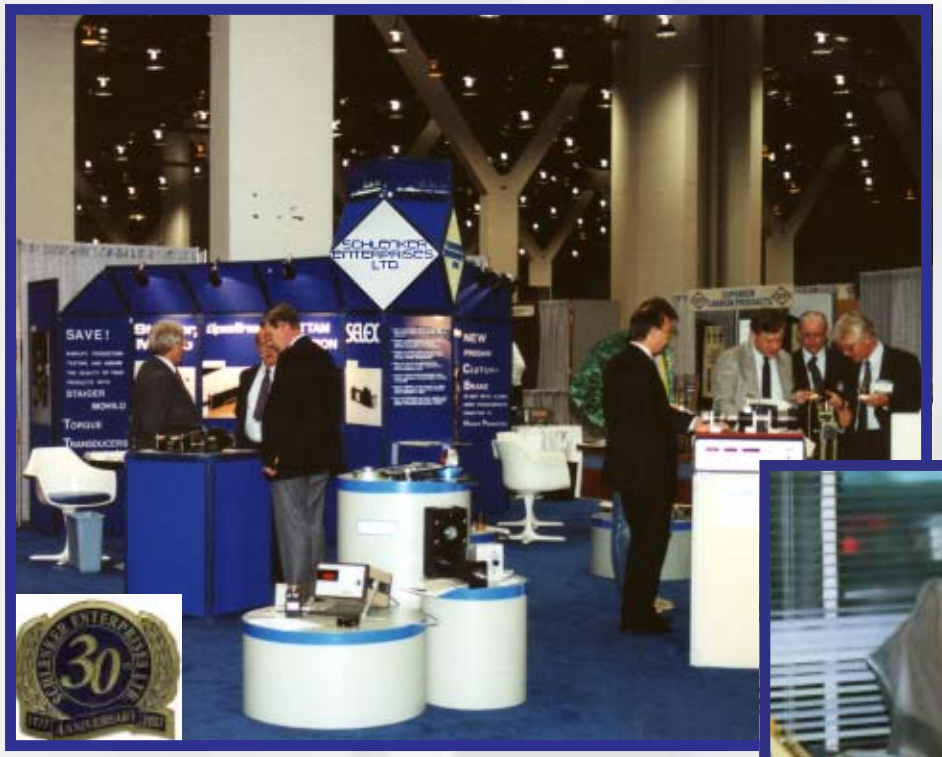


Resumé
of
Merlyn E. Schlenker

(See Article about being honored as Distinguished Engineer at SDSC in 1984 for work in Servo Drives)

www.schlenkent.com
&
www.schlenkerenterprises.com

1952 – 1962 Systems Engineer for Reliance Electric

1. Engineered Servo Drives **for first NC Machine Tool at 1955 Machine Tool Show.** The NC was joint venture between Massachusetts Institute of Technology and Giddings & Lewis Machine Tool Company

2. Engineered **Reliance Electric's first synchronized printing and drying lines for Continental Can Co. for Minute Maid & others**

3. Engineered **Reliance Electric's first low speed direct DC Motor Drives for Boeing's weld positioners**

4. Engineered **first aluminum Coating & Drying Oven Drives for Reynolds Metal Aluminum Siding Program**

Phone: 708.449.5700
Fax: 708.449.5703

SCHLENKER ENTERPRISES LTD.

P.O. Box 9277, Lombard, IL 60148-9277
USA

1962 – 1964 Systems Engineer for Imperial Electric

1) Introduced **First Closed Loop Direct Drive Systems for passenger Elevators**

1964 – 1967 Manager of Sciakydyne Servo Control

1. **Introduced first Static bi-directional, regenerative Servo Drive Systems for many industries.**
2. Supplied **fist Static Elevator Drive System to Montgomery Elevator in Moline, Illinois**
3. **Started the revolution from hydraulic to electric Servo Drives for major machine tool companies such as Excello, Ekstrom Carlson and others**

1967 -1977 Founder of Hyper-Loop

when Sciaky Brothers decided not to stay in the Servo Drive business.

Merlyn Schlenker President, Hyper-Loop, Inc.

Marcel Sommeria looking at the results of a new circuit.

hyper-loop . . . where new electronic drives advance NC machines to maximum productivity and precision

Hyper-Loop's meteoric rise in the field of electronic spindle and servodrive systems is marked by advanced concepts. Today these advanced concepts are supported by a modern manufacturing facility and a growing force of engineers and skilled technicians.

