ◆ Closed Loop Position Control System

- Repeatable accuracy of  $\pm 0.001"$  (.0254 mm).
- Proportional directional valve, digital linear transducer and a 10-micron return line filter provided.

# Greenerd's Touch Screen Control System



**MAIN MENU**

LOGIN  
LOGOUT  
HELP  
TRENDING  
HEAT  
MAINT UTILITY

PRESS MONITOR  
SAVE PROGRAMS  
RETRIEVE PROGRAMS

USER MODE

**I/O MONITOR**  
MAIN RACK/NODE 1

INPUS      OUTPUTS

SLOT 1	SLOT 1	SLOT 2	SLOT 2
0	8	0	8
1	9	1	9
2	10	2	10
3	11	3	11
4	12	4	12
5	13	5	13
6	14	6	14
7	15	7	15

SLOT 3  
ETHERNET  
IP 10.0.0.200

PLC CONFIG    PRESS MONITOR    MAIN MENU

**PLC NETWORK CONFIGURATION**

ETHERNET SWITCH

IP 10.0.0.200

IP 10.0.0.204

EXIT

**TREND - TOOL #1**

TREND TOOL #2

POSITION  
TONS  
UPPER 1 TEMP.  
UPPER 2 TEMP.  
LOWER 1 TEMP.  
LOWER 2 TEMP.  
TOOL 1-1 TEMP.  
TOOL 1-2 TEMP.

6:02:28 PM      8:02:28 PM

PRINT SCREEN    Trend Controls    Pause

Next Pen    Home    End    Move Right

MAIN MENU

**PRESS MONITOR**

OIL OVER-TEMP  
FILTER CLOGGED  
LOW OIL FAULT

RESET FAULT

TOTAL CYCLES    NNNNNNNN  
CYCLE CTR    NNNNNN  
BATCH CTR.    NNNNNN  
RETRACT STOP    NNN.NNN  
SLOW DOWN    NNN.NNN  
REVERSAL    NNN.NNN  
PLATEN POS.    NNN.NN  
TONS ACT    NNN.N  
STAGE 1 TONS    NNN.N  
STAGE 2 TONS    NNN.N  
STAGE 2 TEMP    NNNN

RESET COUNTERS

MAIN HEAT ENABLED

PRODUCTION    EXIT

# Punching Press for Round Jet Engine Cowlings



- ◆ Application: Punching a series of holes around the circumference of a Jet Engine Cowling.
- ◆ Challenge: Atypical part geometry for punching. Multiple P/N's and frequent set-up changes.
- ◆ Solution:
  - Greenerd designed a press with a Horn extension in place of a bed.
  - Part is indexed around it when punching. Operator moves it to various positions with small tool mounted on Horn.
  - Both a 9" (229 mm) diameter and 6" (152 mm) diameter horn supplied for various sizes of Cowlings.
  - Touch screen with integrated bar code scanner allows for quick change between Work Orders.



# Greenerd Removable Horn Jack Design



- ◆ Press can be adapted as a multi-use press with removable Greenerd Horn Jack attachment.
  - When using Horn only, Jack attachment is removed from under Horn.
  - When additional support is needed, Jack attachment is reattached to press.



# Jet Engine Cowling Press Specifications



Model #	HRN-60-30R14
Tons of Ram Force	Adjustable from 12 to 60
Horns (Removable)	6" (152 mm) and 9" (229 mm) diameters
Daylight	12" (305 mm)
Stroke	8" (203 mm)
Floor to centerline of Horn	42" (1,067 mm)
Guiding System	Two-Post Guided
Ram Speeds: Rapid Advance Pressing Rapid Return	517 IPM (Inches Per Minute) (13,132 mm) 84 IPM (2,137 mm) 539 IPM (13,691 mm)
Motor HP	30
Touchscreen control panel	Stores up to 150 different programs for various parts. Allows program changes in just seconds and produces parts precisely the same each run.
Bar Code Reader	Operator simply scans next component to be punched directing Touchscreen control to automatically upload new parameters for that component.
Die Shank Adaptor Plate	Accept dies with shanks on them.

# Triple Action Draw Press



Press is used for drawing Titanium blanks into Aerospace components.

