



THE WORLD RESOURCE
FOUNDATION
FINANCIAL RESOURCES TRUST AND SERVICES

Vélez-Malaga Project 2008



Objetives

Vélez-Málaga Project

- Remove Collection (optional)
- Look for solutions thinking about the environment.
- Recycle up to 99%
 - * Incineration generates a minimum of 35% of waste.
 - * The conventional recycling generates a minimum of 65% of waste.
- The plant can be installed in a urban area.
- It can obtain energy sources (electricity and fuel)
Profitable and Economically.
- Complies with the Kyoto Protocol (ND, G, GB)

¿How can These Objectives be Accomplished?

Comprehensive Municipal Solid Waste Management

- MSW Autoclave System
- Waste Plastic to Fuel



MSW Autoclave

Why is MSW a problem?

Landfills are environmental unfriendly:

- Dust, smell, view and diseases;
- Landfills produce CO₂, and contaminate water tables;
- Landfills are not a final solution, but only a temporary storage, so the problems are increasing every day.

Vulcanes Autoclave system:

- MSW can be recycled up to **99%** in a 24/7 process, without smell and dust.

Waste Plastic to Fuel Conversion

What is the most difficult product
to recycle coming from MSW?

Plastics

Our solution is to transform it into:

Liquid fuel & Gas

It saves the limited amount of fossil fuels

Summary of our Solutions Expertise

- Sorting installations
- Gasification biomass
- Anaerobic digestion
- Installations for bio diesel
- Oil sludge treatment
- Water treatment
- Odour treatment

Strategic Partners

- AeroThermal Group Ltd.
- Steps Pvt. Ltd.
- Steinert GmbH
- Jöst GmbH
- CP Manufacturing
- Krause Manufacturing
- MSS (infra red detection machinery)
- Terra Consult
- UI
- & Witzenhausen Institut
- Mott Mc. Donald UK



Sustainable Technologies & Environmental Projects Pvt. Ltd.

100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000



MSW Autoclave System



Up to 99% MSW recovery rate!

AeroThermal Group, **Our** partner company, founded some 30 years ago, is a company set up to concentrate on its core competence – Partnering with customers to:

Provide Turnkey Process Engineering Solutions.

Company founder, Ian Toll, primarily concentrated on developing products for processing industry specialising in advance composite structures for the aerospace, motor sport and military sectors.

Autoclave Installations



CIRCUMFERENTIAL AIRFLOW AUTOCLAVE

TWO DOOR, THROUGH
PRODUCTION CONTINUOUS
PROCESS AUTOCLAVE



**5.5M Ø x 40M Long, 15 Bars, 250° C
CIRCUMFERENTIAL AIRFLOW AUTOCLAVE UNDER
CONSTRUCTION FOR EADS AIRBUS TO PRODUCE THE
MAIN WING SKIN FOR THE A380 AIRCRAFT**



HEAVY ENGINEERING

Other key achievements haven been with providing some of the worlds largest aerospace autoclaves used to process key components of the new Boeing 787 all composite commercial aircraft.

**7.0M Ø x 35M Long, 10 Bars, 260° C
CIRCUMFERENTIAL AIRFLOW AUTOCLAVE FOR
MITSUBISHI HEAVY ENGINEERING TO PRODUCE THE
MAIN WING SKINS FOR THE 787 AIRCRAFT**





3.5M Ø x 20M Long, 10 Bars, 260° C

**CIRCUMFERENTIAL AIRFLOW AUTOCLAVE FOR
MITSUBISHI HEAVY ENGINEERING TO PRODUCE THE
SPAR SECTIONS FOR THE 787 AIRCRAFT**



**9.0M Ø x 21M Long, 10 Bars, 260° C
AXIAL AIRFLOW AUTOCLAVE BUILT FOR SPIRIT
AEROSTRUCTURES BY THERMAL EQUIPMENT
AMERICA TO PRODUCE THE COCKPIT AND NOSE
SECTION FOR THE BOEING 787 AIRCRAFT.**





8.6M Ø x 40 M Long, 11Bars , 220° C
**THE WORLDS LARGEST AEROSPACE
AUTOCLAVE UNDER CONSTRUCTION FOR
EADS AIRBUS TO MANUFACTURE THE WING
SKINS FOR THE A350.**







Production Facility in the Netherlands



Rotating autoclave

New exclusive design of a two door autoclave under an angle.