Hyper-Loop makes a range of electric spindle and servo drives for a wide variety of machine tools. The new patented concepts contained in the control amplifier allow Hyper-Loop to offer the first all electric drive package that not only competes with, but exceeds, the performance capabilities of Hydraulic systems.

Although all Hyper-Loop products utilize advanced solid state electronic circuitry, the basic electrical elements are carried in large stock quantities for fast service if required.

TECHNICAL ACHIEVEMENTS

- Zero dead band on all applications irrespective of size, one or two motor anti-backlash, or manufacturer of NC (Bendix, Allen Bradley, G.E., Boston Digital, Conrac, Cincinnati Milacron, Machining Technology).
- High static stiffness-infinite on all tests to date as full motor torque is developed with no position error on 0.0001 inch pulse system.
- Servo lock provided in lieu of clamping for jig boring press feeders and other applications.
- The adjustable cross fire which provides high stiffness permits adjustable pre-load for 2 motor anti-backlash systems.
- Inherent noise immunity of amplifier permits high position gain with no resistor around operational amplifier.
- High dynamic gain or K_v in normal NC applications and up to infinite gain with NC servo adapter option.
- Two motor anti-backlash with no loss motion at cross over point with standard gearing and low adjusted pre-load.
- Precision feed back with classic resolver with standard ratios for direct drive for English or metric measurements. Change from brush type to brushless type for continuous feed back.
- Tachometer development for better mounting and electric performance characteristics.
- DC motor development for better utilization on machine tools. (Note: internal tachometer, oil tight, maximum number of segments and field poles.)
- Patented linear motor.

1. **Direct Drives to eliminate Gear Boxes continued as Hyper-Loop philosophy**

2. Introduced the **first Direct Servo Drive for Wean Industrial - McKay Press Feeders where connected inertia was 50 times the drive motor inertia.** (See Photo)

3. Continued replacing hydraulics with Electric Servos to most major machine tool builders including Ingersol Milling, Cincinnati Milacron, American Tool, Bullard, Bryant Griner, Kingsbury, Danly Machines – Milling Machine Div., G.A. Gray and others. (See Photos)

4. Hyper-Loop Drives were on 22 American made CNC machine tools. At the 1970 Machine Tool Exposition and **working with Allen-Bradley**, Bendix, Bunker Ramo, Boston Digital, Conrac, and Cincinnati Milacron's CNC Controllers.

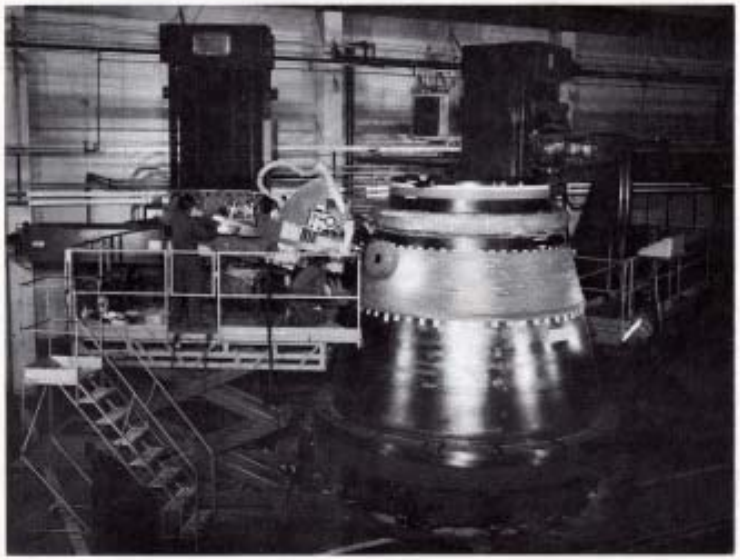
Was on most British and Australian Machine Tools and on many European Machine Tools at the Milan, Italy (EMO) Show

5. Hyper-Loop introduced **the first 2-Motor Anti Backlash System to replace spring loaded gears on Large rack and pinion machines with zero dead band and feed forward to eliminate CNC following error**. The concept has copied by Siemens; and is still being supplied today.

Hy hyper-loop Lines

VOL., No. I — April, 1977

HYPER-LOOP PART OF SHUTTLE PROGRAM



Hyper-Loop equipment on R.D. & D. Machine making rocket thrusters

BUILDS SYSTEMS FOR ROCKET THRUSTER: FUEL TANK MANUFACTURE

If you have been watching the 10 p.m. news during the last month or two you saw filmed reports of the U. S. Space Shuttle's preliminary test flights while attached to the back of a converted 747.

