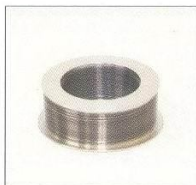


Application of Welded Bellows

- Semi-conductor Equipment
- Aerospace Industry
- Petrochemical Industry
- Ultra-High Vacuum Equipment
- Ultra-High Vacuum Valves
- Pharmaceutical Production Equipment



"How is Bellows Made?"

Manufacturing Progress



Leak detector



PRESS(Dia)



CNC Machine



Metal Lathe Machine



Metal Milling Machine



Leak Test



Welding Machine



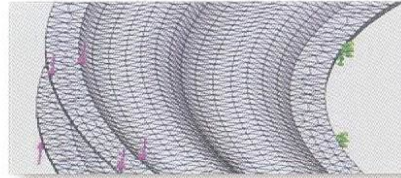
Welding (O.D)



Welding (I.D)

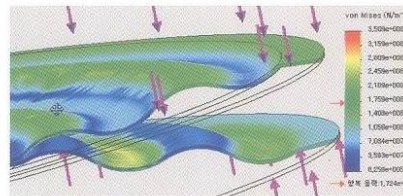
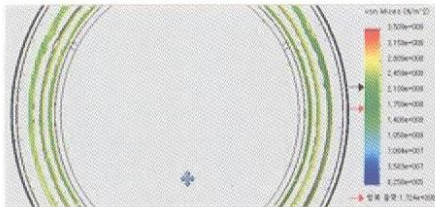
FEA (Finite Element Analysis)

Matter consists of an almost infinite number of elements. It will take a super computer a very long time to calculate the infinite number of interactions among the elements. Finite Element Analysis sets a parameter of the number of atomic structures in a bellow and analyses this using mathematical calculations. This method is used in simulations of the actual environment the bellows are exposed to. The simulated test results aid in applying the data in modeling the bellows. Kobell uses the FEA process in manufacturing operations. Because of the astronomical price tag, it is difficult for small scale bellow manufacturers to acquire the necessary software. The shortage of experienced software operators further aggravates the problem. However, Kobell has extensive experience in designing bellows with the FEA process.



The material is divided into a finite number of elements and is readied for analysis

The green color indicates parts that are overloaded



This is a filtered image. Overloaded areas are not shown.

This image of a single convolution shows areas that are under stress when the bellow is subject to pressure. It is possible to make modifications to disperse the stress in the design stage. This improves the quality and lifespan of our products.

Research and Development / Quality Improvement

2

Bellows are key components that require careful designing. Low quality designs may be the cause of bad results. The application of design simulation methods based on the Finite Element Analysis (FEA) has helped in understanding the physical properties of bellows, and thus shortened development time. Product specification and FMEA (Failure Modes and Effects Analysis) not only enhances product reliability, but also pinpoints potential causes of product deficiencies. This helps to analyze problems and find ways to improve.

Factors to Consider in Producing Bellows

- Dimension of Product (I.D., O.D.)
- Stroke (Maximum Compression Ratio)
- Special Requirements (Spring Rate, Expand Ratio, Torque)
- Application Environment (type of gas or fluid, external or internal pressure, temperature, etc.)

Data to be confirmed from the factors considered

- Type of bellow and dimension (type of bellow, sectional diagram, pitch, etc.)
- Determine Optimized Bellow rate
- Thickness of material considering pressure and spring rate
- Type of material considering corrosion resistance, lifespan and durability
- Mold design information and decision of finishing touches

Mold List

Name	ID	OD	Thick
XB48	4.00	8.00	0.08
XB49	4.00	9.50	0.1
XB410	4.00	10.00	0.10
XB510	5.00	10.00	0.1
XB512	5.50	12.60	0.10
XB619	6.10	19.00	0.10
XB615	6.50	15.00	0.10
XB712	7.00	12.70	0.08
XB720	7.70	20.50	0.1
XB822	8.00	22.00	0.1
XB822	8.00	22.00	0.1
XB922	9.50	22.00	0.1
XB1030	10.00	30.20	0.1
XB1023	10.50	23.00	0.1
XB1124	11.00	24.00	0.08
XB1226	12.00	26.00	0.1
XB1228	12.00	28.00	0.1
XB1334	13.65	34.10	0.1
XB1326	13.70	26.00	0.1
XB1334	13.70	34.40	0.1
XB1334	13.80	34.00	0.1
XB1426	14.00	26.00	0.1
XB1434	14.00	34.00	0.1
XB1428	14.10	28.30	0.1
XB1424	14.20	24.00	0.1
XB1531	15.40	31.80	0.1
XB1531	15.625	31.75	0.1
XB1625	16.00	25.00	0.1
XB1631	16.90	31.50	0.1
XB1730	17.00	30.00	0.1
XB1737	17.00	37.00	0.1
XB1929	19.00	29.60	0.127
XB1939	19.00	39.40	0.08
XB1944	19.00	44.40	0.1
XB1931	19.05	31.70	0.1
XB1941	19.05	41.28	0.1
XB2029	20.15	29.15	0.1
XB2033	20.60	33.40	0.1
XB2145	21.00	45.00	0.127
XB2235	22.00	35.00	0.1
XB2236	22.00	36.00	0.1
XB2240	22.00	40.00	0.127
XB2336	23.00	36.20	0.1
XB2336	23.00	36.20	0.1
XB2338	23.00	38.00	0.1
XB2336	23.50	36.70	0.127
XB2336	23.80	36.40	0.1