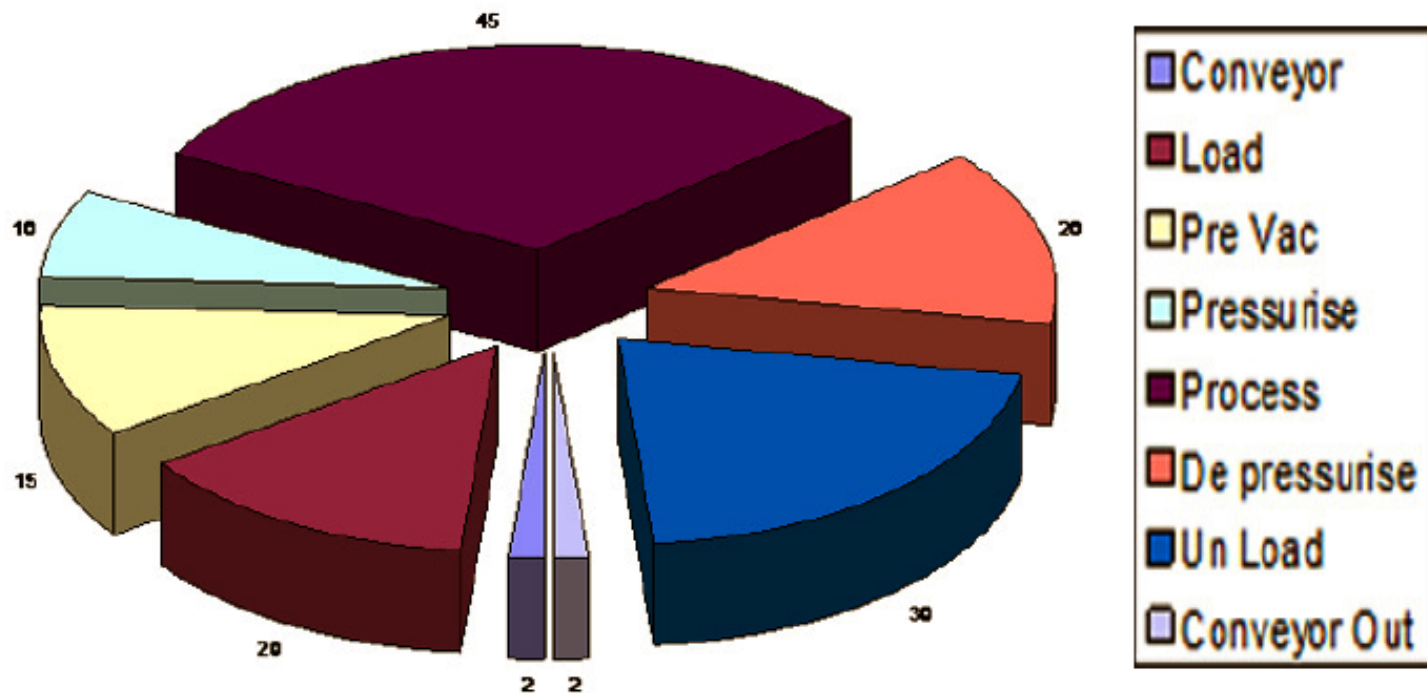
Characteristics

- Process temperature 160° C
- 5.2 Bar pressurized procedure
- Batch process cycle of 144 Minutes
- Material completely sanitised
- Highly energy efficient system
- 60% volume reduction
- 24 Hours per day / 7 days a Week / 330 days per year
- Up to > 99% MSW recovery rate!



Process cycle

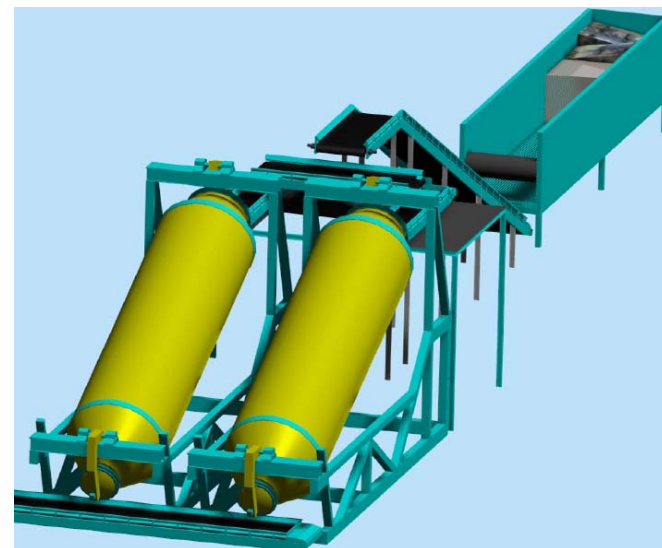
Process Cycle in 144 Minutes



In feed & sorting system

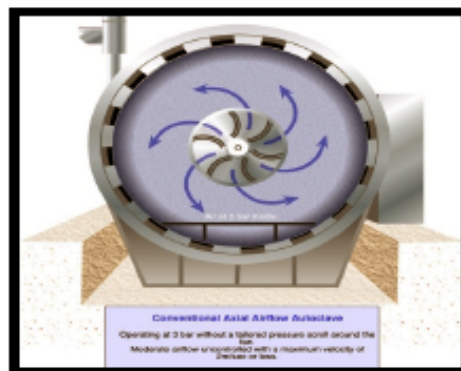
The combination of in feed and sorting equipment is designed by Vulcanes Ireland.