- ◆ 600-ton capacity Main Ram/Punch.
- ◆ 300 ton Capacity Blankholder Platen.
- ◆ 125 Ton capacity Cushion.
- ◆ Full functionality through Touchscreen to set up cylinders for pressure, distance, speed and dwell.
- ◆ All programs are stored in control - capable of storing 100 jobs on board.



# Triple Action Draw Press Features



- ◆ Allen-Bradley Panelview 1000 Plus Electronic Press Control.
  - Set Digital Top Stop, Slow Down, and Bottom Stop stroke positions for Main Ram, Blankholder and Cushion.
  - Set Digital Pressure (Tonnage) set points for Main Ram, Blankholder and Cushion.
- ◆ Non-resettable press stroke counter, resettable stroke and batch counter.
- ◆ Dwell timer, allows adjustable pressure dwells up to 10 seconds.
- ◆ Trend display for Tonnage / Reversal Position; view the last 10 cycles.
- ◆ Cycle rate displayed in cycles per minute.
- ◆ Stores set-ups for up to 100 recipes on board. Speeds press setup.
- ◆ Diagnostic capability. All PLC I/O points can be monitored on the screen.
- ◆ Hour Meter.
- ◆ Vibro Dynamics Micro Level Isolators.
- ◆ Banner Brand Light Curtain with Mirrors: An electronic barrier with transmitter and receiver sending a signal through mirrors. Allows for access to all four sides of the work area. Light curtains also have Blanking Capabilities.

# Triple Action Draw Press Features (cont.)



- ◆ **Closed Loop Speed Control:** Adjusts speed from 10% to 100% of full speed .
- ◆ **Low Oil Level Fault Indicator:** Triggers alarm on Touch Screen.
- ◆ **High Oil Temperature Fault Indicator:** Triggers an alarm on Touch Screen.
- ◆ **Contaminated Oil Filter Fault Indicator:** Triggers a warning on Touch Screen.
- ◆ **VPN Web Server:** Provides feedback from press via Ethernet connection. Customer can view and log data from press. Capabilities:
  - **Web HMI:** view animated screens or tabular data with standard web browser interface. View maintenance reports, production data, and any information available at the machine level.
  - **Alarm Management:** e-mail notifications can be sent if PLC variables are outside predetermined limits. Examples could include cycle complete, batch complete, filter clogged, etc.
  - **Data Logging, Reporting, and Trending:** store data in internal database for later review or real-time analysis. Data can be sent to higher end management system based on timing, on alarm or by request.
- ◆ **Remote Access:** Connect to PLC and other devices as if you were on-site.
- ◆ **Bar Code Reader:** Keyence LED Type Handheld Scanner, Bar Code Interface and DC Input Card. Bar Code Reader scans bar code on any tool or router card to determine proper program called up to Touchscreen.



# Triple Action Draw Press Specifications



Model Number	4TA-600/300-52 x 52-52/52/10
Punch Force	Adjustable 120 to 600 tons
Blankholder Force	Adjustable 60 to 300 tons
Punch Diameter	12" (305 mm)
Blankholder Work Area: L-R	52" (1,321 mm)
Blankholder Work Area: F-B	52" (1,321 mm)
Overall width left to right	84" (2,137 mm)
Overall height above the floor	216" (5,486 mm)
Overall depth below the floor	24" (610 mm)
Punch Daylight	48" (1,220 mm)
Punch Stroke	Adjustable to maximum 38" (965 mm)
Punch Shut Height	10" (254 mm)
Punch Cylinder Bore Diameter	22" (559 mm)
Punch Ram Diameter	12" (305 mm)
Blankholder Daylight	48" (1,220 mm)

# Triple Action Draw Press Specifications (cont.)



Blankholder Stroke	Adjustable to maximum 38" (965 mm)
Blankholder Shut Height	10" (254 mm)
Blankholder Cylinder Bore Dia.	10" (254 mm)
Blankholder Ram Diameter	7" (179 mm)
Bed to floor height	36" (914 mm)
Motor Capacity	150 HP / 1800 RPM
Pump capacity	52 / 52 / 10 GPM
Hydraulic System	Regenerative/Prefill
Reservoir Capacity	650 Gallons Minimum (2,461L)
Maximum System Pressure	3183 PSI
Punch Ram Speed Close inches per minute in run mode Press inches per minute in run mode Open inches per minute in run mode	624 IPM (15,850 mm) 29 IPM (737 mm) 600 IPM (15,240 mm)
Blankholder Ram Speed Close inches per minute in run mode Press inches per minute in run mode Open inches per minute in run mode	624 IPM (15,850 mm) 61 IPM (1,549 mm) 600 IPM (15,240 mm)