Name	ID	OD	Thick
XB2440	24.00	40.00	0.127
XB2444	24.40	44.40	0.1
XB2538	25.40	38.00	0.1
XB2638	26.00	38.00	0.1
XB2646	26.00	46.00	0.1
XB2639	26.90	39.80	0.1
XB2740	27.00	40.00	0.1
XB2842	28.30	42.10	0.1
XB2842	28.50	42.00	0.1
XB3050	30.00	50.00	0.1
XB3055	30.00	55.60	0.1
XB3144	31.00	44.30	0.1
XB3144	31.40	44.20	0.1
XB3151	31.40	51.40	0.1
XB3150	31.55	50.60	0.1
XB3150	31.80	50.50	0.127
XB3248	32.00	48.00	0.1
XB3252	32.00	52.00	0.1
XB3252	32.00	52.00	0.127
XB3346	33.10	46.10	0.1
XB3346	33.30	46.02	0.1
XB3346	33.30	46.20	0.1
XB3555	35.00	55.00	0.1
XB3561	35.00	61.00	0.127
XB3550	35.50	50.50	0.1
XB3651	36.00	51.00	0.1
XB3649	36.20	49.30	0.1
XB3649	36.20	49.40	0.1
XB3649	36.40	49.50	0.127
XB3755	37.00	55.00	0.1
XB3952	39.70	52.30	0.1
XB4060	40.00	60.00	0.127
XB4255	42.80	55.60	0.15
XB4375	43.00	75.00	0.15
XB4658	46.00	58.80	0.127
XB4764	47.00	64.50	0.15
XB4961	49.10	61.90	0.15
XB5070	50.00	70.00	0.127
XB5088	50.80	88.90	0.15
XB5265	52.30	65.10	0.15
XB5568	55.50	68.30	0.15
XB5770	57.00	70.00	0.15
XB5782	57.15	82.55	0.15
XB5771	57.90	71.40	0.15
XB5875	58.60	75.00	0.15
XB5871	58.70	71.50	0.15
XB6085	60.00	85.00	0.15

Name	ID	OD	Thick
XB6174	61.80	74.60	0.15
XB6383	63.00	83.00	0.15
XB6590	65.00	90.00	0.15
XB65105	65.00	105.00	0.15
XB6580	65.70	80.50	0.15
XB6682	66.00	82.00	0.15
XB6692	66.80	92.40	0.15
XB6884	68.00	84.20	0.15
XB68100	68.00	100.00	0.15
XB7094	70.00	94.00	0.15
XB7187	71.30	87.30	0.15
XB7184	71.40	84.10	0.15
XB7692	76.20	92.00	0.15
XB76121	76.20	121.00	0.15
XB7891	78.00	91.50	0.15
XB7995	79.30	95.30	0.15
XB80103	80.00	103.00	0.15
XB8298	82.40	98.40	0.15
XB85101	85.70	101.60	0.15
XB88104	88.80	104.80	0.15
XB89108	89.00	108.00	0.15
XB90120	90.00	120.00	0.15
XB90125	90.00	125.00	0.15
XB90130	90.00	130.00	0.15
XB92108	92.00	108.00	0.15
XB97114	97.00	114.30	0.15
XB98118	98.00	118.00	0.15
XB98114	98.30	114.40	0.15
XB101126	101.60	126.20	0.15
XB104120	104.80	120.80	0.15
XB105121	105.00	121.00	0.15
XB120150	120.00	150.00	0.15
XB125145	125.00	145.00	0.15
XB129148	129.00	148.00	0.15
XB131149	131.65	149.00	0.15
XB149169	149.00	169.00	0.15
XB150174	150.00	174.60	0.15
XB157176	157.00	176.00	0.15
XB161180	161.90	180.00	0.15
XB162180	162.00	180.00	0.15
XB164190	164.40	190.00	0.15
XB167200	167.00	200.00	0.15
XB180219	180.00	219.00	0.15
XB195220	195.00	220.50	0.15
XB205270	205.35	270.40	0.15
XB215286	215.40	286.00	0.15
XB224254	224.00	254.00	0.15