From the in feed of the materials into the converter till the recyclables that are required are delivered by Vulcanes.



MSW Autoclave

Annual capacity of a
two vessel converter
system is
165,000 Tonnes



Steam pressure process

packaged
steam boiler



condensate vessels

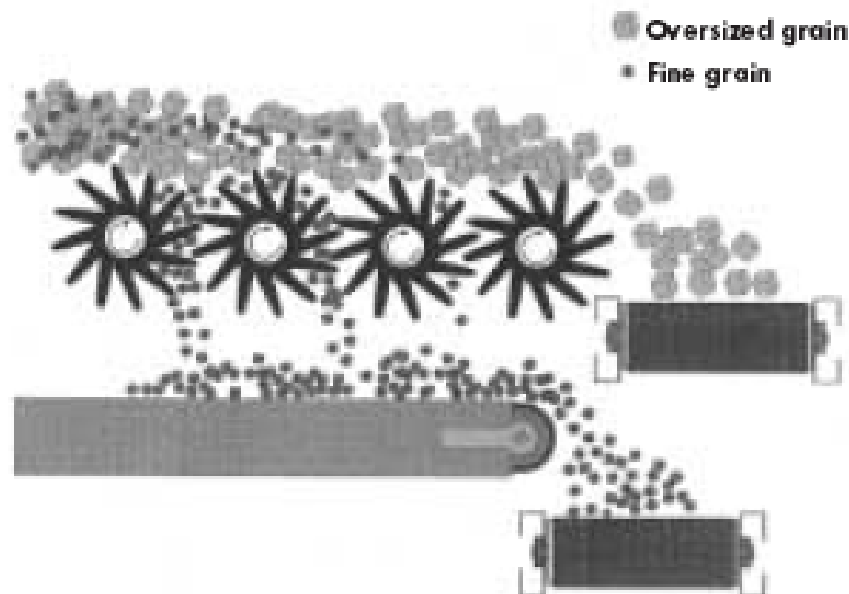
Sorting process

- Starscreens
- Air separation
- Magnets
- Non Ferro separators
- NIR (near infra red) systems