# Triple Action Draw Press Specifications (cont.)



Cushion Specifications	
Cushion Force	Adjustable 25 to 125 Tons
Ejection Force	15 Tons max
Stroke	Adjustable to maximum 8" (203 mm)
Cylinder Bore Diameter	10" (254 mm)
Ram Diameter	7" (179 mm)
Platen Overall: Left to Right	32" (813 mm)
Platen Overall: Front to Back	32" (813 mm)
Ram Speed	
Extend with up to 15 tons of force	59 IPM (1,499 mm)
Retract inches per minute	Punch Pressing Speed
Retract inches per minute in jog mode	59 IPM (1,499 mm)

# Aerospace Component Manufacture Press



Punching, forming and blanking components for the Aerospace industry.

- ◆ Designed to handle large off-center loads with minimal frame deflection.
- ◆ 150 ton capacity hydraulic Gib Guided press.
- ◆ 70 ton capacity hydraulic programmable cushion.
- ◆ 10 ton capacity hydraulic ram-mounted knockout.



# Aerospace Component Press Specifications



Tons of Ram Force	Adj. from 30 to 150 / 112.5 max for blanking
Table Dimensions	50"(1,270 mm) L-R x 30" (762 mm)F-B
Throat	18" (457 mm)
Daylight / Stroke	36"(914 mm)/ Adj. from 1" to 30" (25-762 mm)
Floor to Table	38" (965 mm)
Press Size, L-R x F-B X Tall	90" (2,256 mm) x 125"(3,175 mm) x 164" (4,166 mm)
Guiding System	4 Point Gib-Guided
Off center Capacity, 75 tons / 150 tons	X = 24"(610 mm) ; Y = 12"(305 mm) / X = 12"(305 mm) ; Y = 6" (152 mm)
Upper tooling plate	50"(1,270 mm) L-R x 30" (762 mm)F-B
Pump Capacity	60 & 21 GPM
Cylinder Bore	12" (305 mm)
Ram Diameter	8" (203 mm)
Ram Speed per minute, Close / Press / Open	372" (9,449 mm)/42"(1,067 mm)/ 297"(7,534 mm)"
Maximum System Pressure	2652
Motor	40 HP / 1200 RPM
Weight	85,000 lbs (38,555L)
Deflection Standard for HCG Style Presses	.0005"(.0127 mm) / Inch (mm) of Throat Depth

# Aerospace Component Press Specifications (cont.)



Cushion Specifications	
Cushion Force	Adjustable 14 to 70 Tons
Ejection Force	15 Tons max
Stroke Non-Adjustable	6" (152 mm)
Cylinder Bore Diameter	8" (203 mm)
Ram Diameter	5-1/2" (138 mm)
Platen Overall	22" (559 mm) L- R / 18" (4587 mm) F-B
Guide Rod Quantity	4
Pump Capacity	30 GPM (1,134 LPM)
Maximum System Pressure	2785 PSI
Ram Speed: Extend inches per minute	291
Eject Specifications	
Eject Force	10 Tons
Stroke Non-Adjustable	1" (25 mm)
Cylinder Bore Diameter	3.25" (82.55 mm)
Ram Diameter	2" (51 mm)
Pump Capacity	3 GPM (11 LPM)
Maximum System Pressure	2410 PSI
Ram Speed: Extend inches per minute	84" (2,134 mm)

# The Greenerd Advantage



- ◆ Leading supplier of hydraulic press solutions with product capability to 1,500 tons, bed sizes exceeding 150" (3800 mm), and styles ranging from gap frame and straight-side to gantry-type straightening presses.
- ◆ Unique strength lies in relationships we develop with our customers. We create a true partnership with you, so we can design and build a press that is best suited to your specific needs.
- ◆ Offers an extensive line of standard Hydraulic Presses in all sizes and configurations.
- ◆ Presses can be designed for custom applications by expert engineers with extensive application experience.



# *Thank You!*



*Hydraulic Press Technology*