These tests were so successful that one future planned test has been eliminated.

This success can be directly contributed to the men and women of the many industries throughout the nation that designed and built the equipment that produced the space shuttle. Many of you may not know it, but this includes the men and women of Hyper-Loop.

During 1976, three projects passed through Hyper-Loop. One was for R.D. & D., the second was for Bulland, and the third was for Martin-Marietta. All three are directly related to the space shuttle program.

The product for the R. D. & D. and Bullard projects was a Hytrace Digital Control System. The final destination of this system was thiokol, where it became an integral part in the manufacture of rocket thrusters for the shuttle.

The manufacture of the thrusters is a sophisticated process that requires machining a cone

ining a cone shaped nuzzel, coating it with tape, and then grinding it down to an extremely smooth finish.

The two major criteria of all NASA equipment is workability and safety. Therefore they demand precision.

With the high performance of the Hytrace equipment this precision is provided allowing Thiokol to accurately control tolerances in its manufacturing process.

The Martin-Marietta project was for a Hyper-Loop Servo Drive System which was placed on a machine sent to Mishoud.

continued pg. 4 col. 1

6. Developed **first High Performance Ddddigital Electric Tracer Systems using Honeywell Tracer Heads and all the 2-Motor Anti Backlash, Feed Forward and Infinite Gain techniques.** (See Photo Hytrace Photo)

7. Hyper_Loop helps the Space Program. (See article on Shuttle Program)

8. Sold Hyper-Loop, Inc. to Lucas (our European representatives) in 1977 with rights to market Servo Drive Systems

continued from pg. 1 col. 3

This machine is used to apply an insulation coating to the main fuel tank.

This coating can be likened to that used on a thermos bottle. In this case the insulation is used to prevent ice from forming when oxygen for fuel is inserted into the tank.

To some of you whose day to day job is wiring, or drawing plans, or working in the stock room, your jobs may not seem important. But when looking at the end result of your work, you can feel proud that you, along with the millions of other workers throughout the United States, are the ones that are going to be responsible for the first returnable shuttle in outer space.

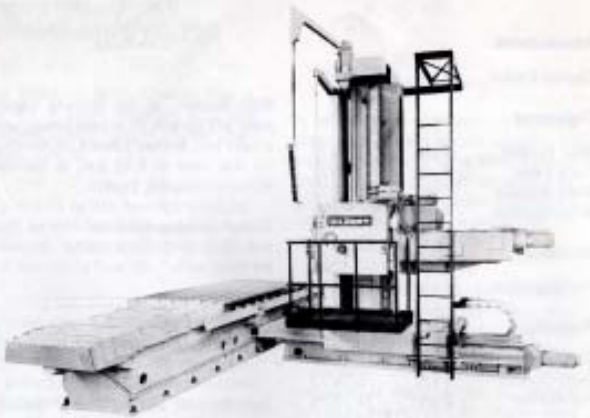
HI LINES

The Hyper-Loop, Inc., "Hi Lines" is published four times per year by and for the employees of Hyper-Loop, Inc. Publication dates are April, July, October and January.

Views expressed in this publication are those of the writers and are not necessarily those of Hyper-Loop, Inc. or its management.

Inquiries concerning this publication should be addressed to: Editor, Marketing Department, Hyper-Loop, Inc., 7459 W. 79th St., Bridgeview, Il., 60455.

APPLICATION OF THE MONTH

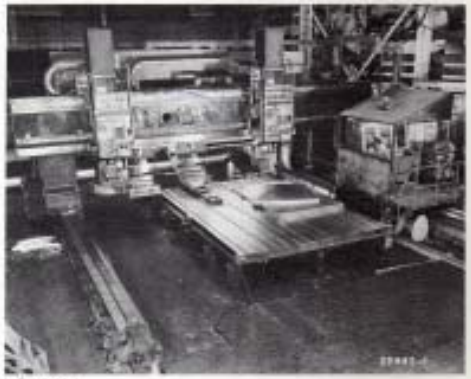


Horizontal Boring Mill and Rotary Table

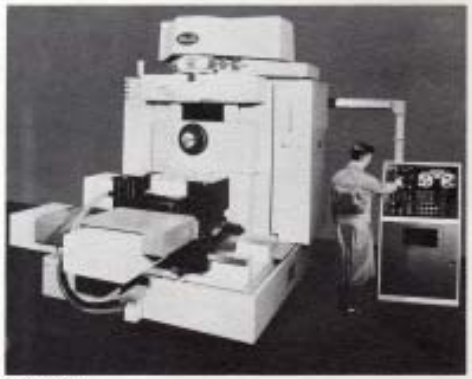
Company: Cincinnati Gilbert, Cincinnati, OH