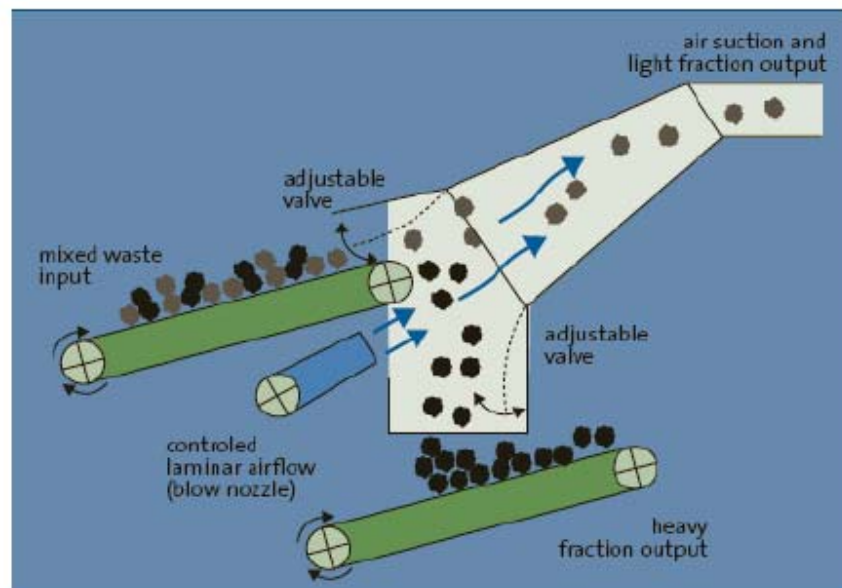


Starscreen technology

Principle of star screen



Air separation



Ferro and Non-Ferrous separation



- Drum magnet



- Over belt magnet



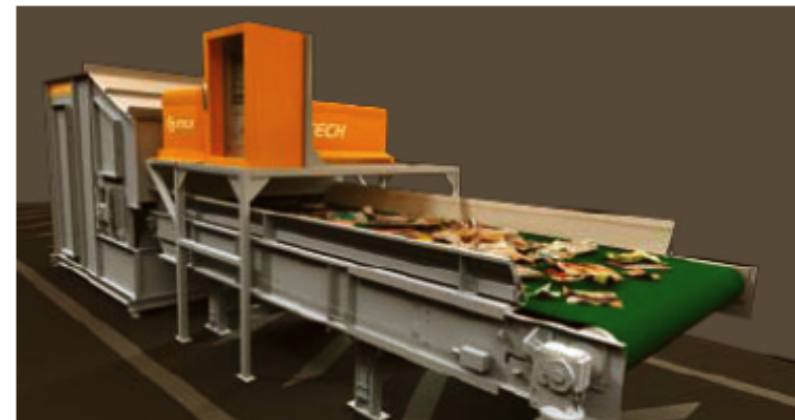
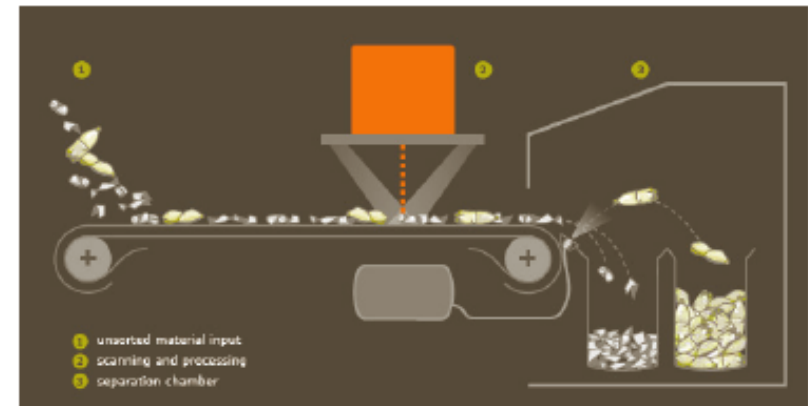
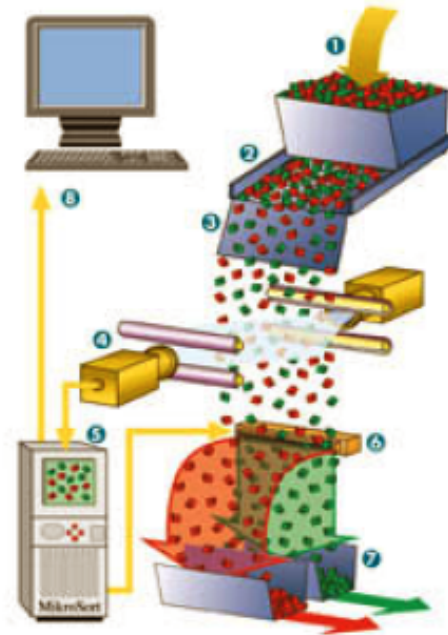
- Eddy Current



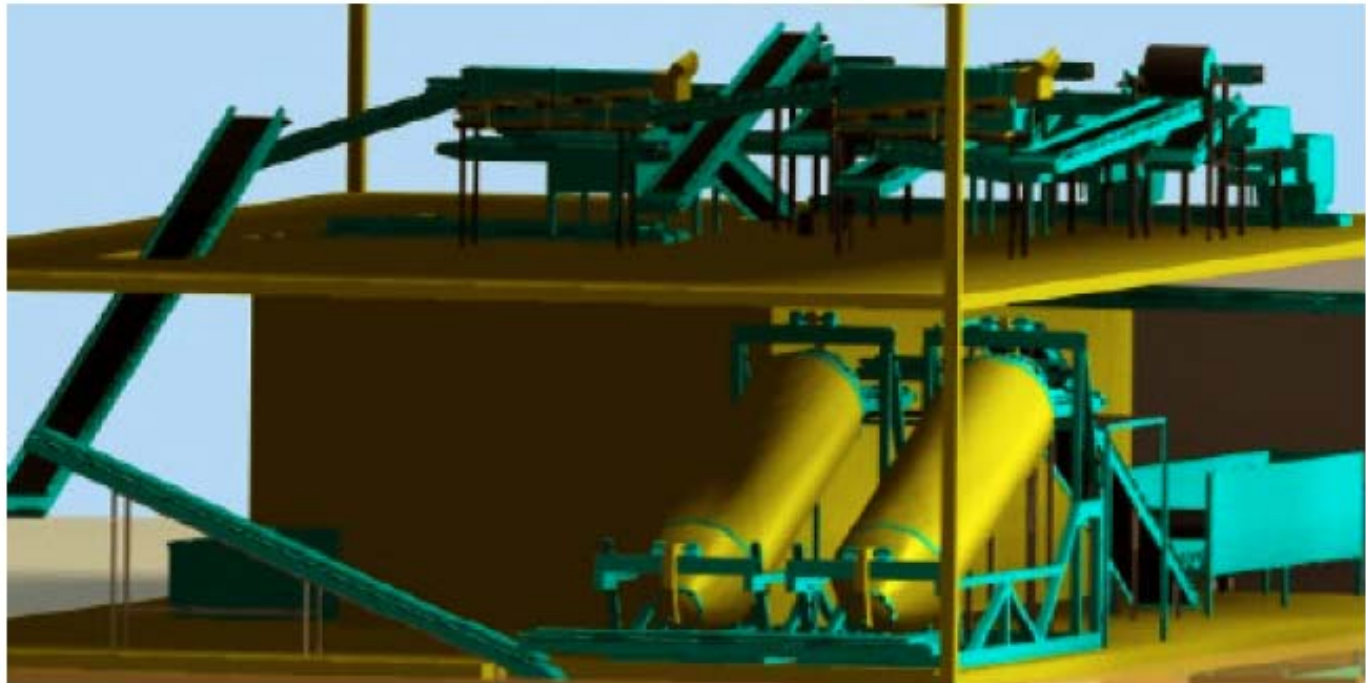
- Induction sorting system



Near Infra Red detection (NIR)



MSW Autoclave system



A simplified process diagram for AeroThermal Waste Technology





Deliverables / recyclables

- Clean non-ferrous
- Clean plastic with use of Polycrack machine
- Clean metals
converted to fuel
- Fiber for fuel by gasifier
through Polycrack
(all organic, food rests,
paper, paper board, etc)



Generating power

When we further process the fiber we are able to produce up to 20 – 24 MW of electricity.

We need to realize some extra steps:

- Drying the fiber in the AKT-KIX dryer.
- Process the dry fiber in the Polycrack system[®] to produce high value gas.
- Power plant to transform the gas in electricity.

Drying the fiber

After separating the fiber we bring this to a drying system.

With this system we use the produced heat from the power plant to get the moisture out of the fiber.



Polycrack system[®]

After drying we bring the dry fiber to the polycrack system[®]. In this system we convert the fiber in high-quality gas and a rest product of high-quality carbon.



Power generating plant

In the power plant we transform the gas into saleable electricity and heat.

The heat that this plant produces will be used for the drying process.