Hyper-Loop Equipment:

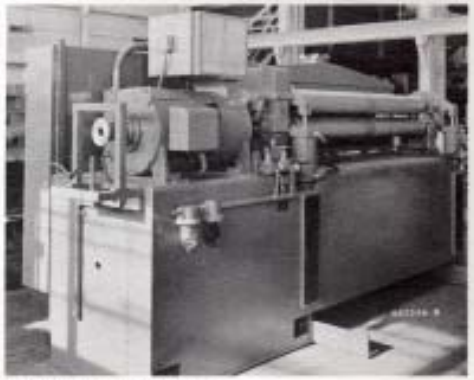
Servo Drive Amplifier:	50 amp., 90 Volt HLB 30 amp., 90 Volt Hyamp I
Servo Motors:	A-1315
Spindle Amplifier:	120 HLB 150
Spindle Motor:	Frame 2508; 20 HP Machine Tool Duty; 15 HP continuous; 1150 RPM base speed; 3450 RPM field weakening speed.
Control:	General Electric Numberical Control



Ingersoll

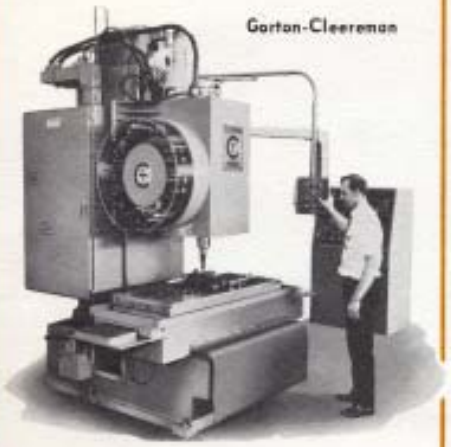


Ex-Cell-O



Wean Industries-McKay

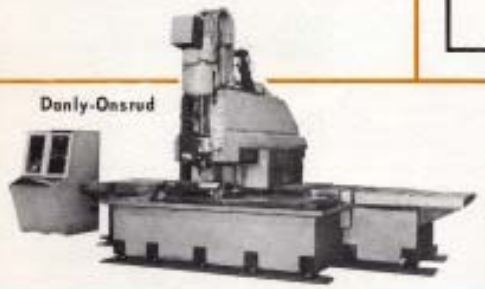
Gorton-Cleereman



HYPER-LOOP DRIVES FOR MANY APPLICATIONS

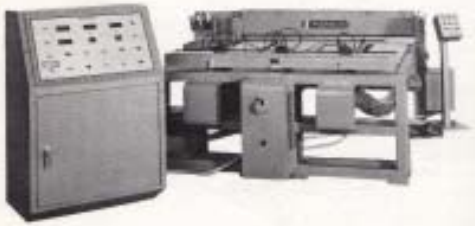
- Punch press
- Profile milling
- Machining centers
- Drilling machines
- Boring mills
- Lathes
- Press feeders
- Test stands
- Chemicals
- Plastics
- Metalworking

Danly-Onsrud



American Tool Works

Fanco



Ekstrom Carlson

hyper-loop INC.

7459 W. 79TH STREET
BRIDGEVIEW, ILLINOIS 60455
312/594-2288

1977 – 2007

Schlenker honored at SDSU banquet

The Seventh Annual Distinguished Engineers Banquet included a Frederick native as one of its honorees. The banquet was held Monday night at South Dakota State University.

The event recognized four SDSU graduates as Distinguished Engineers chosen by committees for their contributions to the engineering profession. The honorees were Merle Esmay, C. Milo Thelin, Merlyn Schlenker and Lawrence R. Thielen.

Schlenker, born and raised on a farm near Frederick, received his degree in electrical engineering from SDSC in 1951. His SDSC activities included Sigma Tau, Blue Key, Rooter Bums and American Institute of Electrical Engineers.