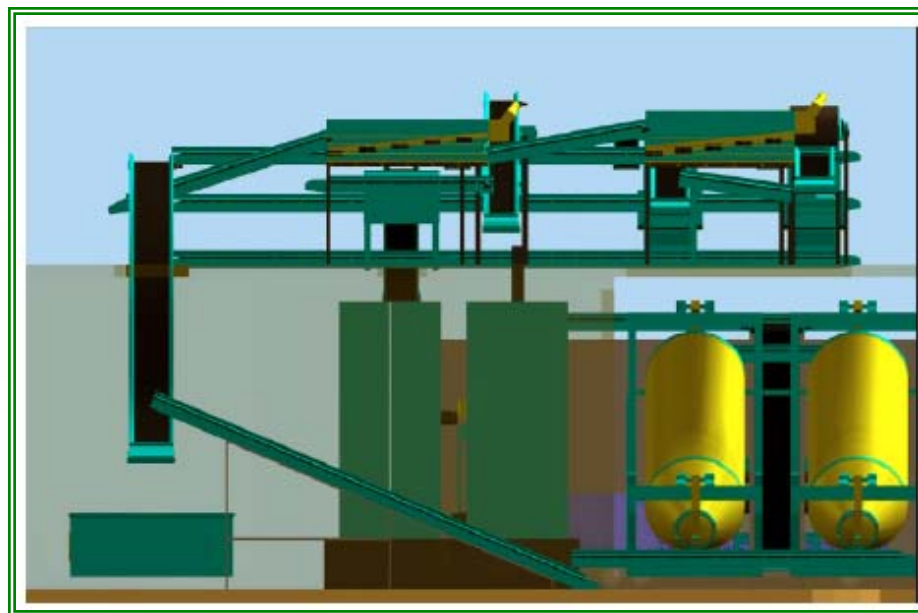
Gasification Process



Drying process



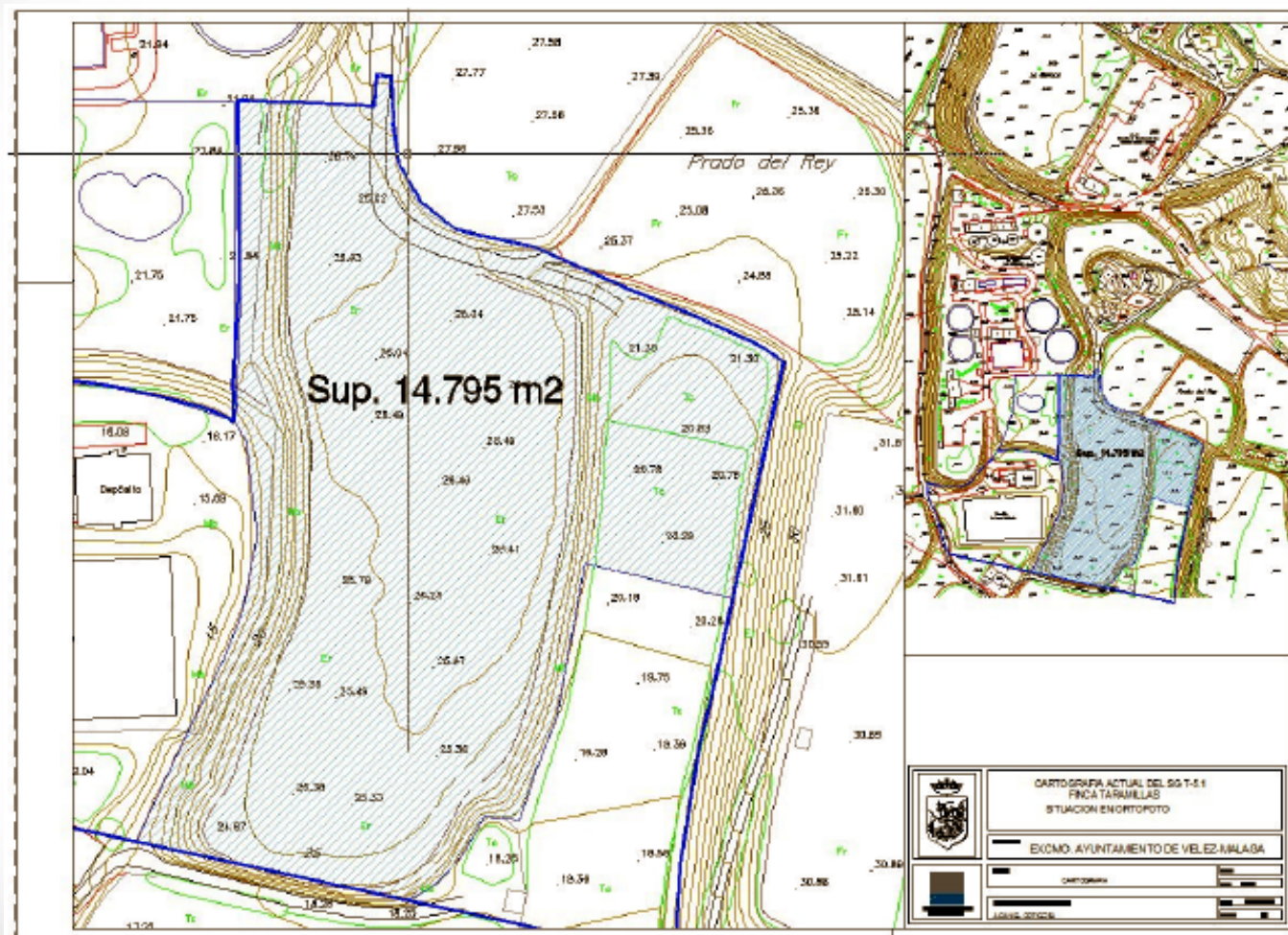
Production of electrical energy



Planned Installations

- Vélez Málaga - issuing company is to be determined, will probably be a cooperation of several companies with also the city of Vélez Málaga Spain
- Nisninovgorod - customer is Stroitransgaz Gazprom in the Russian Fed.
- Santiago city - customer will be the Dominican Republic

Vélez Málaga site picture



Waste plastic to fuel



The total solution for al kind of plastics

OUR partner company for the Polycrack technology is STEPS

Sustainable Technologies & Environmental Projects

- ❖ More than 25 years experience in the Oil Industry
- ❖ Some developed products are:
 - ❖ Bitumen to Furnace Oil Conversion
 - ❖ Desulphurization of Diesel Fuels
 - ❖ Conversion of waxy sludge to fuel oil
 - ❖ Conversion of sludge to bio-fertilizer
 - ❖ Development of chemicals for water purification
 - ❖ Development of chemicals for tank cleaning

Polycrack system[®]

In this system:

- Plastic waste segregated from the Vulcanes system is converted to fuel
- This is a zero discharge system
- Plastic converted into gas, liquid fuel and carbon
- Conversion is > 99%.

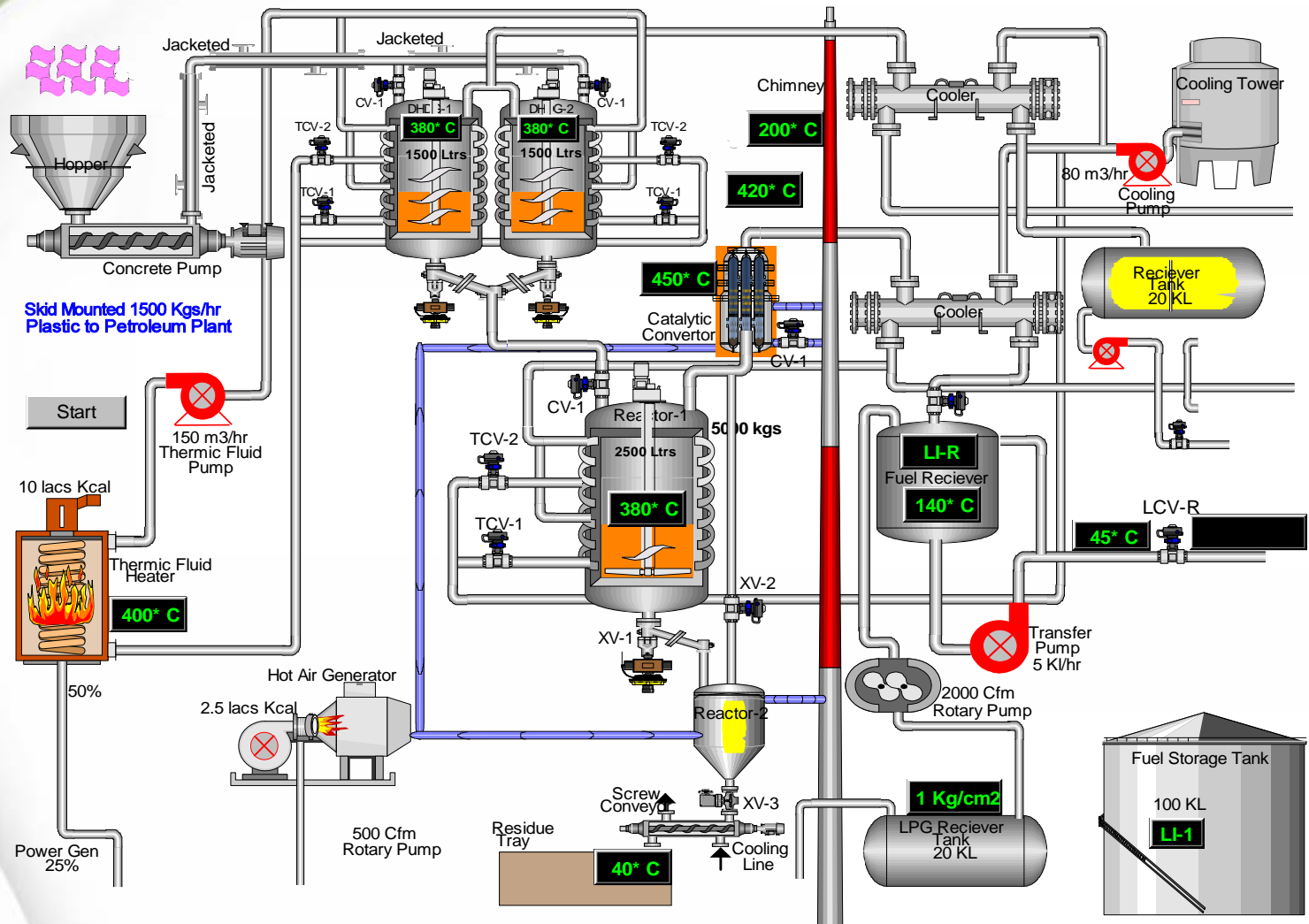
Pre-treatment plastics

The following steps has to be done:

- Collect the segregated plastics from the Vulcanes sorting system
- Shred the plastic to app. 25 mm size pieces
- Load the shredded plastics into the system.