Merlyn has spent his professional life in the field of servo drive systems after completion of the Student Training course of Westinghouse Electric Corp.

While acting as an application engineer with Reliance Electric in Chicago, he was involved with the electric controls on the first numerically controlled (NC) machine shown at the Machine Tool Show in Chicago in 1955.

This stimulated his interest in closed loop control systems. In 1964, he joined Sciaky Bros. as Manager of the Servo Control Division to promote electric servo systems used to replace hydraulic systems as machine tool interface with NC Systems. When Sciaky Bros. elected not to actively pursue this market, he left the company; and founded Hyper-Loop, Inc. in 1967. Hyper-Loop is credited with having developed the first practical SCR closed loop bi-directional servo amplifier. They also developed low speed, high torque DC motors to eliminate gearboxes for directly coupling to high performance machine tools. He held the position of President and Chairman until 1977 when Hyper-Loop was sold to its European agent--Lucas Industries.

Schlenker Enterprises, Ltd. was founded in 1977 as a trading company to export engineered closed loop systems and import electro mechanical devices associated with them for both domestic and foreign markets.

Merlyn has two children--Diane, a graduate M.E. from Valparaiso University, working for Dresser Ind. and Craig who will earn his BSME from Valparaiso in May of 1984. His wife Jolanta is an immigrant from Poland and is actively involved with Schlenker Enterprises, Ltd.

Distinguished Engineers citations began in 1977 with 22 honorees. Pictures of the honorees are displayed in SDSU's Crothers Engineering Hall.

Founder of Schlenker Enterprises, Ltd. (May 5th, 1977) as a Systems Integrator for Motion Control components and systems in Servo Drives.

1. Engineered 18 Foot Rotary Table using 2-Servo Motor Anti-Backlash technology for NASA, Huntsville, AL.

2. In 1983, I met Engr. Branimir Ruzojcic, Design Engineer at Prvomajska-Inda (a Yugoslavian company) for AC Permanent Magnetic Servo Motors and Controllers for the American Market.

3. After starting some good applications for Inda Motors in USA, former Yugoslavia dissolved during the domestic ethnic war; and Inda-Prvomajska was forced to become denationalized. Shortly thereafter, Inda went bankrupt leaving Schlenker Enterprises without an AC Servo Motor supply.

   Branimir Ruzojcic founded TEMA to continue his development of AC Servo Drives; and TEMA became partners with Schlenker Enterprises, Ltd.

4. Schlenker Enterprises developed an AC Permanent Magnet Servo Motor for use with TEMA Servo Control in 1995 for a project in India. When Mamata (an Indian company) decided to abandon the drive project, Schlenker Enterprises Ltd continued to design complete family of Selex AC Servo Motors from 70mm to 200mm Diameter rated 1.15 Nm to 147 NM (see attached RSM family) using high energy NdFeB imbedded magnets (to avoid banding Rotors for high speed) and Sinusoidal distribution windings while competition were promoting Trapezoidal distribution windings.

   In 1997, we sold the AC Servo Motor License to Sundstrand Aerospace to manufacture the imbedded magnet rotor design which was going well until Sundstrand was acquired by United Technologies and became Hamilton-Sundstrand. TEMA was designing a compatible amplifier for use with these motors.

SELEX

SCHLENKER ENTERPRISES LTD.
5143 Electric Avenue
Hillside, Illinois 60162
Ph: 708/449-5700
Fax: 708/449-5703

RSM Series AC Servo Motors

Performance Specifications

Motor Model Number	Continuous Torque		Speed	Moment of Inertia x 10^{-3}		Torque Constant		Current AMPS		Weight		Length (L)	
	lb-in	Nm	RPM	lb-in-sec^2	kgm^2	lb-in/A	Nm/A	Cont	Peak	lb	kg	in	mm
RSM 35.1.30	10	1.15	3000	0.47	.053	10.1	1.14	1.0	6.0	4.4	2.0	4.0	101.6
RSM 35.1.60	10	1.15	6000	0.47	.053	5.04	0.57	2.0	12.0	4.4	2.0	4.0	101.6
RSM 35.1.80	10	1.15	8000	0.47	.053	3.78	0.43	2.67	16.0	4.4	2.0	4.0	101.6
RSM 35.2.30	20	2.26	3000	0.87	.098	10.1	1.14	1.98	12.0	7.7	3.5	5.0	127.0
RSM 35.2.60	20	2.26	6000	0.87	.098	5.04	0.57	3.96	23.8	7.7	3.5	5.0	127.0
RSM 35.2.80	20	2.26	8000	0.87	.098	3.78	0.43	5.26	31.6	7.7	3.5	5.0	127.0
RSM 35.3.30	30	3.39	3000	1.27	.143	10.1	1.14	2.97	17.8	11.0	5.0	6.0	152.4
RSM 35.3.60	30	3.39	6000	1.27	.143	5.04	0.57	5.95	35.7	11.0	5.0	6.0	152.4
RSM 35.3.80	30	3.39	8000	1.27	.143	3.78	0.43	7.89	63.1	11.0	5.0	6.0	152.4
RSM 50.1.30	50	5.6	3000	2.40	.271	10.1	1.14	6.38	51.1	11.0	5.0	7.4	186.0
RSM 50.1.45	50	5.6	4500	2.40	.271	6.73	0.76	7.37	59.0	11.0	5.0	7.4	186.0
RSM 50.1.60	50	5.6	6000	2.40	.271	5.04	0.57	9.82	79.6	11.0	5.0	7.4	186.0
RSM 50.2.30	87	9.8	3000	4.00	.452	10.1	1.14	8.60	68.8	16.7	7.6	9.5	242.0
RSM 50.2.45	87	9.8	4500	4.00	.452	6.73	0.76	12.9	103.2	16.7	7.6	9.5	242.0
RSM 50.2.60	87	9.8	6000	4.00	.452	5.04	0.57	17.2	137.5	16.7	7.6	9.5	242.0
RSM 50.3.30	124	14.0	3000	5.60	.632	10.1	1.14	12.3	98.3	24.2	11.	11.75	298.0
RSM 50.3.45	124	14.0	4500	5.60	.632	6.73	0.76	18.4	147.4	24.2	11.	11.75	298.0
RSM 50.3.60	124	14.0	6000	5.60	.632	5.04	0.57	24.6	196.5	24.2	11.	11.75	298.0
RSM 50.4.30	160	18.0	3000	7.20	.814	10.1	1.14	15.8	126.3	30.8	14.	13.95	354.0
RSM 50.4.45	160	18.0	4500	7.20	.814	6.73	0.76	23.7	198.5	30.8	14.	13.95	354.0
RSM 50.4.60	160	18.0	6000	7.20	.814	5.04	0.57	31.6	252.6	30.8	14.	13.95	354.0
RSM 70.1.20	100	11.2	2000	13.3	1.50	15.1	1.71	6.55	52.4	22.0	10.	8.5	216.0
RSM 70.1.30	100	11.2	3000	13.3	1.50	10.1	1.14	9.82	78.6	22.0	10.	8.5	216.0
RSM 70.1.45	100	11.2	4500	13.3	1.50	6.73	0.76	14.7	117.9	22.0	10.	8.5	216.0
RSM 70.2.20	198	24.0	2000	22.1	2.50	15.1	1.71	14.0	112.3	33.0	15.	10.71	272.0
RSM 70.2.30	198	24.0	3000	22.1	2.50	10.1	1.14	21.1	168.4	33.0	15.	10.71	272.0
RSM 70.2.45	198	24.0	4500	22.1	2.50	6.73	0.76	31.6	252.6	33.0	15.	10.71	272.0
RSM 70.3.20	297	33.6	2000	30.9	3.50	15.1	1.71	19.0	157.0	44.0	20.	12.92	328.0
RSM 70.3.30	297	33.6	3000	30.9	3.50	10.1	1.14	29.5	236.0	44.0	20.	12.92	328.0
RSM 70.3.45	297	33.6	4500	30.9	3.50	6.73	0.76	44.2	353.6	44.0	20.	12.92	328.0
RSM 70.4.20	398	45.0	2000	39.8	4.50	15.1	1.71	26.3	210.5	55.0	25.	15.2	384.0
RSM 70.4.30	398	45.0	3000	39.8	4.50	10.1	1.14	39.5	315.8	55.0	25.	15.2	384.0
RSM 70.4.45	398	45.0	4500	39.8	4.50	6.73	0.76	59.2	473.7	55.0	25.	15.2	384.0
RSM 100.1.12	223	25.0	1200	35.4	4.0	25.2	2.85	8.77	70.2	55.0	25.	9.37	238.0
RSM 100.1.20	223	25.0	2000	35.4	4.0	15.1	1.71	14.6	117.0	55.0	25.	9.37	238.0
RSM 100.1.30	223	25.0	3000	35.4	4.0	10.1	1.14	21.9	175.4	55.0	25.	9.37	238.0
RSM 100.2.12	443	50.0	1200	70.8	8.0	25.2	2.85	17.5	140.4	88.0	40.	11.58	294.0
RSM 100.2.20	443	50.0	2000	70.8	8.0	15.1	1.71	29.2	233.9	88.0	40.	11.58	294.0
RSM 100.2.30	443	50.0	3000	70.8	8.0	10.1	1.14	43.9	350.9	88.0	40.	11.58	294.0
RSM 100.3.12	681	77.0	1200	97.4	11.0	25.2	2.85	27.0	216.1	121.0	55.	13.78	350.0
RSM 100.3.20	681	77.0	2000	97.4	11.0	15.1	1.71	45.0	360.2	121.0	55.	13.78	350.0
RSM 100.3.30	681	77.0	3000	97.4	11.0	10.1	1.14	67.5	540.4	121.0	55.	13.78	350.0
RSM 100.4.12	885	100.0	1200	123.9	14.0	25.2	2.85	35.1	280.7	132.0	60.	17.09	434.0
RSM 100.4.20	885	100.0	2000	123.9	14.0	15.1	1.71	58.5	467.8	132.0	60.	17.09	434.0
RSM 100.4.30	885	100.0	3000	123.9	14.0	10.1	1.14	87.7	701.8	132.0	60.	17.09	434.0
RSM 100.5.12	1115	126.0	1200	159.3	18.0	25.2	2.85	44.2	353.7	165.0	75.	19.29	490.0
RSM 100.5.20	1115	126.0	2000	159.3	18.0	15.1	1.71	73.7	589.5	165.0	75.	19.29	490.0
RSM 100.5.30	1115	126.0	3000	159.3	18.0	10.1	1.14	110.5	884.0	165.0	75.	19.29	490.0
RSM 100.6.12	1300	147.0	1200	185.8	21.0	25.2	2.85	51.6	412.6	198.0	90.	21.5	546.0
RSM 100.6.20	1300	147.0	2000	185.8	21.0	15.1	1.71	86.0	687.7	198.0	90.	21.5	546.0
RSM 100.6.30	1300	147.0	3000	185.8	21.0	10.1	1.14	129.0	1032.0	198.0	90.	21.5	546.0