Technical overview



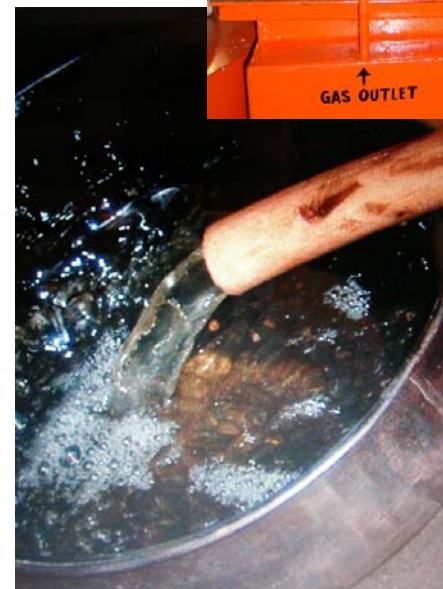
Process (1)

- Pre-heat the plastics to melting form
- Heating plastics in main reactor to reach the gas phase
- Gas treated by catalyst.



Process (2)

- Condense gas to liquid fuel
- Filtering fuel
- Distillation fuel to kerosene, petrol, gas oil, heating oil.



Waste Plastic to Fuel conversion

- Catalyst quality determines full conversion to gas or liquid fuel
- Gas can be fed to gas engine to generate heat to heat the reactor
- Thus the gas feed can be used for internal fuel consumption
- Liquid fuel can be sold or used for internal use.

Fuel extracted from plastic (example)

Specs.	Regular Gasoline Fuel	Extracted from Plastic Waste
• Colour, Visual	Orange	Pale Yellow
• Specific Gravity at 28°C	0.74	0.72
• Gross Calorific Value	11210	11260
• Net Calorific Value	10460	10500
• API gravity	56,46	60,65
• Sulphur Content (by mass max)	0.1	<0.002
• Flash Point (Abel)°C	23.0	22.0
• Pour Point °C	<-20°C	<-20° C
• Cloud Point	<-20°C	<-20° C

Process parameters

- Feed rate: modular system can handle 5Mt per day to 500Mt per day
- Heating: can be achieved by electrical power or internally produced gas/liquid fuel
- Conversion rate: > 99%
- Residue: approx. 10% which is carbon.

Proven Technology

- Bahrain; plant to treat bitumen to fuel.
dimensions: 3000 tons per day
owner: king of Bahrain
- Dubai; plant to treat oil sludge packed
in plastic bags to fuel.
dimensions: 25 tons a day.
owner: king of the UAE.

Bahrain plant



Capacity of 3000 tons per day



The bitumen lake below, the
pumps and the storage tanks on
the right



Dubai plant

Capacity: 25 tons per day of
oil sludge packed in plastic
bags.

End products are liquid Fuels



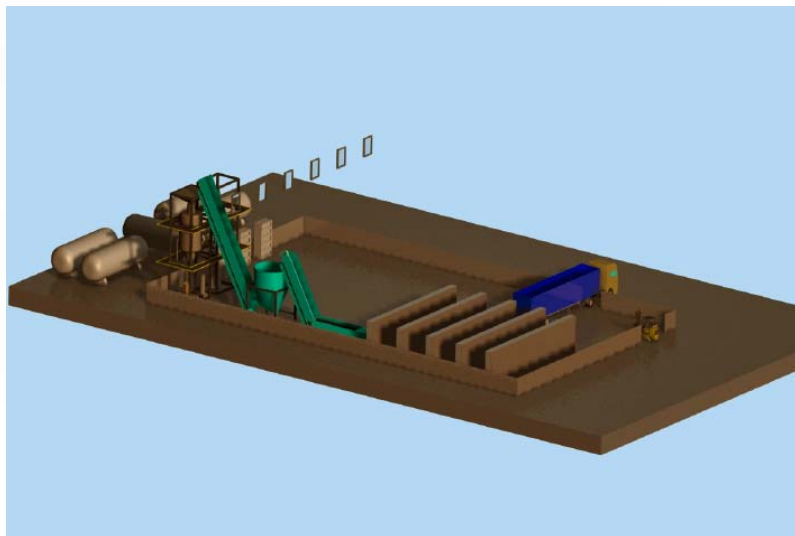
Polycrack status Germany

- Project Vulcanes Productions GmbH
25 tons per day plastic to fuel
- Project Fiwa Niederlangen
5 tons per day plastic to fuel
- Project waste treatment Essen
25 tons per day plastic to fuel

Vulcanes Productions GmbH Germany



Site of
Vulcanes Productions
GmbH, 10.000 m².
Production facility
for 25 tons
of plastics per day, Fuel
production of approx.
8.000.000 per annum.



Some other solutions we supply



24-Composting system.
Producing high quality organic fertilizer

Bio-gas installations, in combination with autoclave technology material like supermarket and food waste.





THANK YOU!
**Together we can take full
advantage of waste.**

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