1. Line to line is 3-phase 160 Volts AC (nominal)
2. The RSM 35 Series are 4 pole and the others are 6 pole design
3. All magnets are NdFeB with under 3% power loss at 150°C
4. All ratings are with class H insulation at 40°C ambient
5. All motors are suitable for higher speeds without banding magnets due to patent pending rotor construction
6. All motors are IP-65 protected
7. All include encoders or resolvers for commutation and position feedback

5. After September 11, 2001, UTC required Hamilton-Sundstrand to drop production and rescind the license to manufacturing RSM Servo Motors. Hamilton-Sundstrand had previously rescinded the licenses to manufacture AC Servo Controllers.

6. Branimir Ruzojcic joined a group of over 30 Servo Drive Researchers at Padova University in Italy where he furthered his Servo Technology; and received his PhD.

7. Schlenker Enterprises Ltd supplied large AC Synchronous Motors to TEMA for use with Dr. Ruzojcic's Servo controls to convert a Hydraulic "De-Mining" (machine for finding Land Mines left during the Civil War in Yugoslavia) into an Electric Servo Driven machine.

8. TEMA acquired a contract for 750 KW Marine Propulsion AC PM Servo Motors; and Dr. Ruzojcic designed the family of 300KW to 1000 KW water cooled Motor (See attached LPMR ratings & preliminary Dimension Data). TEMA has since received an order for 1000 kW LPMR Motor documentation.

9. TEMA /SEL have a recent Joint Venture Contract with Liu Zhou Jiali Eleactric (Mr. Wang Zhifang-GM) to Develop & Manufacture AC Permanent Magnet Motors from TEMA Design; and Quality Control under Dr. Ruzojcic's supervision for marketing by Schlenker Enterprises Ltd.

10. TEMA is now designing special 25 HP & 50 HP 2000 RPM AC Synchronous Permanent Magnet Servo Motors for Direct Drive on Rockwell's ELS Printing Press Program with emphasis on Length, Size & Weight + efficiency.